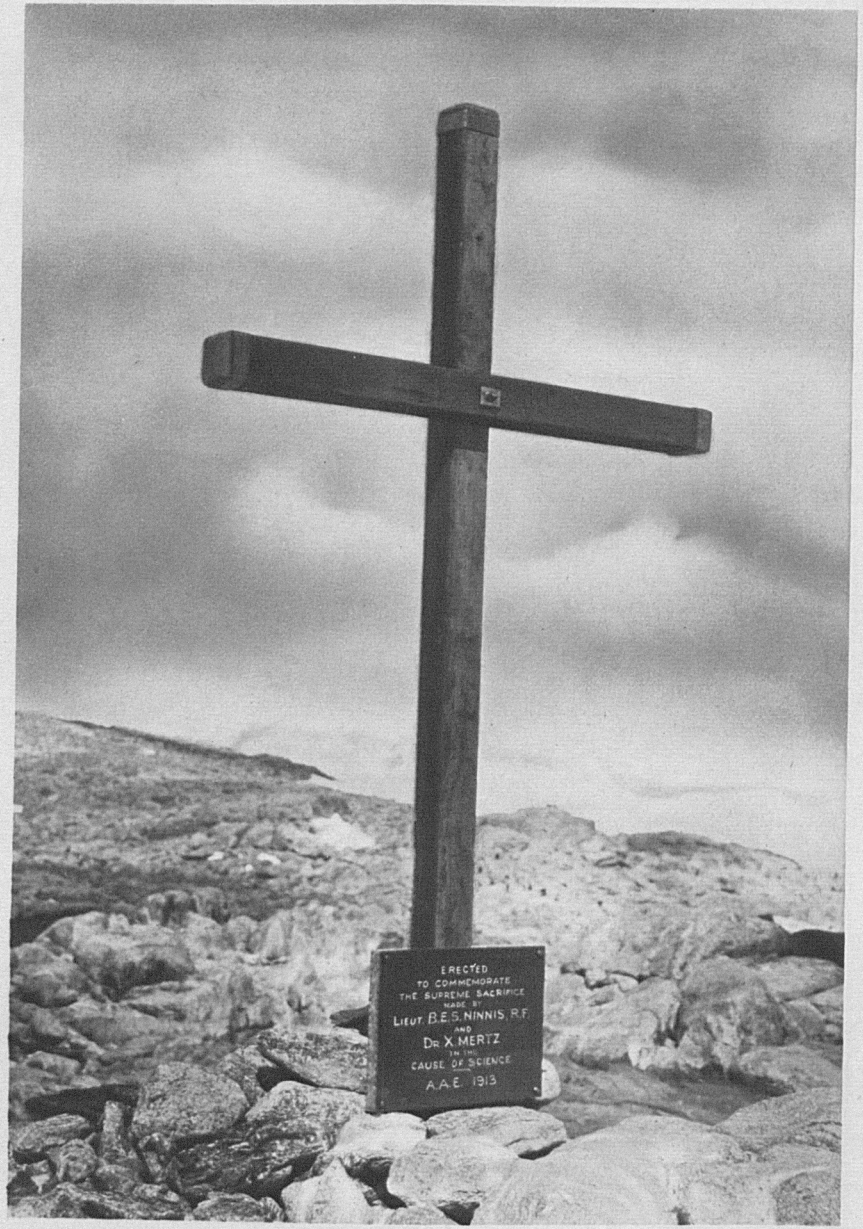
THE HOME OF THE BLIZZARD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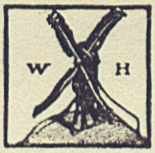
IN MEMORIAM CROSS AT CAPE DENISON

THE HOME OF THE BLIZZARD

BEING THE STORY OF THE AUSTRALASIAN ANTARCTIC EXPEDITION, 1911–1914;

BY SIR DOUGLAS MAWSON, D.Sc., B.E.

ILLUSTRATED IN COLOUR AND BLACK AND WHITE ALSO WITH MAPS



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In pocket of binding case

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King George V Land, showing Tracks of the Eastern Sledging Parties from the Main Base

Queen Mary Land, showing Tracks of the Sledging Party from the Main Base

CHAPTER XVII

WITH STILLWELL'S AND BICKERTON'S PARTIES

LEAVING Madigan's party on November 19, when forty-six miles from the Hut, Stillwell, Hodgeman and Close of the Near-Eastern Party diverged towards a dome-shaped mountain—Mount Hunt. A broad valley lay between their position on the falling plateau and this eminence to the north-east. Looking across, one would think that the depression was slight, but the party found by aneroid that their descent was one thousand five hundred feet into a gully filled with soft, deep snow. After skimming the polished sastrugi of the uplands, the sledge ran heavily in the yielding drifts. Then a gale of wind rose behind them just as the ascent on the other side commenced, and was a valuable aid in the pull to the summit.

From the highest point or cap of what proved to be a promontory, a wide seascape dotted with bergs was unfolded to the north. To the west the eastern cape of Commonwealth Bay was visible, and sweeping away to the north-east was the Mertz Glacier with sheer, jutting headlands succeeding one another into the distance. True bearings to these points were obtained from the camp, and, subsequently, with the help of an observation secured on the *Aurora* during the previous year, the trend of the glacier-tongue was determined. Hodgeman made a series of illustrative sketches.

On November 21 the party commenced the return journey, moving directly towards Madigan Nunatak to the south-west. This nunatak had been sighted for the first time on the outward march, and there was much speculation

as to what the rock would prove to be. A gradual descent for seven miles brought them on to a plain, almost at sea-level, continuous with the valley they had crossed on the 19th further to the east. On the far side of the plain a climb was commenced over some ice-spurs, and then a broad field of crevasses was encountered, some of which attained a width of fifty yards. Delayed by these and by unfavourable weather, they did not reach Madigan Nunatak until the evening of November 20.

The outcrop—a jagged crest of rock—was found to be one hundred and sixty yards long and thirty yards wide, placed at an altitude of two thousand four hundred feet above sea-level. It is composed of grey quartzose gneiss.

There were no signs of recent glaciation or of ice-striæ, though the rock was much weathered, and all the cracks and joint-planes were filled with disintegrating material. The weathering was excessive and peculiar in contrast with that observed on fresh exposures near the Hut and at other localities near sea-level.

After collecting specimens and placing a small depot of food on the highest point, the party continued their way to the Hut, reaching it on November 27.

At Winter Quarters noticeable changes had taken place. The harbour ice had broken back for several hundred yards and was rotten and ready to blow out in the first strong wind; marked thawing had occurred everywhere, and many islands of rock emerged from the snow; the ice-foot was diminishing; penguins, seals, and flying birds made the place, for once, alive and busy.

Bickerton, Whetter and Hannam carried on the routine of work; Whetter as meteorologist and Hannam as magnetician, while Bickerton was busied with the air-tractor and in preparations for sledging. Thousands of penguins' eggs had been gathered for the return voyage of the *Aurora*, or in case of detention for a second winter.

Murphy, Hunter and Laseron arrived from the south on the same day as Stillwell, Hodgeman and Close came in from

ISLETS FRINGING THE MAINLAND

VIEW LOOKING WEST FROM STILLWELL ISLAND

Adelie Land. *Paget colour photo by Correll*

the east. The former party had plodded for sixty-seven miles through a dense haze of drift. They had kept a course roughly by the wind and the direction of sastrugi. The unvarying white light of thick overcast days had been so severe that all were suffering from snow-blindness. When, at length, they passed over the endless billows of snow on to the downfalls near the coast, the weather cleared and they were relieved to see once more the Mecca of all sledging parties—Aladdin's Cave.

A redistribution of parties and duties was made. Hodgeman joined Whetter and Bickerton in preparation for the air-tractor sledge's trip to the west. Hunter took up the position of meteorologist and devoted all his spare time to biological investigations amongst the immigrant life of summer. Hannam continued to act as magnetician and general "handy man." Murphy, who was also to be in charge during the summer, returned to his stores, making preparations for departure. Hourly meteorological observations kept every one vigilant at the Hut.

In pursuance of a plan to examine in detail the coast immediately east of Commonwealth Bay, Stillwell set out with Laseron and Close on December 9. The weather was threatening at the start, and they had the usual struggle with wind and drift to "make" Aladdin's Cave.

Forewarned on the first journey of the dangers of bad ventilation, they cleared the entrance to the cave of obstacles so that a ready exit could be made, if, as was expected, the opening became sealed with snow-drift. This did happen during the night, and, though everything seemed all right the next morning, the whole party was overpowered during breakfast by foul air, the presence of which was not suspected.

Hoosh was cooked and about to be served, when Stillwell, who was in charge of the primus, collapsed. Close immediately seized an ice-axe, stood up, thrust its point through the choked entrance, and fell down, overcome. Laseron became powerless at the same time. An hour and

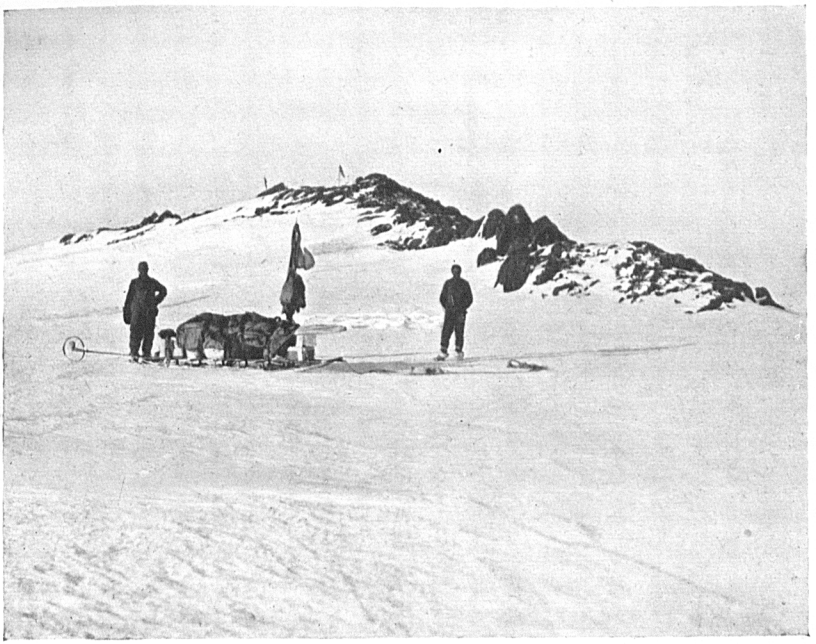
a half later—so it was reckoned—the party revived and cleared the opening. The hole made by the ice-axe had been sufficient to save their lives. For a day they were too weak and exhausted to travel, so the tent was pitched and the night spent outside the Cave.

On December 11 they steered due south for a while and then eastward for three days to Madigan Nunatak; delayed for twenty-four hours by a blizzard.

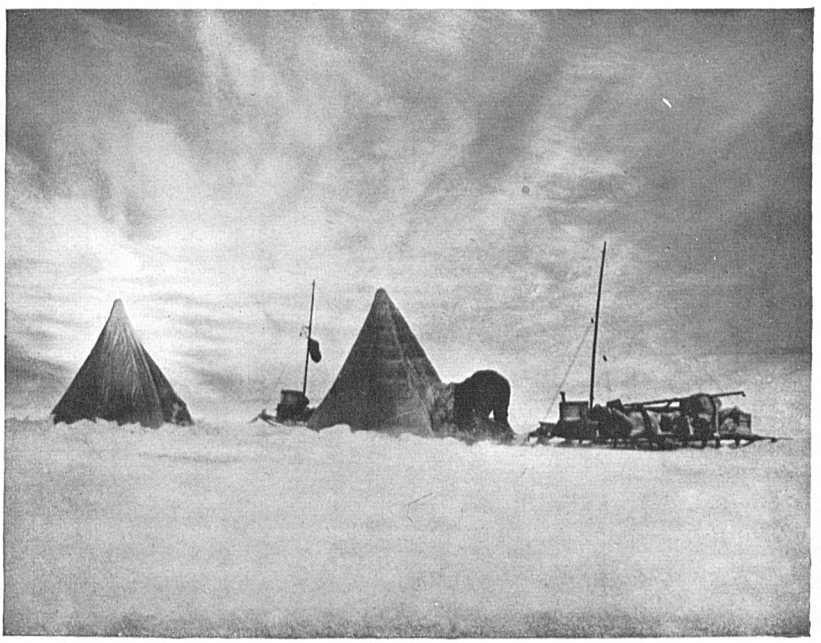
Stillwell goes on to describe: "Part of the 15th was spent in making observations, taking photographs and collecting specimens of rocks and lichens. Breaking camp, we set out on a northerly course for the coast down gently falling snowfields. Gradually there opened up a beautiful vista of sea, dotted with floes and rocky islets (many of which were ice-capped). On December 16 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 an islet connected by a snow-ramp with the icy barrier. Lying farther off the shore was a thick fringe of islets, among and beyond which drifted a large quantity of heavy floe. The separate floes stood some ten or fifteen feet above the water-level, and the lengths of several exceeded a quarter of a mile. Every accessible rock was covered with rookeries of Adelie penguins; the first chicks were just hatched."

A theodolite traverse was run to fix the position of each islet. The traverse-line was carried close to the ice-cliff, so that the number of islets hidden from view was as few as possible. Snow mounds were built at intervals and the intervening distances measured by the sledge-meter.

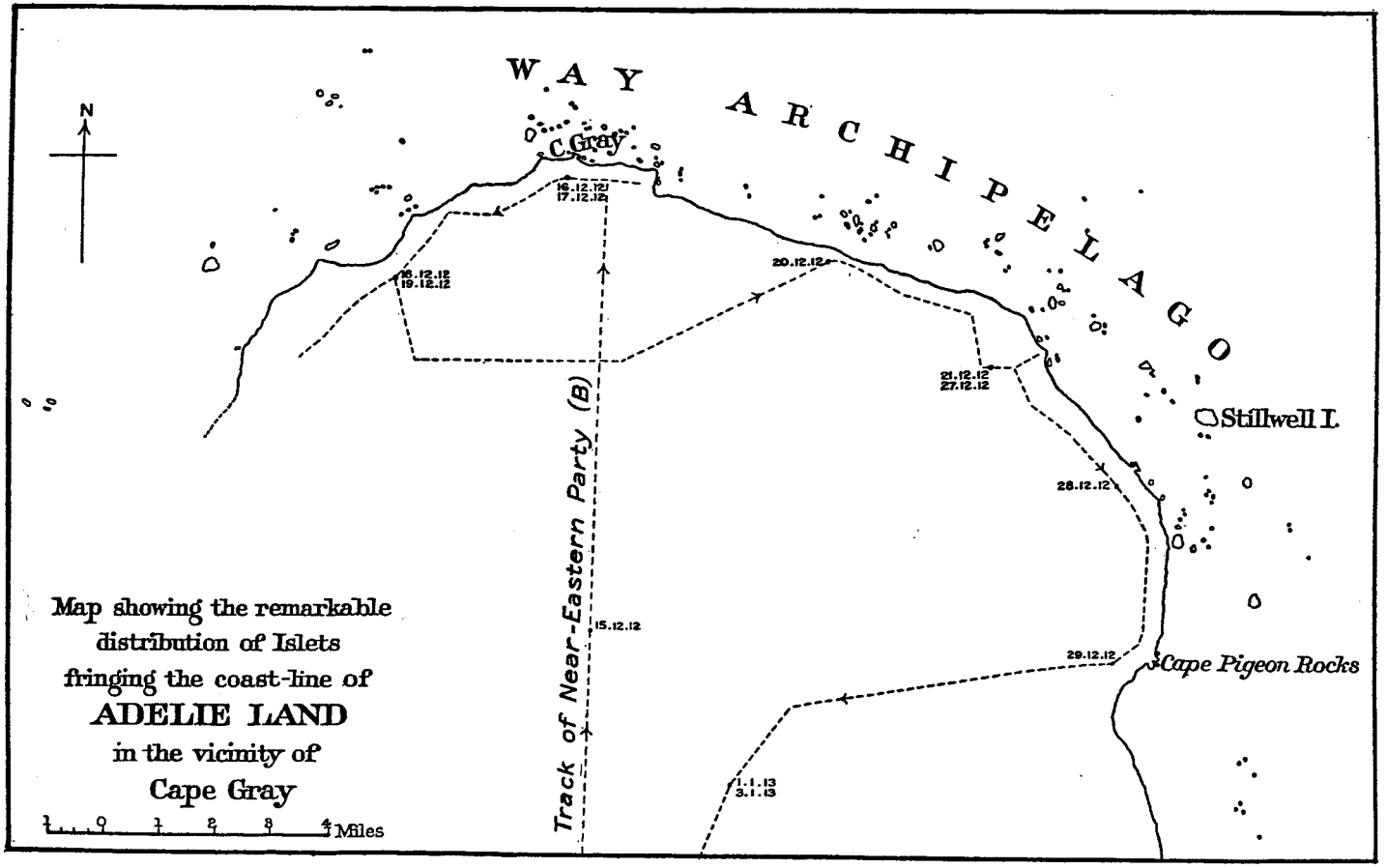
The party travelled west for seven and a quarter miles round a promontory—Cape Gray—until the Winter Quarters were sighted across Commonwealth Bay. They then turned eastward over the higher slopes, meeting the coast some three miles to the east of the place where they had first encountered it. The surface was for the most part covered with snow, while crevasses were frequent and treacherous.



MADIGAN NUNATAK—CLOSE AND LASERON STANDING BY THE SLEDGE *Stillwell*



A DESOLATE CAMP ON THE PLATEAU *Hurley*


WAY ARCHIPELAGO
N
C. Gray
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17.12.12
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27.12.12
28.12.12
29.12.12
15.12.12
1.1.13
3.1.13
Track of Near-Eastern Party (B)
Stillwell I.
Cape Pigeon Rocks
Map showing the remarkable distribution of Islets fringing the coast-line of
ADELIE LAND
in the vicinity of
Cape Gray
0 1 2 3 4 Miles

In the midst of the survey the sledge-meter broke down, and, as the party were wholly dependent upon it for laying out base-lines, repairs had to be made.

On the 27th another accessible rocky projection was seen. Over it and the many islands in the vicinity hovered flocks of snow petrels and occasional Antarctic and Wilson petrels. Masses of Adelie penguins and chicks constituted the main population, and skua gulls with eggs were also observed. The rock was of garnet gneiss, traversed by black dykes of pyroxene granulite.

A great discovery was made on December 29. On the abrupt, northern face of some rocks connected to the ice-cap of the mainland by a causeway of ice a large colony of sea-birds had nested. Cape pigeons, the rare silver-grey and snow petrels were all present. Amongst these Laseron made a collection of many eggs and birds.

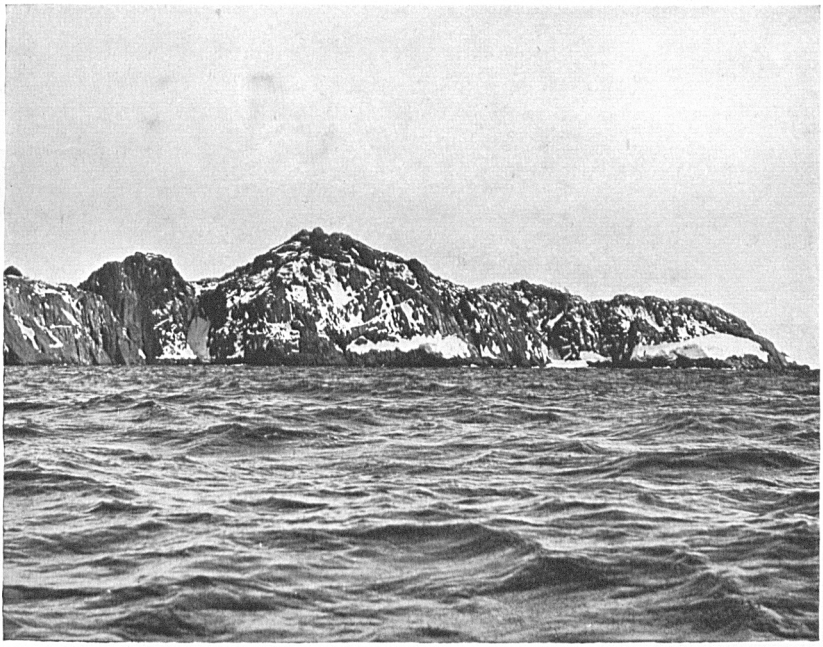
The traverse-line was then carried back to Madigan Nunatak along a series of connecting mounds. After being held up for three and a half days in a blizzard from December 31 to January 4, the party were home once more late on January 5, 1913.

Returning to the fortunes of the air-tractor sledge, which was to start west early in December. Bickerton has a short story to tell, inadequate to the months of work which were expended on that converted aeroplane. Its career was mostly associated with misfortune, dating from a serious fall when in flight at Adelaide, through the southern voyage of the *Aurora*, buffeted by destructive seas, to a capacious snow shelter in Adelie Land—the Hangar—where for the greater part of the year it remained helpless and drift-bound.

Bickerton takes up the story :

I had always imagined that the air-tractor sledge would be most handicapped by the low temperature; but the wind was far more formidable. It is obvious that a machine which depends on the surrounding air for its medium of traction could not be tested in the winds of an Adelie Land

SLEDGING RATIONS FOR THREE MEN FOR THREE MONTHS *Hurley*



STILLWELL ISLAND.—A HAUNT OF THE SILVER-GREY PETREL *Hurley*

winter. One might just as well try the capabilities of a small motor-launch in the rapids at Niagara. Consequently we had to wait until the high summer.

With hopes postponed to an indefinite future, another difficulty arose. As it was found that the wind would not allow the sea-ice to form, breaking up the floe as quickly as it appeared, the only remaining field for manœuvres was over the highlands to the south ; under conditions quite different from those for which it was suited. We knew that for the first three miles there was a rise of some one thousand four hundred feet, and in places the gradient was one in three and a half. I thought the machine would negotiate this, but it was obviously unsafe to make the venture without providing against a headlong rush downhill, if, for any reason, power should fail.

Suggestions were not lacking, and after much consideration the following device was adopted:

A hand rock-drill, somewhat over an inch in diameter, was turned up in the lathe, cut with one-eighth-inch pitched, square threads and pointed at the lower end. This actuated through an internal threaded brass bush held in an iron standard ; the latter being bolted to the after-end of a runner over a hole bushed for the reception of the drill. Two sets of these were got ready ; one for each runner.

The standards were made from spare caps belonging to the wireless masts. The timely fracture of one of the vices supplied me with sufficient ready-cut thread of the required pitch for one brake. Cranked handles were fitted, and the points, which came in contact with the ice, were hardened and tempered. When protruded to their fullest extent, the spikes extended four inches below the runners.

The whole contrivance was not very elegant, but impressed one with its strength and reliability. To work the handles, two men had to sit one on each runner. As the latter were narrow and the available framework, by which to hold on and steady oneself, rather limited, the office of brakesman promised to be one with acrobatic possibilities.

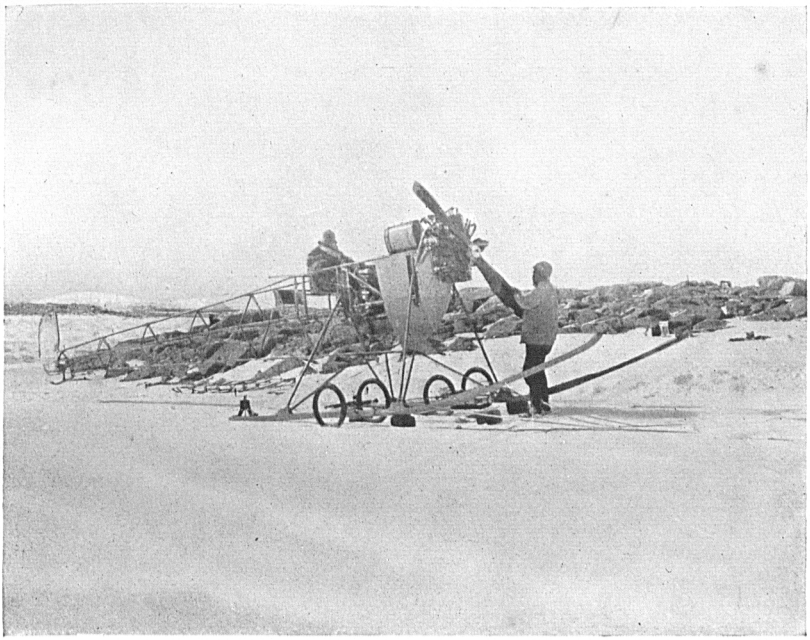
To start the engine it was necessary to have a calm and, preferably, sunny day; the engine and oil-tank had been painted black to absorb the sun's heat. On a windy day with sun and an air temperature of 30° F., it was only with considerable difficulty that the engine could be turned—chiefly owing to the thickness of the lubricating oil. But on a calm day with the temperature lower—20° F. for example—the engine would swing well enough to permit starting, after an hour or two of steady sun. If there were no sun even in the absence of wind, starting would be out of the question, unless the atmospheric temperature were high or the engine were warmed with a blow-lamp.

It was not till November 15 that the right combination of conditions came. That day was calm and sunny, and the engine needed no more stimulus than it would have received in a " decent " climate.

Hannam, Whetter and I were the only inhabitants of the Hut at the time. Having ascertained that the oil and air pumps were working satisfactorily, we fitted the wheels and air-rudder, and made a number of satisfactory trials in the vicinity of the Hut.

The wheels were soon discarded as useless; reliance being placed on the long runners. Then the brakes were tested for the first time by driving for a short distance uphill to the south and glissading down the slope back to the Hut. With a man in charge of each brake, the machine, when in full career down the slope, was soon brought to a standstill. The experiment was repeated from a higher position on the slope, with the same result. The machine was then taken above the steepest part of the slope (one in three and a half) and, on slipping back, was brought to rest with ease. The surface was hard, polished blue ice. The air-rudder, by the way, was efficient at speeds exceeding fifteen miles per hour.

On the 20th we had a calm morning, so Whetter and I set out for Aladdin's Cave to depot twenty gallons of benzene and six gallons of oil. The engine was not running well, one cylinder occasionally " missing." But, in spite



"THE BUS," THE AIR-TRACTOR SLEDGE *Mawson*

BICKERTON AND HIS SLEDGE WITH DETACHABLE WHEELS *Hurley*

of this and a head wind of fifteen miles per hour, we covered the distance between the one-mile and the two-mile flags in three minutes. This was on ice, and the gradient was about one in fifteen. We went no farther that day, and it was lucky that we did so, for, soon after our return to the Hut, it was blowing more than sixty miles per hour.

On December 2 Hodgeman joined us in a very successful trip to Aladdin's Cave with nine 8-gallon tins of benzene on a sledge; weighing in all seven hundred pounds.

After having such a good series of results with the machine, the start of the real journey was fixed for December 3. At 3 P.M. it fell calm, and we left at 4 P.M., amid an inspiriting demonstration of goodwill from the six other men. Arms were still waving violently as we crept noisily over the brow of the hill and the Hut disappeared from sight.

On the two steepest portions it was necessary to walk, but, these past, the machine went well with a load of three men and four hundred pounds, reaching Aladdin's Cave in an hour by a route free of small crevasses, which I had discovered on the previous day. Here we loaded up with three 100-lb. food-bags, twelve gallons of oil (one hundred and thirty pounds), and seven hundred pounds of benzene. Altogether, there was enough fuel and lubricating oil to run the engine at full speed for twenty hours as well as full rations for three men for six weeks.

After a few minutes spent in disposing the loads, our procession of machine, four sledges (in tow) and three men moved off. The going was slow, too slow—about three miles an hour on ice. This would probably mean no movement at all on snow which might soon be expected. But something was wrong. The cylinder which had been missing fire a few days before, but which had since been cleaned and put in order, was now missing fire again, and the speed, proportionately, had dropped too much.

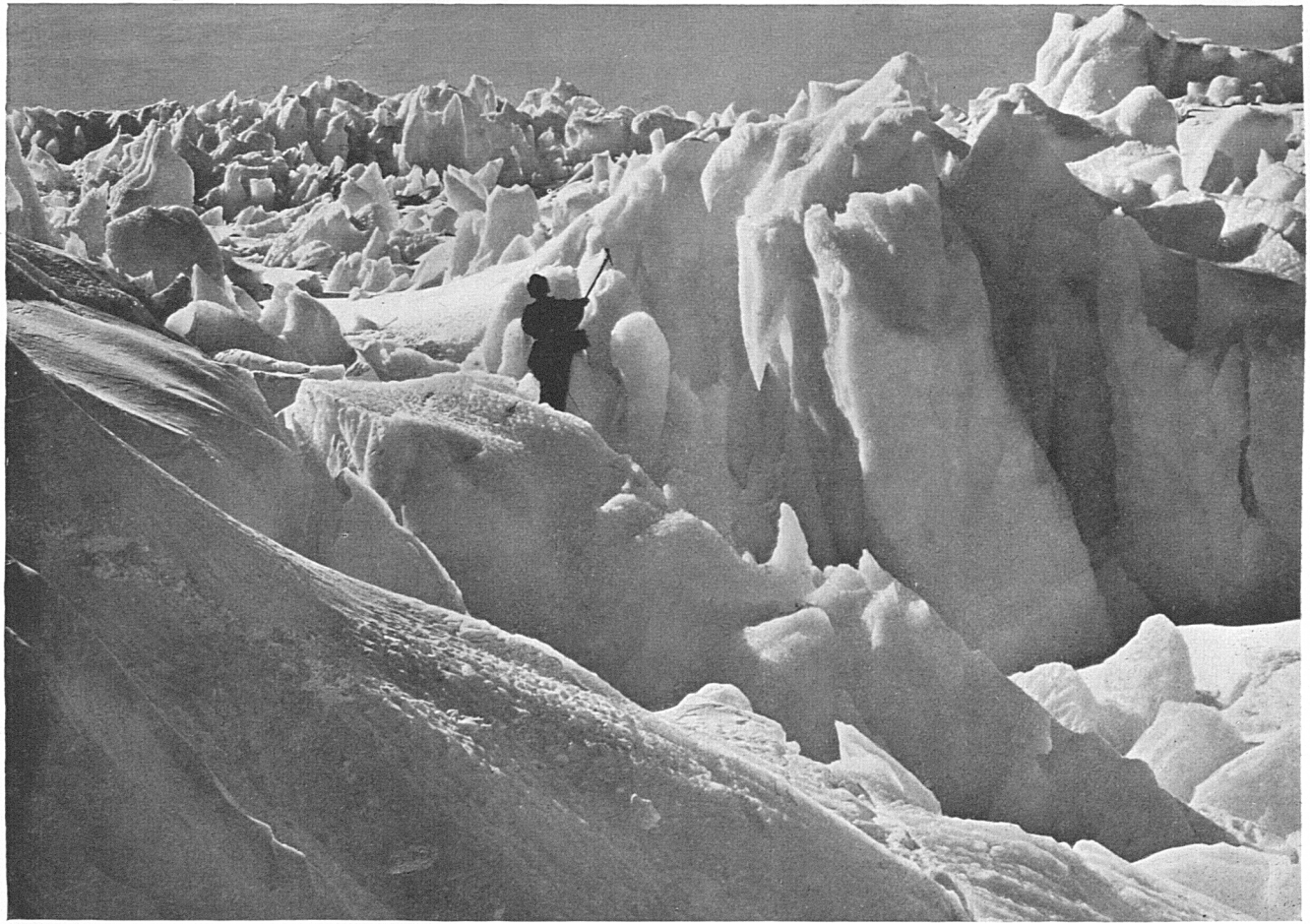
I made sure that the oil was circulating, and cleaned the sparking-plug, but the trouble was not remedied. A

careful examination showed no sufficient cause, so it was assumed to be internal. To undertake anything big was out of the question, so we dropped thirty-two gallons of benzene and a spare propeller. Another mile went by and we came to snow, where forty gallons of benzene, twelve gallons of oil and a sledge were abandoned. The speed was now six miles an hour and we did two miles in very bad form. As it was now 11 P.M. and the wind was beginning to rise, we camped, feeling none too pleased with the first day's results.

While in the sleeping-bag I tried to think out some rapid way of discovering what was wrong with the engine. The only conclusion to which I could come was that it would be best to proceed to the cave at eleven and three-quarter miles—Cathedral Grotto—and there remove the faulty cylinder, if the weather seemed likely to be favourable; if it did not, to go on independently with our man-hauled sledge.

On December 4 the wind was still blowing about twenty miles per hour when we set to work on the machine. I poured some oil straight into the crank-case to make sure that there was sufficient, and we also tested and improved the ignition. At four o'clock the wind dropped, and in an hour the engine was started. While moving along, the idle cylinder was ejecting oil, and this, together with the fact that it had no compression, made me hope that broken piston-rings were the source of the trouble. It would only take two hours to remove three cylinders, take one ring from each of the two sound ones for the faulty one, and all might yet be well!

These thoughts were brought to a sudden close by the engine, without any warning, pulling up with such a jerk that the propeller was smashed. On moving the latter, something fell into the oil in the crank-case and fizzled, while the propeller could only be swung through an angle of about 30°. We did not wait to examine any further, but fixed up the man-hauling sledge, which had so far been carried by



Adelie Land AMONGST SPLINTERED ICE WHERE THE ICE-SHEET DESCENDS TO THE SEA NEAR CAPE DENISON *Hurley*

the air-tractor sledge, and cached all except absolute necessities.

We were sorry to leave the machine, though we had never dared to expect a great deal from it in the face of the unsuitable conditions found to prevail in Adelie Land. However, the present situation was disappointing.

Having stuffed up the exhaust-pipes to keep out the drift, we turned our backs to the aero-sledge and made for the eleven-and-three-quarter-mile cave, arriving there at 8 P.M. There was a cheering note from Bage in the "Grotto," wishing us good luck.

To avoid crevasses we steered first of all to the south-west on the morning of the 5th, which was clear and bright. After six 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 five inches by three inches by three and a half inches and was covered with a black scale which in places had blistered; three or four small pieces of this scale were lying within three inches of the main piece. Most of the surface was rounded, except one face which looked as if it had been fractured. It was lying on the snow, in a slight depression, about two and a half inches below the mean surface, and there was nothing to indicate that there had been any violent impact.

At eight o'clock that night we had done twelve miles, losing sight of the sea at a height of about three thousand feet. All felt pleased and looked forward to getting over a ridge ahead, which, from an altitude of four thousand feet, ran in pencilled outline to the western point of Commonwealth Bay.

On December 6 it was drifting hard, and part of the

* This has since been examined by Professor E. Skeats and Stillwell, who report it to be an interesting form of meteorite, containing amongst other minerals, plagioclase felspar. This is, we believe, the first occasion on which a meteorite has been found in the Antarctic regions.—ED.

morning was spent theorizing on our prospects in an optimistic vein. This humour gradually wore off as the thick drift continued, with a fifty-mile wind, for three days.

At 5 P.M. on December 8 a move was made. The drift was what our Hut-standard reckoned to be "moderate," but the wind had fallen to thirty miles an hour and had veered to the east; so the 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 eight miles.

The thirst each one of us developed in those earlier days was prodigious. When filling the cooker with snow it was hard to refrain from packing it "up to the knocker" in order to obtain a sufficient supply of water.

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 thirty-one 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.

December 10 was Whetter's birthday. It was heralded by an extra strong wind and the usual liberal allowance of drift. I was cook, and made some modifications in the meal. Hodgeman (who was the previous cook) used to make hoosh as thick as a biscuit, so we had some thin stuff for a change —two mugs each. Then really strong tea; we boiled it for some time to make sure of the strength and added some leaves which had already done good service.

Several times fault had been found with the way the tent was pitched. I had not yet tried my hand at being the "man inside" during this operation. One day, while every one was grumbling, I said I would take the responsibility at the next camp; the proposal being received with grunts of assent. When the job was finished and the poles appeared to be spread taut, I found myself alone in

Adelie Land MACCORMICK SKUA GULL ON THE NEST WITH EGG *Hurley*

Adelie Land CHICK OF MACCORMICK SKUA GULL ON THE NEST *Hurley*

what seemed to me a cathedral. Feeling pleased, I called for the others to come in, and arranged myself in a corner with an "I-told-you-so" expression on my face, ready to receive their congratulations. Hodgeman came in first. He is not a large man, though he somehow gives one the impression that he is, but after he had made himself comfortable the place seemed smaller. When half-way through the "spout," coming in, he gave a grunt which I took to be one of appreciation. Then Whetter came in. He is of a candid disposition: "Ho, ho, laddie, what the dickens have you done with the tent?"

I tried to explain their mistake. But it was no good. When we were all inside, I couldn't help seeing that the tent was much smaller than it had ever been before, and we had to huddle together most uncomfortably. And there were three days like this.

At nine o'clock one morning Hodgeman woke me with, "What about getting a move on?" The wind had dropped to forty miles an hour, and through a tiny hole in the tent the ground could be seen. Amid a thinning fog of drift, the disc of the sun was just visible.

We made a start and then plodded on steadily till midnight over a soft and uncomfortable surface. Shortly after that hour I looked at the sledge-meter and found that it had ceased working; the sprocket had been knocked off. Repair was out of the question, as every joint was soldered up; so without more ado we dropped it. In future we were to estimate our speed, having already had some good experience in this way.

No sooner had Friday December 13 come on the scene than a catastrophe overtook us. The superstitious might have blamed Fate, but on this occasion there was no room for doubt; the fault was mine. The sail was up and, while braking the load upwind, I slipped and fell, allowing the sledge to collide with a large sastruga. The bow struck the solid snow with such force that it was smashed.

Next day a new bow was manufactured from a spare

bamboo which had been brought as a depot pole. It took some time splitting and bending this into position and then lashing it with raw hide. But the finished article fully justified the means, and, in spite of severe treatment, the makeshift stood for the rest of the journey.

While on the march on December 16, the wind dropped and the drift ceased for the first time since December 5; for eleven days it had been heavy or moderate. Before we got into harness on the same day, a Wilson petrel flew above us. This little touch of life, together with the bright sun, light wind and lack of drift enabled us to start away in better spirits than had been our wont.

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 "piecrust" were met but only lasted for two or three miles. Making up for lost time, we did a few miles short of one hundred in five days.

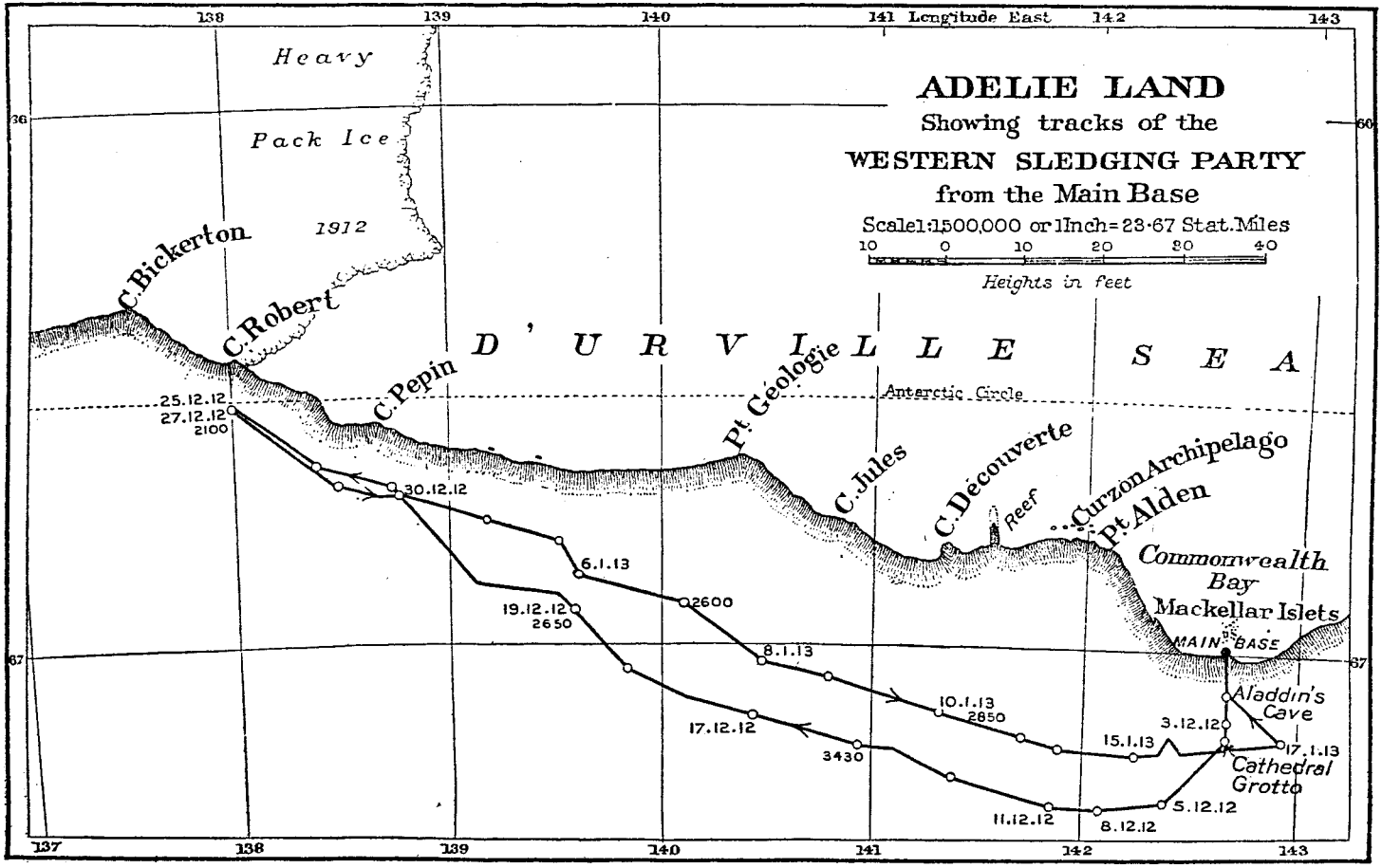
Unfortunately there was always drift at midday, so that it was impossible to get a latitude "shot" with a sextant and artificial horizon.

On December 19 camp was pitched at 1 A.M. before a glorious view; an horizon of sea from west to north-east and white fields of massive bergs. In the extreme 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.

December 21 marked the end of the good weather, for


ADELIE LAND
Showing tracks of the
WESTERN SLEDGING PARTY
from the Main Base
Scale 1:1,500,000 or 1 Inch = 23·67 Stat. Miles
10 0 10 20 30 40
Heights in feet
Longitude East
138
139
140
141
142
143
Heavy
Pack Ice
1912
C. Bickerton
C. Robert
C. Pepin
D ' U R V I L L E
S E A
Antarctic Circle
Pt. Géologie
C. Jules
C. Découverte
Reef
Curzon Archipelago
Pt. Alden
Commonwealth Bay
Mackellar Islets
MAIN BASE
Aladdin's Cave
Cathedral Grotto
25.12.12
27.12.12
2100
30.12.12
6.1.13
2600
19.12.12
2650
8.1.13
10.1.13
2850
17.12.12
3430
11.12.12
8.12.12
5.12.12
15.1.13
3.12.12
17.1.13
66
67
137

drift and wind came on apace lasting four days, the wind attaining about eighty 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 thirteen 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 fifty miles from our altitude.

All things considered, I thought it right to turn back at this stage. In twenty-six days we had done one hundred and fifty-eight miles, and ninety-seven 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 30 we reoccupied the camp of the 20th, sixteen 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 five miles away. These turned out to be high snow-ramps, two hundred 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. A New Year pudding was made of soaked biscuit, cocoa, milk, sugar, butter, and a few remaining raisins, and it was, of course, an immense success.

On January 1 and the two succeeding days the drift was so thick that we had to lie up and amuse ourselves discussing various matters of individual interest. Hodgeman gave us a lecture on architecture, explaining the beauties of certain well-known buildings. Whetter would describe some delicate surgical operation, while I talked about

Adelie Land WHERE THE PLATEAU DESCENDS TO COMMONWEALTH BAY *Hurley*

machinery. I also worked up the time-shots, and the hours passed quickly. If only our sleeping-bags had been drier we might have enjoyed ourselves at intervals.

The evening of the 4th found us camped ten miles nearer home, beside a large crevasse and with a closer view of the bay seen on December 20. 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 ten 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, forty-five 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 fifty-mile wind on January 12 kept us confined for thirty-six hours. It was clear enough after noon on the 13th, and five miles were covered in four hours through thick surface drift. What the course was we did not care as we steered by the sastrugi. If ever a man had any " homing instinct " it would surely show itself on such an occasion as this.

Travelling in driving snow used to have a curious effect on me. I always imagined that we were just coming to an avenue of trees running at right angles to our course. What produced this idea I have not the slightest suspicion, but while it lasted, the impression was very strong.

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 twelve miles by concerted reckoning.

Next day we went three 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 eight miles at least. It was about midnight—the time when mirage was at a maximum. Consequently, all agreed that the machine was about twelve miles away, and we went on our way rejoicing, steering towards the Cathedral Grotto which was two miles south of the aero-sledge. After three miles we camped, and, it being my birthday, the two events were celebrated by "blowing in" the whisky belonging to the medical outfit.

On the 16th the weather was thick, and we marched east for ten miles, passing a tea-leaf, which it was afterwards found must have come downwind from the Grotto. For eight hours nothing could be done in thick drift, and then, on breaking camp, we actually came to a flag which had been planted by Ninnis in the spring, thirteen miles south-east of Aladdin's Cave. The distance to the air-tractor had been over-estimated, and the Grotto must have been passed quite close.

We made off down the hill, running over the crevasses at a great pace. Aladdin's Cave with its medley of boxes, tins, picks and shovels, gladdened our eyes at 10 P.M. on the 17th. Conspicuous for its colour was an orange, stuck on a pick, which told us at once that the Ship was in.

CHAPTER XVIII

THE SHIP'S STORY

By Captain J. K. DAVIS

> By sport of bitter weather
> We're walty, strained, and scarred
> From the kentledge on the kelson
> To the slings upon the yard.
>
> Kipling.

DR. MAWSON'S plans, as laid before the Royal Geographical Society in 1911, provided for an extensive oceanographical campaign in the immense stretch of ocean to the southward of Australia. Very little was known of the sea-floor in this area, there being but a few odd soundings only, beyond a moderate distance from the Australian coast. Even the great *Challenger* expedition had scarcely touched upon it; and so our Expedition had a splendid field for investigation.

The first discovery made in this connexion on board the *Aurora* was the fact that deep-water work is more intricate than books would make it appear. Although text-books had been carefully studied on the subject, it was found that most of them passed over the practical side of the work in a few words, insufficient to give us much help in carrying out difficult operations with the vessel rolling and tumbling about in the heavy seas of the Southern Ocean.

So it was only after a good deal of hard work and many disappointments that the experience was gained which enabled us, during the later stages of the Expedition, to do useful and successful work.

Before passing on to the operations of the *Aurora*

during the winter of 1912, I shall briefly refer to the equipment provided for oceanographical work.

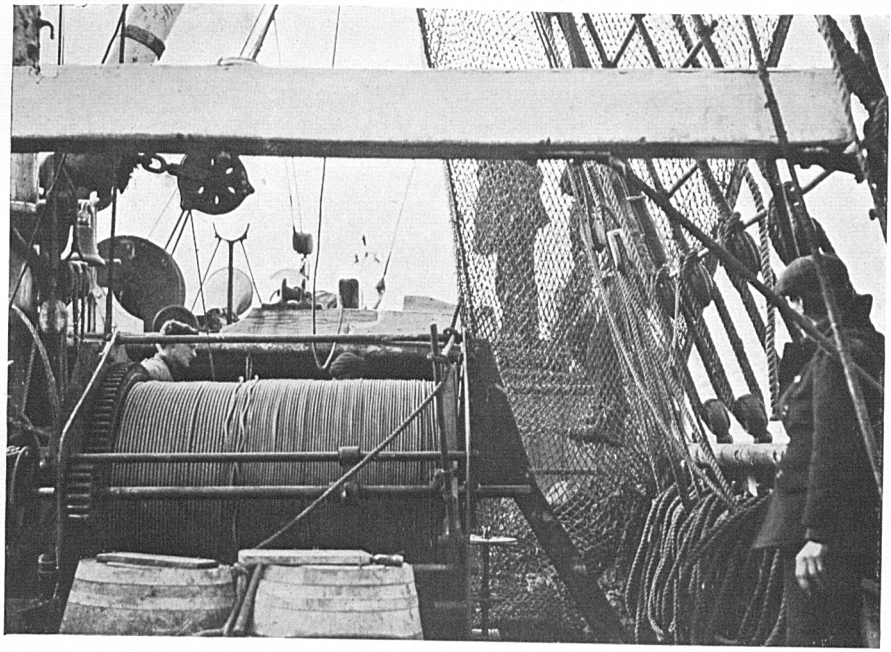
The Lucas Automatic Sounding Machine was situated on the port side of the forecastle head. It was suitable for depths up to six thousand fathoms, being fitted with a grooved wheel so as to be driven by a rope belt from a steam-winch or other engine. The wire was wound in by means of a small horizontal steam-engine which had been specially designed for the *Scotia*, of the Scottish Antarctic Expedition (1902) and was kindly lent to us by Dr. W. S. Bruce.

The wire as it is paid out passes over a measuring wheel, the revolutions of which record on a dial the number of fathoms out. A spring brake, which is capable of stopping the reel instantly, is kept out of action by the tension of the wire, but when the sinker strikes the bottom, the loss of tension allows the brake to spring back and stop the reel. The depth can then be read off on the dial.

A hollow iron tube called a driver is attached to a piece of hemp line spliced into the outer end of the sounding wire. This driver bears one or two weights to the bottom and detaches them on striking it; a specimen of the bottom being recovered in the hollow part of the tube which is fitted with valves to prevent water from running through it on the way up. Immediately the driver and weight strike the bottom, the reel automatically stops paying out wire.

To obtain a deep-sea sounding on the *Aurora*, the vessel was stopped, turned so as to bring the wind on the port-bow and kept as nearly stationary as possible; the engines being used to balance any drift of the vessel due to wind or sea.

The difficulties of sounding in the Southern Ocean were much increased by the almost constant, heavy swell. The breaking strain of the wire being only two hundred and forty pounds and the load it had to carry to the bottom weighing nearly fifty-six pounds in air, it could easily be understood that the sudden strain imposed by the violent



THE BIG WINDING-DRUM FOR THE DEEP-SEA DREDGING CABLE *Hurley*

FLETCHER WITH THE DRIVER LOADED READY TO TAKE A SOUNDING *Davis*

rolling of the vessel often resulted in the parting of the wire. We soon learnt to handle both vessel and sounding machine in such a way as to entail the least possible strain on the wire.

Of all the operations conducted on board the *Aurora*, deep-sea trawling was the one about which we had most to learn. Dr. W. S. Bruce gave me most valuable advice on the subject before we left England. Later, this was supplemented by a cruise in Australian waters on the *Endeavour*, of the Commonwealth Fisheries Investigation. Here I was able to observe various trawling operations in progress, subsequently applying the information gained to our own requirements on the *Aurora*.

A short description of our trawling arrangements may be useful to those who are engaged in this work on board a vessel not specially designed for it.

We were provided with three thousand fathoms of tapered steel wire (varying from one and three-quarters to one and a half inches in circumference and weighing roughly a ton to the thousand fathoms in air); this was kept on a large iron reel (A) mounted on standards and controlled by a friction-brake. This reel was situated on the starboard side of the main deck, the wire being wound on to it by means of a chain-drive from the forward cargo-winch.

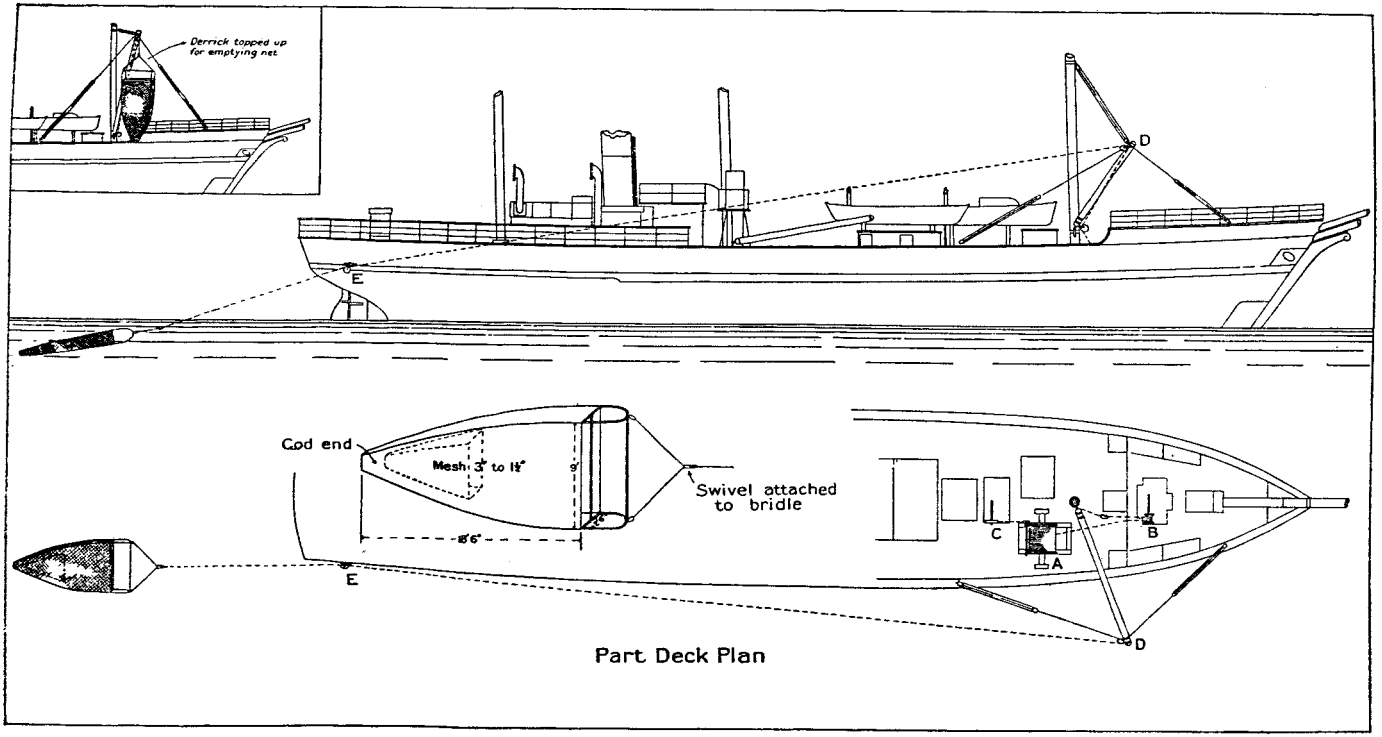
For heaving in, our steam-windlass was fitted with a specially constructed drum (B), which absorbed the crushing strain and then allowed the slack wire to be wound on the reel (A), which was driven as nearly as possible at the same speed; the windlass usually heaving at the rate of four hundred and fifty fathoms per hour.

A wooden derrick (D), provided with topping lift and guys, was mounted on the foremast by means of a band and goose-neck. At the outer end of the derrick, the dynamometer and a fourteen-inch block were attached. The maximum strain which could be supported was ten tons. In paying out, the wire was led from the head of the derrick to a snatch-block on the quarter (E), constructed so as to admit

of its disengagement from the wire when it was necessary to heave in. This block kept the wire clear of the propeller and allowed us to have the vessel moving slow or fast as required, while the trawl was being paid out. The positions of the various parts of the trawling gear are shown in the plan on the opposite page.

Before trawling in deep water the vessel was stopped and a sounding obtained; then the derrick was hoisted, the wire rove through the various blocks, the trawl shackled on, and the men distributed at their stations. When all was ready, the engines were put at half-speed (three knots), a course was given to the helmsman and the trawl lowered into the water. When it was flowing nicely just astern, the order, "Slack away," was given; the wire being paid out evenly by means of the friction-brakes. In one thousand five hundred fathoms of water, after the two-thousand-fathom mark had passed out, the order was given, "Hold on and make fast." Speed was now reduced to one and a half knots and the wire watched until it gave a decided indication of the trawl dragging over the bottom. The strain was now taken by the windlass-barrel, controlled by a screw-brake, backed if necessary by a number of turns round the forward bitts. A slow drag over the bottom was generally continued for one hour. The engines were then stopped, and the order came, "Stand by to heave away." This was quickly followed by "Knock out," which meant the disengaging of the after-block from the wire and allowed the vessel to swing round head-on to the wire. "Vast heaving" indicated the appearance of the net at the surface, and, when the mouth of the net was well above the bulwarks the derrick was topped up vertically, the lower part of the net dragged inboard and the cod-end untied, the catch being thus allowed to empty itself on deck. The contents of the haul supplied the biologists with the work of sorting and bottling for the next twelve hours or more.

The form of trawl used on board the *Aurora* was known as a Monagasque trawl, of a type employed by the Prince



PLAN ILLUSTRATING THE ARRANGEMENTS FOR DEEP-SEA TRAWLING ON BOARD THE *AURORA*.

of Monaco. As will be seen from the sketch, it is of simple construction and possesses the advantage of having both sides similar so that it is immaterial which lands on the bottom.

The winter cruise in the Sub-Antarctic began on May 18, 1912, after we had refitted in Sydney and taken on board all the oceanographic apparatus, during the previous month. Leaving Port Jackson, we proceeded to Port Kembla, N.S.W., and took in four hundred and eleven tons of coal.

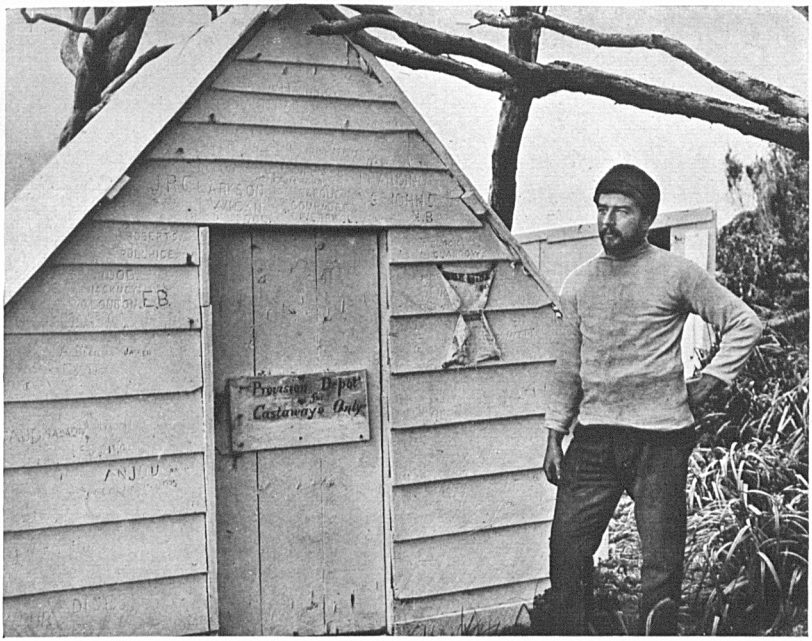
The following was the personnel of the ship's officers on this and the two following cruises: Chief Officer, F. D. Fletcher; Chief Engineer, F. J. Gillies; Second Officer, P. Gray; Third Officer, C. P. de la Motte.

During the first dredging cruise, Mr. E. R. Waite, from the Canterbury Museum, Christchurch, was in charge of the biological work.

My plan was to go through Bass Strait and then to sail towards the Royal Company Islands as given on the French chart, before heading for Macquarie Island. From thence we should steam across to the Auckland Islands. At both the latter places Mr. Waite would be able to secure specimens. It was not expected that the weather would permit of much trawling, but we anticipated some good soundings. As a matter of fact, sub-antarctic weather in the winter may be predicted with some certainty: strong winds, heavy seas, much fog and general gloom.

We had a fine run through Bass Strait with a light south-east breeze, arriving off King's Island at noon on May 23. The trawling gear was got ready for the following day, but the sea was too high and the ship continued south towards the position of the Royal Company Islands.

On June 1 we were in latitude 53° south, longitude 152° east, and had been cruising about fruitlessly in heavy weather for days waiting for an opportunity to dredge. After being at sea for a whole fortnight we had only three soundings to our credit, and it was, therefore, resolved to make for Macquarie Island.



Davis

AT THE PROVISION DEPOT FOR CASTAWAYS PROVIDED BY THE NEW ZEALAND GOVERNMENT, CAMP COVE, CARNLEY HARBOUR, AUCKLAND ISLAND. PRIMMER ON THE RIGHT

Primmer

THE BRICK PIER ERECTED AT PORT ROSS, AUCKLAND ISLANDS, BY THE MAGNETICIANS OF SIR JAMES CLARKE ROSS'S EXPEDITION

On the 7th we reached the island and anchored at North-East Bay in twelve fathoms, about one mile from land.

After a stiff pull ashore, next day, we landed and found the party all well. They had built a comfortable hut and were enjoying life as far as possible, despite the constant gales and continuous days of fog.

We then climbed up the hill to the wireless station, where everything was in splendid order. Two small huts had been erected, one for the engine and the other for the receiving apparatus. Sandell and Sawyer, the two operators, were to be congratulated on the efficient way the station had been kept going under very considerable difficulty. In addition to the routine work with Hobart and Wellington they had occasionally communicated with stations over two thousand miles distant.

I was able to send the following message to Professor David: "*Aurora* arrived Macquarie Island; all well, June 7; constant gales and high seas have prevented dredging so far. Royal Company Islands not found in the position indicated on the chart."

We were able to land some stores for the use of the land party under Ainsworth. Meteorological, biological and geological work were all in progress and the scientific records should be of great value. Up to the date of our arrival, no wireless messages had been received from Adelie Land. As Dr. Mawson was in ignorance of its exact location, the position of the Western Base under Wild was given to Ainsworth to forward to Adelie Land in case communication should be established.

After Mr. Waite had obtained several birds, it was decided to move down to Lusitania Bay to secure some Royal penguins and a sea-elephant. Two days later, the *Aurora* anchored in the bay, three-quarters of a mile from the beach, in sixteen fathoms; the weather was very misty. Mr. Waite and Mr. Haines, the taxidermist, were rowed ashore.

The island, above a height of three hundred feet from

sea-level, was shrouded in mist throughout the day, and, before dark, all signs of the land had disappeared. The mist did not clear until 6 P.M. on the 15th.

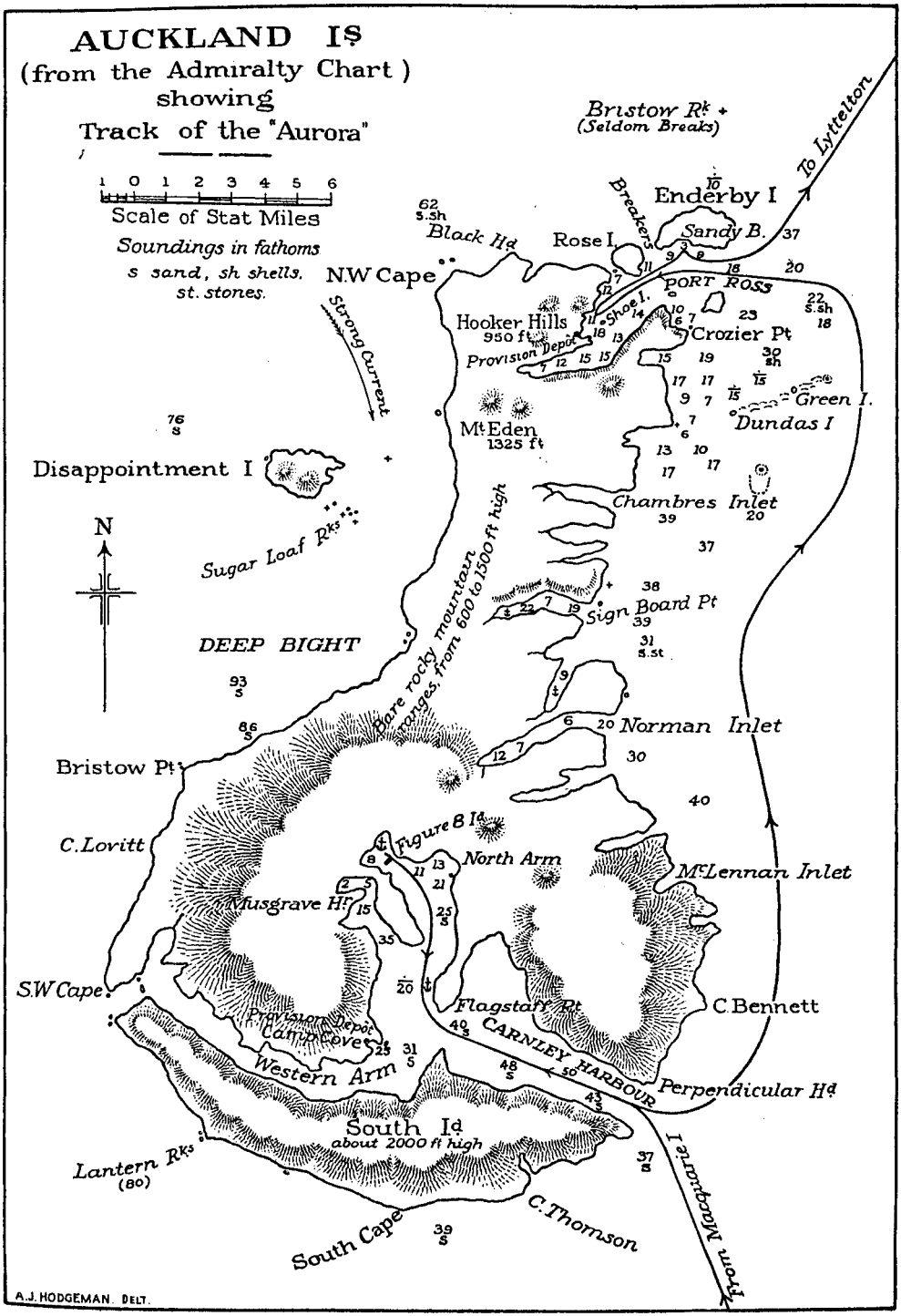
We stayed for a whole fortnight at Macquarie Island, during which time the highest velocity of the wind recorded on shore was thirty-five miles per hour, although, during the winter, gales are almost of daily occurrence. On June 22, the date of departure, a course was set for the Auckland Islands, which lie in the track of homeward-bound vessels from Australia via Cape Horn.

The group was discovered in 1806 by Captain Bristow of the *Ocean*, owned by Samuel Enderby. It comprises one main island and several smaller ones, separated by narrow channels. There are two spacious harbours; a northern, now called Port Ross, and a southern, Carnley Harbour. The islands are situated about one hundred and eighty miles south of Stewart Island (New Zealand).

After a run of three hundred and forty miles on a north-east course, we entered Carnley Harbour and anchored off Flagstaff Point. A breeze blew strong from the west-north-west. Next day, June 25, we stood up to Figure of Eight Island and found good holding for the anchor in nine and a half fathoms.

The eastern entrance to Carnley Harbour is formed by two bluff points, about two miles apart; its upper extremity terminating in a lagoon. The site of Musgrave's house ("Epigwaith") is on the east side of this lagoon. Here he spent twenty months after the wreck of the *Grafton*.

We set off in the motor-launch on the 26th to visit Camp Cove, where we found the two huts maintained by the New Zealand Government for the benefit of castaways. In the larger hut there were potatoes, biscuits, tinned meats and matches. The smaller hut was empty but on the outside were carved many names of shipwrecked mariners. The *Amakura* had visited the depot in November 1911. The various depots established on the island by the New Zealand Government are visited every six months.



A.J. HODGEMAN. DELT.

While in Carnley Harbour we were able to make several hauls with the small dredge.

After passing up the eastern coast of the main island we entered Port Ross and anchored west of Shoe Island. On June 30 the depot on Erebus Cove was visited, where three white sheds contain the usual necessaries for unfortunate castaways. The New Zealand Government steamer, *Hinemoa*, while on a scientific expedition to the Sub-Antarctic in 1907, rescued the sixteen survivors of the barque *Dundonald*, two thousand two hundred and three tons, which had been wrecked on Disappointment Island. The captain and ten men had been drowned and the chief officer had died from the effects of exposure and starvation.

On July 2 we went to Observation Point, finding there a flat stone commemorating the visit of the German Scientific Expedition of 1874.

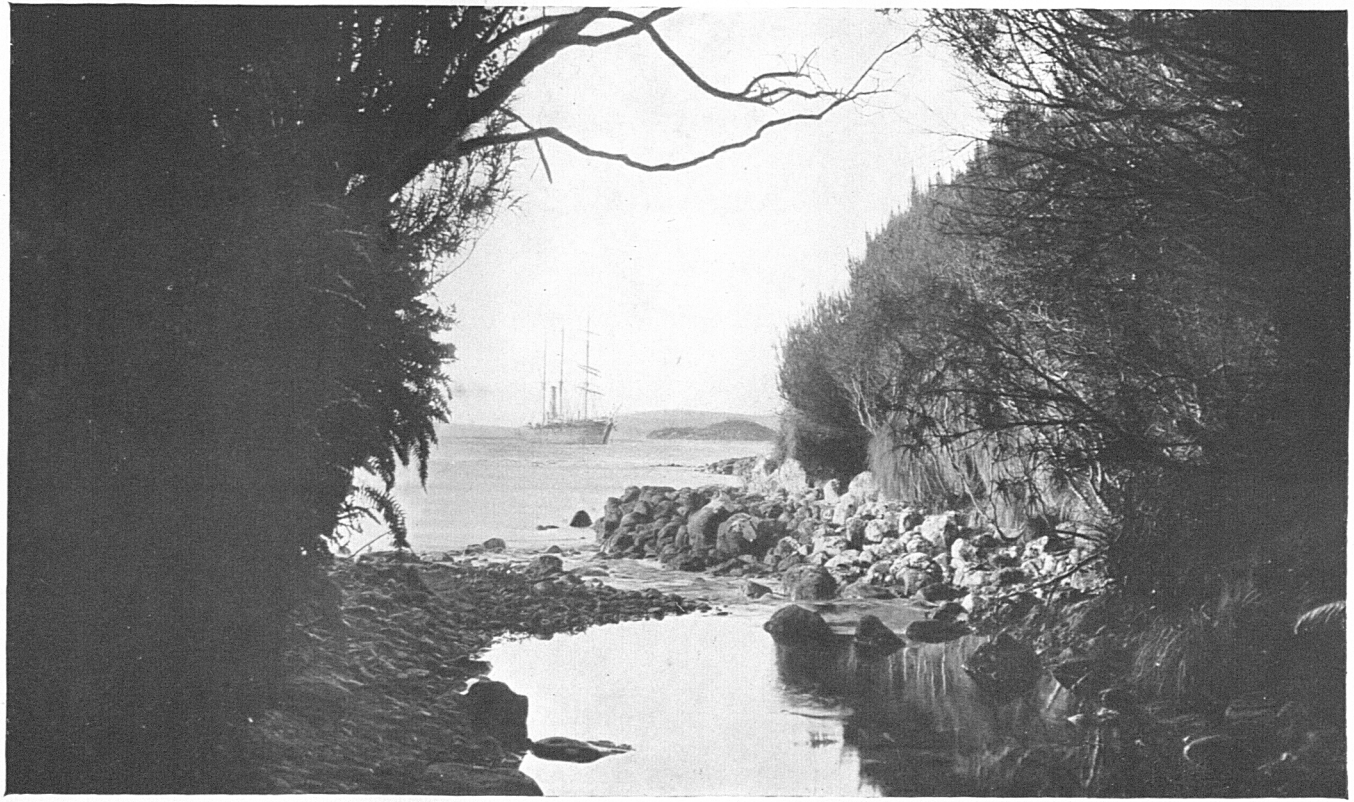
The biologist found various kinds of petrels on Shoe Island, where the turf was riddled in all directions by their burrows.

At Rose Island, close by, there are some fine basaltic columns, eighty feet high, weathered out into deep caverns along their base.

In Sandy Bay, Enderby Island, there was an extensive depot. Among the stores I found a Venesta case marked s.y. *Nimrod*, which contained dried vegetables and evidently formed part of the stores which were sold on the return of the British Antarctic Expedition of 1907.

After leaving the Auckland Islands for New Zealand, we were fortunate in having fairly good weather. Five soundings were taken, and, on July 9, the trawl was put over in three hundred and forty-five fathoms. The net unfortunately fouled on a rocky bottom and so we gained nothing but experience in the operation.

The *Aurora* arrived at Port Lyttleton on July 11 and we received a very kind welcome from the people of Christchurch. Mr. J. J. Kinsey, well known in connexion with various British Antarctic expeditions, gave us valuable



THE *AURORA* AT ANCHOR IN PORT ROSS, AUCKLAND ISLANDS *Primmer*

assistance during our stay. We were back again in Melbourne on the 17th of the month.

While the first oceanographical cruise of the *Aurora* did not prove very fruitful in results, chiefly on account of the stormy weather, it provided the necessary training for officers and men in the handling of the deep-sea gear, and we were able to realize later how much we had learnt on our first cruise.

The ship, after undergoing a thorough overhaul at the State dockyard at Williamstown, Victoria, undertook a second deep-sea cruise.

Leaving Hobart on November 12, 1912, she laid her course to the southward in order to obtain soundings for a complete section of the sea-floor, as nearly as possible on the meridian of Hobart. Our time was limited to one month, during which a visit to Macquarie Island for the purpose of landing stores and mail had to be made. Professor T. Flynn of Hobart University accompanied the vessel in charge of the biological work.

An interesting discovery was made two hundred miles south of Tasmania. Here it was proved that a rocky ridge rose like a huge mountain from depths of more than two thousand fathoms to within five hundred and forty fathoms of the surface. A great number of soundings were taken in the vicinity of this rise, subsequently named the Mill Rise, until a heavy gale drove us far from its situation.

On November 21 we were not far from Macquarie Island and, at 7 P.M., sounded in one thousand four hundred and fifty fathoms. As the weather was remarkably fine for these latitudes we decided to lower the trawl. Before dark it was being towed slowly towards the east with one thousand nine hundred fathoms of wire out.

We spent an anxious night hoping that the weather would remain fine long enough to permit us to get the gear on board again. We had been driving before a light

westerly wind, when the trawl caught on the bottom and stopped the vessel.

A very heavy strain was imposed on the wire as the vessel rose in the swell; the dynamometer registering up to seven tons. I decided to wait for daylight before attempting to heave in the trawl. At 3 A.M. we cast the wire off the after-block and started to heave away; it was two hours before the trawl cleared the bottom and the strain was reduced.

At 8 A.M. the trawl was once more on board, the frames being bent and twisted and the net badly torn. On sounding, the depth was found to be only six hundred and thirty-six fathoms, so that we had evidently put over the trawl on to the edge of a steep rise and then drifted across it.

In view of our position—only thirty miles from Macquarie Island—this accident might have been expected. But opportunities of trawling had been so few that risks had to be taken when the weather quieted down for a few hours. Our only consolation on this occasion was that we recovered the gear.

The following evening, at 7.30, the anchor was dropped in North-East Bay, Macquarie Island, and we were immediately boarded by our land party who were all well. They had become very clever boatmen during their stay, using a small dinghy to make coastal journeys.

On November 24 we left the anchorage at 9 A.M. and spent the day in its vicinity. More than one hundred soundings were taken, which Blake, the geological surveyor, was to plot on the chart of the island which he had almost completed.

Some idea of the steepness of the submarine mountain of which Macquarie Island forms the crest may be gathered from a sounding, taken ten and a half miles east of the island, which gave two thousand seven hundred and forty-five fathoms and no bottom. In other words, if the sea were to dry up, there would be a lofty mountain rising from

THE MONAGASQUE TRAWL HOISTED ON THE DERRICK: GRAY STANDING BY *Davis*

the plain of the ocean's bed to a height of nearly eighteen thousand feet.

A great deal of work still required to be done off Macquarie Island, but, as the uneven and rocky nature of the bottom prevented dredging, I decided to sail on the 25th, continuing the voyage towards the Auckland Islands.

Several people had expressed belief in a submarine ridge connecting Macquarie Island with the Auckland group. Three soundings which we obtained on this voyage did not support the suggestion, ranging as they did from one thousand eight hundred and fifty-five to two thousand four hundred and thirty fathoms, eighty-five miles south-west of the Auckland group. We were the more glad to obtain these soundings, as, during the winter cruise, in the same waters, the weather had forced us to abandon the attempt.

On November 28 we took several soundings on the eastern side of the Auckland Islands, but did not prolong our stay as we wished to investigate the ridge south of Tasmania—the Mill Rise. The course was therefore directed westward with a view to outlining the eastern edge of this submarine elevation.

The first sounding to indicate that we were once more approaching the Mill Rise was in one thousand and seventy-six fathoms. Continuing west we secured the next record in one thousand three hundred fathoms, limiting the southern extremity of the ridge which extends northward for nearly one hundred miles. From this sounding the water shoaled quickly as we steered north. Thus, on the same day, we were in eight hundred and thirty-five fathoms at noon, in seven hundred and thirty-five fathoms at 3.40 P.M. and in seven hundred and ten fathoms at 7.30 P.M. After the last sounding we lowered the rock-gripper. On the first trial, however, it failed to shut and, on the second, only a little fine sand was recovered. As it was blowing hard most of the time, we were very fortunate in being able to do this piece of work.

An inspection of the chart reveals the fact that the

main direction of the shallowest water is in a north-west and south-east direction, but the number of soundings obtained was too small to give more than a general outline. Later, we were able to add to these on the voyage southward to relieve the Antarctic Bases.

The weather was so bad and the sea so heavy that we were unable to obtain soundings on December 9, and, as dredging under such conditions was out of the question, I decided to steer for the east coast of Tasmania, where dredging might be possible under the lee of the land. The constant gales were very disheartening, the last having continued for four days with only short intervals of moderate weather.

On December 12 and 13, in calmer water, some thirty miles off the east coast of Tasmania, trawlings were made successfully in one thousand three hundred fathoms and seventy-five fathoms respectively. From the deeper trawling were obtained a large octopus and several interesting fish.

Just before noon on December 14 we arrived in Hobart and immediately began preparations for the voyage to the Antarctic.

On December 24, 1912, preparations for sailing were complete. For ten days every one connected with the *Aurora* had been working at high pressure, and Christmas Day, our last day ashore, was to be celebrated as a well-earned holiday.

There was on board a good supply of coal, five hundred and twenty-one tons, and a very heavy mail of letters and packages for the members of the Expedition who had been isolated in the far South for more than twelve months. We were to take thirty-five sheep on board as well as twenty-one dogs, presented by Captain Amundsen upon his return from his South Polar expedition. Captain James Davis, of Hobart, of long whaling experience, was to accompany us to give an expert opinion upon such whales as we might meet. Mr. Van Waterschoot van der Gracht, who had had previous

RAFTS OF FLOE-ICE

Paget colour plate by Correll

experience in the Antarctic, joined as marine artist, and Mr. S. N. Jeffryes as wireless operator. With C. C. Eitel, Secretary of the Expedition, the whole party on board numbered twenty-eight.

A very pleasant Christmas was spent ashore. The ship's company of twenty-three men met for dinner, and we did not forget to wish a "Merry Christmas" to our leader and his twenty-six comrades who were holding their celebration amid the icy solitudes of Antarctica. I was glad, on this festive occasion, to be able to congratulate officers and men on their willing and loyal service during the previous twelve months; every one had done his best to advance the objects of the Expedition.

The attractions of Hobart, at this season, are so numerous, and Tasmanian hospitality so boundless, that it gives me great pleasure to place on record that every man was at his post on the *Aurora* at 10 A.M. on Boxing Day.

As we drew away from the wharf amid the cheers of those who had come to wish us God-speed, the weather was perfect and the scene on the Derwent bright and cheering. Captain James Davis acted as pilot.

At 11.30 A.M. we had embarked the twenty-one dogs, which were brought off from the Quarantine Station, and were steaming down Storm Bay. Outside there was a heavy swell, and the wind was freshening from the west. The course was laid south 50° west, true.

For the next two days there was a westerly gale with a very high sea, and the dogs and sheep had a bad time, as a good deal of water came aboard. Two of the sheep had to be killed. By the afternoon of the 29th it had moderated, and a sounding was secured.

This storm was followed by another from the west-north-west. The *Aurora* weathered it splendidly, although one sea came over everything and flooded the cabins, while part of the rail of the forecastle head was carried away on the morning of the 31st. At this time we were in the vicinity of the reputed position of the Royal Company Islands. A

sounding was taken with great difficulty, finding two thousand and twenty fathoms and a mud bottom.

January 4, 1913, was a fine day, with a fresh westerly breeze and a high sea. Occasionally there were snow squalls. At night the wireless operator was able to hear H.M.S. *Drake* at Hobart, and also the station at Macquarie Island; the ship having been fitted to receive wireless signals before sailing.

Next day the sun was bright and there was only a moderate westerly swell. Large bunches of kelp were frequently seen drifting on the surface. "Blue Billys" * flew in great numbers about the ship. Two soundings were obtained in one thousand nine hundred fathoms.

On the 8th a heavy swell came from the south-east. During the morning a sounding realized two thousand two hundred and seventy fathoms and the sample of mud contained a small, black manganese nodule. At 8 P.M. a floating cask was sighted and taken aboard after much difficulty. It turned out to be a ship's oil cask, empty, giving no clue from whence it came.

The first ice was observed about 6 P.M. on the 10th. The water was still deep—more than two thousand fathoms.

By noon on January 11 loose pack came into view, with a strong blink of heavier pack to the south. The course was changed to south-west. At 7 P.M. the ship was steaming west in clear water, a few bergs being in sight and a marked ice-blink to the south. Several whales appeared which Captain James Davis reported were "blue whales" (finners or rorquals).

After we had been steering westward until almost midnight, the course was altered to south-west in the hope of encountering the shelf-ice barrier (met in 1912) well to the east of the Main Base station. On the 12th we sailed over the position of the ice-tongue in 1912 without seeing a trace of it, coming up with heavy broken floe at 10 A.M.

For four hours the *Aurora* pushed through massive floes

* Prion Banksii.

and " bergy bits," issuing into open water with the blink of ice-covered land to the south. At nine o'clock Adelie Land was plainly visible, and a course was set for the Main Base. In squally weather we reached the Mackellar Islets at midnight, and by 2 A.M. on the 13th dropped anchor in Commonwealth Bay under the ice-cliffs in twenty fathoms.

At 6 A.M. Fletcher, the chief officer, reported that a heavy gust of wind had struck the ship and caused the chain to carry away the lashing of the heavy relieving-tackle. The chain then ran over the windlass, and, before anything could be done, the pointer to which the end of the chain was attached had been torn from the bolts, and our best ground-tackle was lost overboard. It was an exasperating accident.

At seven o'clock the port anchor was dropped in ten fathoms, about eight hundred yards west of the first anchorage, with ninety fathoms of chain. The wind shifted suddenly to the north, and the *Aurora* swung inshore until her stern was within one hundred yards of the cliffs; but the depth at this distance proved to be seventeen fathoms. After a few northerly puffs, the wind shifted to the south-east and then died away.

At 2.30 P.M. the launch was hoisted over and the mail was taken ashore, with sundry specimens of Australian fruit as " refreshment " for the shore-party. The boat harbour was reached before any one ashore had seen the *Aurora*. At the landing-place we were greeted most warmly by nine wild-looking men; some with beards bleached by the weather. They all looked healthy and in very fair condition, after the severe winter, as they danced about in joyous excitement.

We learned that five sledging parties had left the Hut: Bage, Webb and Hurley had returned from the south, Stillwell, Close and Laseron from the east, and the others were still out. In Dr. Mawson's instructions, all parties were to be back at the Hut by January 15, 1913.

The launch made some trips to and from the ship with specimens during the afternoon. I returned on board and

had a look at the cable. The weather was fine, but changes were apt to occur without much warning. At midnight it was blowing a gale from the south-east, and the chain was holding well. The launch was hoisted up in the davits and communication with the shore was suspended until 8 A.M. on January 15.

The lull was of two hours' duration, during which Murphy came aboard and furnished me with some particulars about the sledging parties still away.

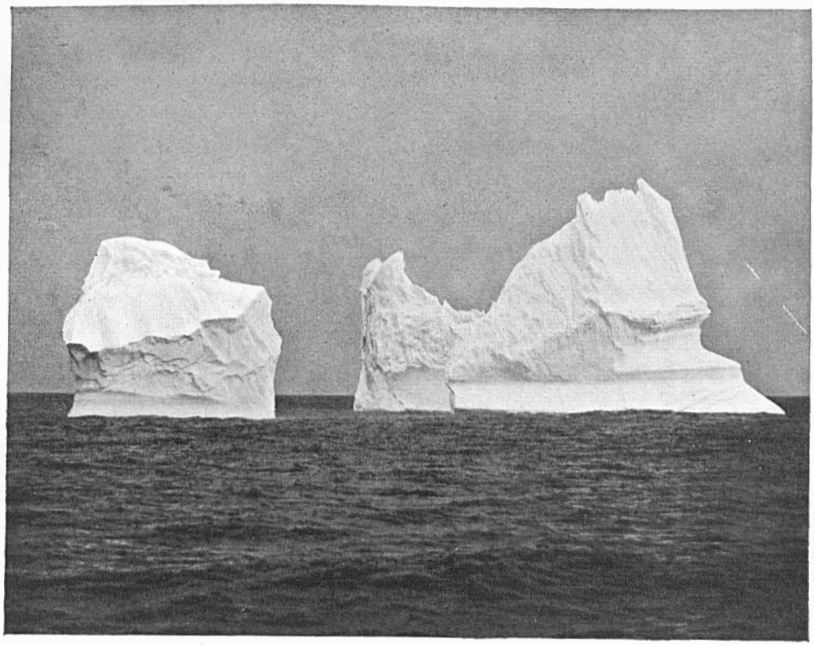
Dr. Mawson, with Ninnis and Mertz, had gone to the south-east. They were well provisioned and had taken eighteen dogs for transport purposes. Bickerton, Hodgeman and Whetter had been out forty-three days to the west and had food for forty days only. Madigan, McLean and Correll had been away for seventy days in an easterly direction.

Dr. Mawson had left a letter for me with instructions to take charge if he failed to return to time, that is not *later* than January 15, 1913.

On January 16 a party was observed from the ship coming in over the slope. There was much speculation as to its personnel since, at a distance, the three figures could not be recognized. The launch took us ashore and we greeted Madigan, McLean and Correll who had returned from a very successful expedition along the eastern coast over sea-ice.

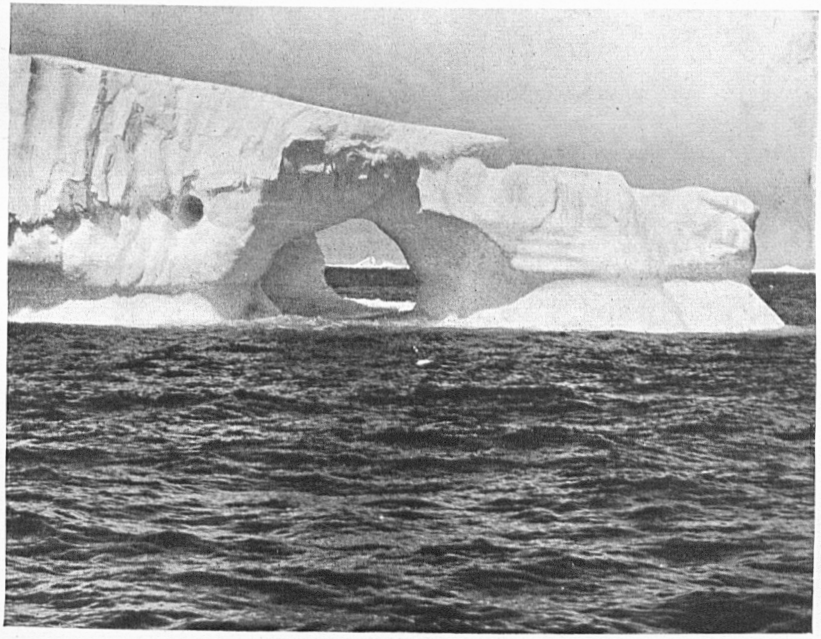
Madigan and Bage came on board during the forenoon of the 17th and we had a long consultation about the position of affairs owing to the non-return of two parties. It was decided to re-erect the wireless mast and stay it well while the ship was waiting, so that, in case of any party being left at the Main Base, the wireless station would be in working order.*

* It should be borne in mind that during the summer months (November, December, January and part of February) wireless communication with the outside world is impossible owing to continuous daylight reducing the effective range. In summer the range was only a few hundred miles, and the effective working distance for all times of the day probably not above one hundred miles.



Hurley

A REMARKABLE BERG, TWO CUSPS STANDING ON A SINGLE BASEMENT. NOTE THAT IT HAS RISEN CONSIDERABLY OUT OF THE SEA, EXPOSING OLD WATER-LINES



A PORTAL WORN THROUGH A BERG BY THE WAVES *Hurley*

At one o'clock on the morning of January 18, de la Motte, the officer on watch, reported that a party could be seen descending the glacier. This proved to be Bickerton, Hodgeman and Whetter returning from their trip along the west coast. Thus Dr. Mawson's party was the only one which had not yet returned.

All day work on the wireless mast went along very satisfactorily, while Captain James Davis and Chief Officer Fletcher spent their time in the launch dragging for the cable lost on the morning of our arrival. The launch returned at 10.30 P.M. and Captain Davis reported that the grapnel had been buoyed until operations could be resumed.

On January 19 we tried to recover the chain, and to this end the *Aurora* was taken over to the position where the grapnels had been buoyed and was anchored. All efforts to secure the chain were unsuccessful. At 7 P.M. we decided to return to our former position, having a hard job to raise the anchor, which appeared to have dragged under a big rock. Finally it broke away and came up in a mass of kelp, and with the stock " adrift." The latter was secured and we steamed back, " letting go " in eleven fathoms with ninety fathoms of chain.

When Dr. Mawson's party was a week overdue, I considered that the time had arrived to issue a provisional notice to the members of the Expedition at Commonwealth Bay concerning the establishment of a relief party to operate from the Main Base.

A party of four left the Hut on the 20th, keeping a sharp look-out to the south-east for any signs of the missing party. They travelled as far as the air-tractor sledge which had been abandoned ten miles to the south, bringing it back to the Hut.

I decided to remain at Commonwealth Bay until January 30. If the leader's party had not returned by that day, a search party was to proceed eastward while the *Aurora* sailed for Wild's Base. From the reports of the gales which prevailed during the month of March in 1912, and

considering the short daylight there was at that time, I felt that it would be risking the lives of all on board to return to the Main Base after relieving Wild's party. I resolved, therefore, to wait *as long as possible*. As a result of a consultation with Madigan and Bage, I had a provisional notice drafted, to be posted up in the Hut on January 22.

This notice was to the effect that the non-arrival of the leader's party rendered it necessary to prepare for the establishment of a relief expedition at Winter Quarters and appointed Bage, Bickerton, Hodgeman, Jeffryes and McLean as members, under the command of Madigan; to remain in Antarctica for another year if necessary.

On the same evening I went ashore to inspect the wireless mast, which was practically complete. The work had been done thoroughly and, provided the mast itself did not buckle, the stays were likely to hold. Hannam, Bickerton and Jeffryes were busy placing the engine and instruments in position.

I then went up the slope for about a mile. The Winter Quarters looked like a heap of stones; boundless ice rose up to the southern skyline; the dark water to the north was broken by an occasional berg or the ice-covered islands. This wonderful region of ice and sea looks beautiful on a fine day. But what a terrible, vast solitude, constantly swept by icy winds and drift, stretches away to the south! A party will go out to-morrow to visit the depot at the top of the slope. This is the seventh day we have been waiting and hoping to welcome the absentees!

On the 23rd the breeze was very strong in the forenoon, but the wind moderated about 4 P.M., when the launch was able to leave for the shore. We could see a search party (Hodgeman, Stillwell, and Correll) marching against a strong south-east wind on their way to examine the depot at Aladdin's Cave and its vicinity.

Though there was a moderate south-easter blowing, communication with the land went on during the day. I went ashore early, but the search party did not return until

noon. They had remained at Aladdin's Cave overnight and marched farther south next morning, approaching a line of dense drift, without seeing anything.

It was arranged that another party of three men should start next morning (January 25) and, going in a south-easterly direction, make a search for five days, laying a depot at their farthest point. Hodgeman, Hurley and McLean made preparations to set out. I left instructions that a flag should be flown on the wireless mast if Dr. Mawson returned.

I now went through the supplies of provisions and coal which were to be landed for the use of the Relief Party. I intended to try and have everything on shore by January 29, taking advantage of any short interval of fair weather to send a boatload to the landing-place.

On the 25th there was a hard south-east gale blowing until the afternoon, when it moderated sufficiently to send off the launch with thirteen bags of coal, Gillies being in charge. The boat harbour was reached in safety, the wind freshening to a gale before 6 P.M.

Terrific gusts followed in rapid succession and, without warning, the cable parted sixty fathoms from the anchor at 9 P.M. Having cleared the reefs to leeward, we managed to get in the rest of the chain and then stood along the coast to the north-west. By keeping about three miles from the shore, we seemed to be beyond the reach of the more violent gusts, but a short sea holding the ship broadside to the wind during the squalls, rendered it difficult to maintain a fixed course.

With reefs and bergs around, the increasing darkness about midnight made our position unpleasant. The engines had to be stopped and the ship allowed to drift with the wind, owing to a bearing becoming hot, but in a quarter of an hour they were moving once more.

Early on January 26 the *Aurora* was about half-way between Winter Quarters and the western point of Commonwealth Bay, when the wind suddenly ceased, and then

came away light from the north-west. We could see that a south-east gale was still raging close inshore. Over the sea, towards the north, dark clouds were scudding with great rapidity along the horizon: the scene of a violent disturbance.

We returned towards our late anchorage. On reaching it, the south-east wind had moderated considerably, and we let go our spare anchor and what had been saved of the chain.

To the north, violent gusts appeared to be travelling in various directions, but, to our astonishment, these gusts, after approaching our position at a great rate, appeared to curve upwards; the water close to the ship was disturbed, and nothing else. This curious phenomenon lasted for about an hour and then the wind came with a rush from the south-east, testing the anchor-chain in the more furious squalls.

The gale was in its third day on the 27th, and there was a "hurricane sky" during the morning. The wind would die away, only to blow more fiercely than before. The suddenness with which the changes occurred may be gathered from the following extracts from my journal:

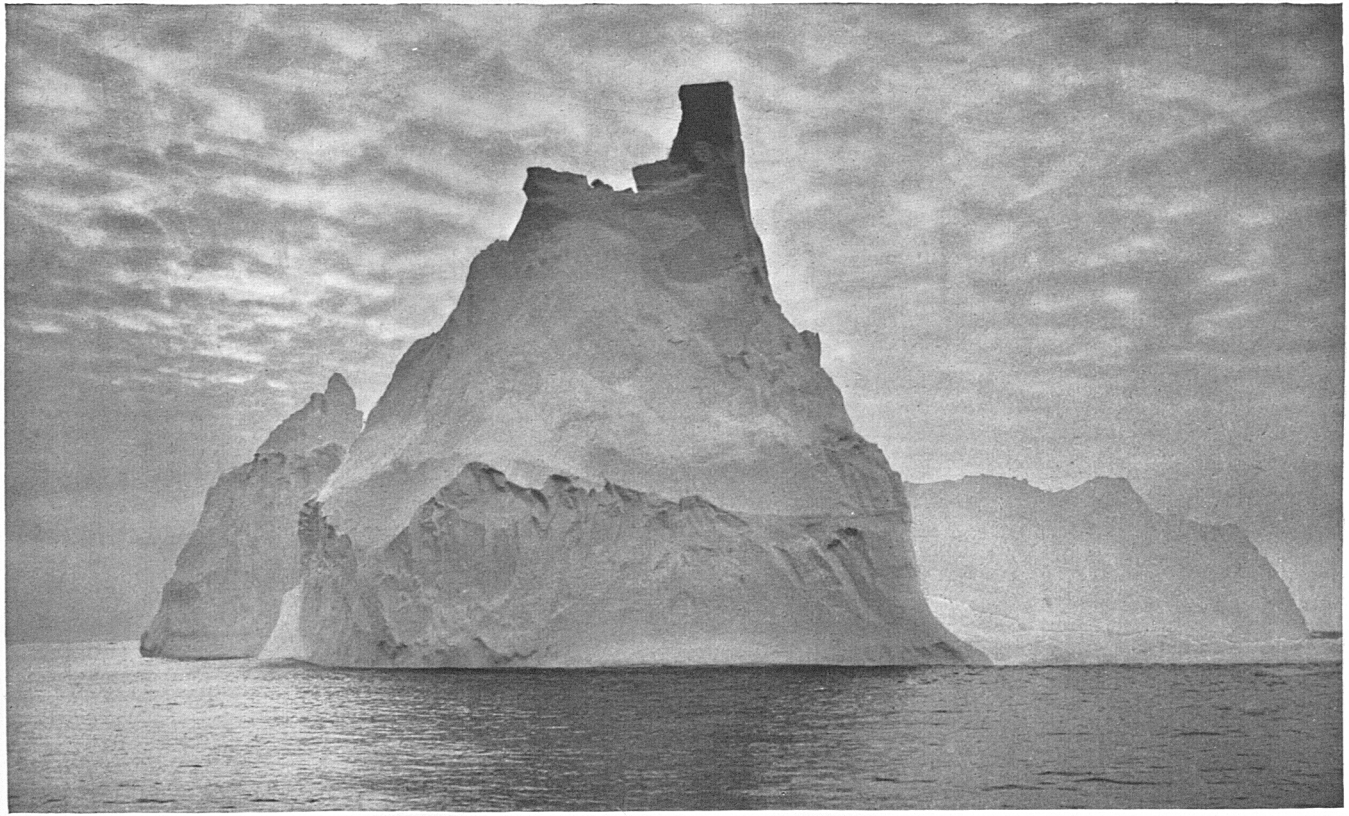
"*January* 27. 6 A.M. A whole gale blowing from the south-east.

"9 A.M. Light airs from north to east. Launch taking coal ashore.

"11 A.M. Last cargo of coal had just left ship when the wind freshened from the south-east. The launch had just got inside the boat harbour when a terrific gust struck the vessel and our chain parted. We were blown out to sea while heaving in thirty fathoms of chain which remained.

"4 P.M. We have been steaming backwards and forwards until the wind died away. The launch has just come off and taken another load of stores to the boat harbour.

"7 P.M. The weather is moderating with rising baro-



A TURRETED BERG *Hurley*

meter. Nearly everything required by the Relief Party is now ashore. Two or three trips will take the remainder.

"We shall steam about for a few hours, and make the anchorage early to-morrow morning."

Next morning a kedge-anchor (about five hundredweights) was lowered with the remainder of the chain. For a time this held the ship, but a gust of wind from the south-east caused it to drag. It was, therefore, hauled up and, on coming to the surface, was seen to have lost a fluke.

All equipment, coal and food were now on shore for the use of the Relief Party. I had given them everything that could be spared from the provisions set apart for the use of the ship's company. Next day I purposed to cruise along the coast to the east, if the weather were clear.

January 29 was fine, so we steamed off at 6.30 A.M. As no flag was seen on the wireless mast, we knew that Dr. Mawson had not returned. A course was kept two or three miles from the ice-cliffs beyond the fringe of rocky islets.

At 4 A.M. on the 30th we were alongside the Mertz Glacier and reached the head of the bay at the confluence of glacier with land-ice. Mount Murchison was only dimly visible, but the weather was clear along the glacier-tongue. Signals were fired and a big kite flown at a height of about five hundred feet to attract attention on shore in case the missing party were near.

"1.30 P.M. We are now about half a mile from the head of the inlet. From the appearance of the country (heavily crevassed) approach to the sea by a sledging-party would be extremely difficult. There is no floe-ice at the foot of the cliff.

"10.30 P.M. We are approaching the end of the glacier-tongue around which there is a collection of pack. There is some drift ahead and it is difficult to see far. We have passed the eastern limit of coast to be searched.

"10.35 P.M. The glacier-tongue is trending to the east and a line of heavy pack extends to the north, with many

large bergs. No sign of flag or signal on the end of the barrier.

"*January* 31. We left the glacier-tongue at 8 A.M. and steered back to Winter Quarters.

"At noon we could see Madigan Nunatak, a rocky patch, high up on the slope.

"4.15 P.M. Sighted the large grounded berg, fifteen miles from the Main Base.

"9 P.M. Off Main Base. There is no flag to be seen on the wireless mast!

"Dr. Mawson's party is now sixteen days overdue; there must be something seriously amiss. But from our examination of the line of coast as far as 64° 45′ south, 146° 19′ east, there does not appear to be any probability of finding traces along the shore line at the base of vertical ice-cliffs."

No communication with the shore was possible until the wind, which had again risen, had moderated. We could just stand off and on until a favourable opportunity occurred. Once the returning ten members of the Expedition were embarked it was imperative to hasten towards Wild's Base.

A week's gale in Commonwealth Bay! The seven days which followed I do not think any of us will forget. From February 1 to 7 it blew a continuous heavy gale, interrupted only when the wind increased to a full hurricane * (eighty miles an hour).

We endeavoured to maintain a position under the cliffs where the sea had not room to become heavy. This entailed a constant struggle, as, with a full head of steam during the squalls, the vessel drove steadily seaward to where the rising waves broke on board and rendered steering more perplexing. Then, when it had moderated to a mere "howl," we would crawl back, only to be driven out again by the next squall. The blinding spray which was swept out in

* The maximum wind-velocity recorded at this time by the anemometer on shore was approximately eighty miles an hour.

Adelie Land A MIDSUMMER VIEW OF THE HUT AND ITS NEIGHBOURHOOD, LOOKING S.E. *Hurley*

front of the squalls froze solidly on board and lent additional difficulty to the operation of "wearing ship."

It was on this occasion that we realized what a fine old vessel the *Aurora* was, and, as we slowly moved back to shelter, could appreciate how efficiently our engine-room staff under Gillies were carrying out their duties. The ordinary steaming speed was six knots, yet for the whole of this week, without a hitch, the ship was being driven at an equivalent of ten knots. The fact of having this reserve power undoubtedly saved us from disaster.

A typical entry from my diary reads:

"*February* 6. Just as the sun was showing over the ice-slopes this morning (4 A.M.) the wind became very violent with the most terrific squalls I have ever experienced. Vessel absolutely unmanageable, driving out to sea. I was expecting the masts to go overboard every minute. This was the worst, I think, lasting about two hours. At 6 A.M., still blowing very hard but squalls less violent, gradually made shelter during the morning. . . ."

On February 8 the weather improved after 1 A.M. The gusts were less violent and the lulls were of longer duration. At 9 A.M. there was only a gentle breeze. We steamed in towards the boat harbour and signalled for the launch to come off with the ten members of the shore-party. The latter had been instructed to remain at the Hut until the vessel was ready to sail. Here, while the gale had been in full career, they had helped to secure enough seal and penguin-meat to keep the Relief Party and their dogs for another year.

The good-byes were brief while the launch discharged the men and their belongings. Instructions were handed over to Madigan directing him to follow the course believed to have been taken by Dr. Mawson and to make an exhaustive search, commencing as soon as the *Aurora* left Commonwealth Bay. Madigan gave me a letter containing a report of the work done by the party which had left on the 25th.

It appears that they had been confined in Aladdin's

Cave for twenty-four hours by dense drift and then, in moderate drift, made four miles to the south-east. Here they camped and were not able to move for thirty-six hours in a high wind with thick snow.

On the 28th the drift decreased in amount and, though it was only possible to see a few hundred yards and crevasses were frequent, they kept a course of east 30° south for six miles. A snow-mound was built and on top of it were placed provisions and a note giving the bearing and distance from Aladdin's Cave.

In the afternoon the wind subsided and it became clear. Eight miles on the same course brought them to their farthest camp, twenty-three miles from the Hut. A mound of eleven feet was erected here, provisions and a note being left and some black bunting wound among the snow-blocks. The depot was on a ridge and, with glasses, several miles could be swept to the south-east.

The party consisted of McLean, Hodgeman and Hurley.

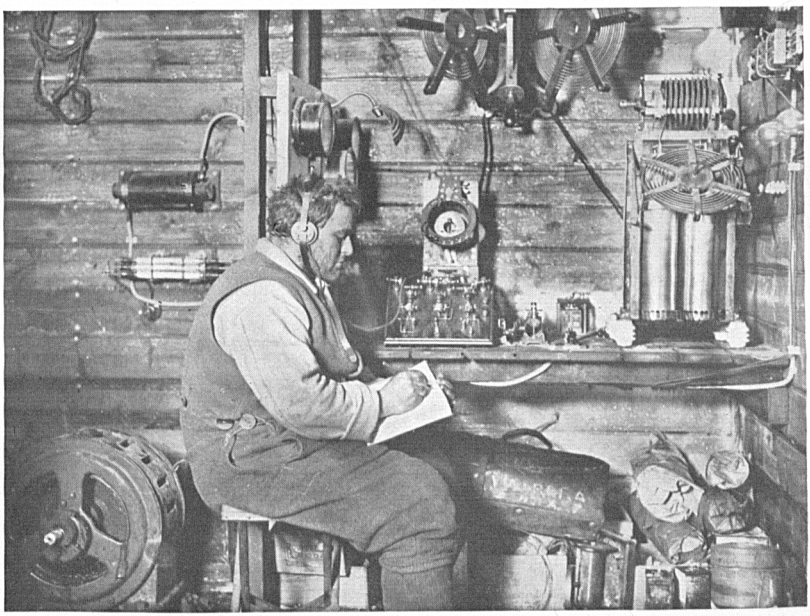
De la Motte and Hannam took the Relief Party ashore in the launch and, as soon as they had returned—at 11.30 A.M. —we steamed out of the bay. The weather had calmed and there were light airs and a smooth sea.

The members of the Relief Party were as follows: C. T. Madigan (leader), R. Bage, F. H. Bickerton, A. J. Hodgeman, Dr. A. L. McLean and S. N. Jeffryes (wireless operator). The remaining ten members of the Main Base Party returned to Australia: J. H. Close, P. E. Correll, W. H. Hannam, J. G. Hunter, J. F. Hurley, C. F. Laseron, H. D. Murphy, F. L. Stillwell, E. N. Webb and Dr. L. A. Whetter.

Throughout the afternoon we steered north-west and at 8.30 P.M. were approaching heavy pack. Just then Hannam received a wireless message from the Main Base informing us that Dr. Mawson had reached the Hut alone, his two comrades having perished, and instructing me to return at once and pick up all hands. We turned round and steered back immediately.

Gillies

MEMBERS OF THE MAIN BASE PARTY HOMEWARD BOUND, JANUARY 1913. FROM LEFT TO RIGHT: BACK ROW—WHETTER, HURLEY, WEBB, HANNAM, LASERON, CLOSE; FRONT ROW—STILLWELL, HUNTER, CORRELL, MURPHY



Adelie Land *Hurley*

"WIRELESS" CORNER IN THE WORKSHOP. OUR LINK WITH CIVILIZATION

At 8 A.M. on February 9 the ship entered Commonwealth Bay steaming against a strong southerly breeze with some snow. We were right up near the anchorage about noon and the Pilot Jack could be seen flying from the wireless mast. Instructions were signalled for, but our efforts were unobserved. We then steamed to and fro across the bay. At 4 P.M. it was blowing a hard gale and showed signs of becoming worse.

At 6 P.M. the wind was growing in strength and the barometer was falling. Not having received any reply to my signal for instructions, I felt it was necessary to decide whether I was justified in remaining any longer.

After considering the position in all its bearings I decided to sail westward without further delay and for the following reasons :

1. Dr. Mawson and his companions were in safety, comfortably housed and fully equipped for another winter.

2. Any further delay was seriously endangering our chance of being able to relieve Wild's party that year. The navigation of the fifteen hundred miles to the Shackleton Ice-Shelf was becoming, daily, more dangerous on account of the shortness of daylight and the conditions of the ice.

3. The only vessel which had wintered in the vicinity of the Western Base (the *Gauss*) had been frozen in as early in the season as February 22, spending more than twelve months in the ice. The *Aurora* was not provisioned for a winter in the ice.

4. It had been ascertained from the records at the Main Base that gales were often protracted at the close of the short summer season. We had just experienced one such gale, lasting seven days.

5. As a seaman, I had realized the difficulties encountered in approaching and getting away from the Western Base in 1912. It was then three weeks later in the year.

I felt convinced that in leaving the Main Base, without further delay, I was acting as Dr. Mawson would have

wished, if I had been able to acquaint him with the position of the Western Party.

At 6.30 P.M. we steamed out of the bay, the wind moderating as the ship got well out to sea. At midnight there was a moderate breeze from the south, with some snow.

On February 10 heavy pack was met, about fifty miles north of Commonwealth Bay. After coasting along its margin for a while, we pushed among the floes and, after three hours, reached a patch of fairly open water about 1 P.M.

One hour later a large ice-formation was sighted, which tallied with that met on January 3 of the previous year (1912) and which, on this occasion, was no longer in its original position. We came to the conclusion that the whole must have drifted about fifty miles to the north-west during the intervening year. The face of this huge berg, along which the *Aurora* coasted, was about forty miles in length.

Hannam heard fragments of a message from Dr. Mawson during the evening. The words, " crevasse," " Ninnis," " Mertz," " broken " and " cable " were picked up.

Good progress was made on the 11th against a high westerly sea. The sun set in a clear sky and the barometer was slowly rising. Our position was evidently north of the pack and, if unimpeded by ice, there was a chance of the ship arriving at her destination in time.

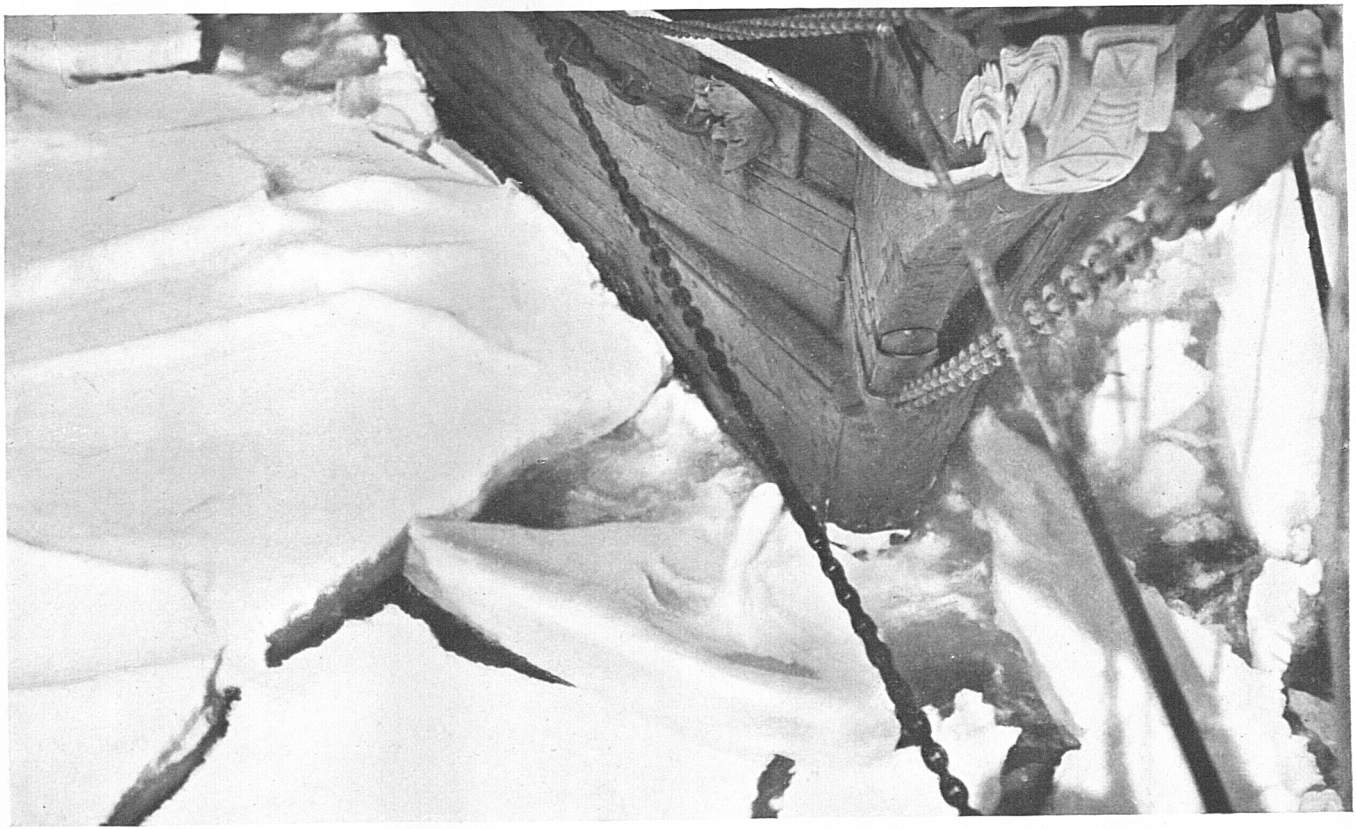
Poor headway was made for nearly three days against an adverse wind and sea. Then, late on the 14th, a breeze sprang up from the east-south-east and, under all sail, the *Aurora* made seven knots.

Next morning we were driving along before an easterly gale in thick snow, and at noon the day's run was one hundred and eighty miles.

The journal describes the following week :

" *February* 16. The weather cleared up this morning and the sun came out, enabling us to fix our position.

" We are doing about eight knots under topsails and



FORGING THROUGH PACK ICE

Hurley

foresail. The sky looked threatening this evening but improved considerably before midnight.

"*February* 17. There were frequent snow squalls to-day, making it difficult to see. Only a few scattered pieces of ice were about.

"*February* 18. Bright, clear weather to-day enabled us to get good observations. There are a great many 'blue whales' round the ship, and the many bergs in sight are suggestive of heavy pack to the south. A great many petrels and Cape pigeons have been seen.

"*February* 19. The ship was brought up this morning at 8.45 by a line of heavy pack extending across the course. The weather was misty, but cleared up before noon. We have been obliged to steer a northerly course along the edge of the pack.

"The margin of this pack is some sixty miles farther north than that which we followed in 1912.

"At midnight we were steering north-north-west; many bergs in sight and a line of pack to port.

"*February* 20. At daylight we were able to steer south-west, being at noon about twenty miles north of Termination Ice-Tongue. Pushing through the looser edge of pack for a couple of hours we saw the loom of the ice-tongue to the southward. The pack becoming closer, we turned back to the north in order to try and push through farther west, where the sky looked more promising.

"At dark we were in a patch of clear water, with ice all around. It began to snow and, as the wind remained a light easterly, the ship was allowed to drift until daylight.

"*February* 21. The morning was very foggy up till 11 A.M. We steered west until noon and then entered the pack; there was a promising sky towards the south. Fair progress was made through the ice, which became looser as we advanced to the south. At 8 P.M. we passed through leads by moonlight, having a favourable run throughout the night.

"*February* 22. At 4 A.M. the wind freshened from the

south-east with some snow; the floes were getting heavier and the advent of a blizzard was not hailed with joy. About noon the ship approached open water and the snow ceased.

"We were now on the confines of the sea of bergs where navigation had proved so dangerous in 1912.

"At 8 P.M. the driving snow and growing darkness made it impossible to see any distance ahead. The next seven hours were the most anxious I have ever spent at sea. Although the wind blew hard from the south-east, we passed through the sea of bergs without mishap, guided and protected by a Higher Power.

"*February* 23. At 4 A.M. the loom of an ice-tongue was sighted and we were soon standing in to follow this feature until we reached the Shackleton Shelf.

"At 8 A.M. we found that we were some miles south of our reckoning.

"At 11 A.M. we sighted a depot-flag on the slope. Soon after the ship was up to the fast floe at the head of the bay, the ice being nearly a mile farther north than on the previous year. In fact, the ice-conditions as a whole had changed considerably.

"At noon we reached the Base and found the party all well."

Wild and his comrades were as glad to see the *Aurora* as we were to see them. They had commenced to lay in a stock of seal-meat fearing that they might have to pass another winter on the glacier.

All the afternoon every one was busy getting baggage on board and watering ship. The weather was good and I had intended to sail on the same evening by moonlight, following the glacier-tongue northward in clear water for sixty miles.

As we turned northward, "all well" on board, I felt truly thankful that Wild's party had been relieved and anxiety on their account was now at an end. The party included F. Wild (leader), G. Dovers, C. T. Harrisson, C. A.

Queen Mary Land THE *AURORA* ANCHORED TO THE FLOE OFF THE WESTERN BASE *Hurley*

Hoadley, Dr. S. E. Jones, A. L. Kennedy, M. H. Moyes and A. D. Watson.

Early on the 24th there was a fresh easterly breeze, while the ship steamed among fields of bergs, for the most part of glacier-ice. It is marvellous how a vessel can pass through such an accumulation in the dark and come off with only a few bumps!

Pack consisting of heavy broken floe-ice was entered at four o'clock on the same day, and at 8 A.M. on the 25th we were clear of it, steering once more among bergs, many of which were earth-stained. The day was remarkably fine with light winds and a smooth sea.

After we had passed through three hundred miles of berg-strewn ocean, large masses of ice, water-worn in most instances, were still numerous, and on February 27, though our position was north of the 60th parallel, they were just beginning to diminish in numbers. At noon on that day a sounding was made in two thousand two hundred and thirty fathoms.

Any hope we may have had of steaming to the east with the object of attempting to relieve the seven men at Adelie Land had to be definitely abandoned on account of the small supply of coal which remained.

There was now a clear run of two thousand miles through the zone of westerly gales and high seas, and on March 14 we reached Port Esperance. Mr. Eitel, Secretary of the Expedition, landed here and caught the steamer *Dover* to Hobart. We heard of the disaster to Captain Scott and it was learned that wireless messages had been received from Dr. Mawson, which had been forwarded on to Australia through the Macquarie Island party.

CHAPTER XIX

THE WESTERN BASE—ESTABLISHMENT AND EARLY ADVENTURES

By F. WILD

AT 7 A.M. on February 21, 1912, the *Aurora* steamed away to the north leaving us on the Shackleton Ice-Shelf, while cheers and hearty good wishes were exchanged with the ship's company. On the sea-ice, that day, there stood with me my comrades—the Western Party; G. Dovers, C. T. Harrisson, C. A. Hoadley, S. E. Jones, A. L. Kennedy, M. H. Moyes and A. D. Watson.

We proceeded to the top of the cliff, where the remainder of the stores and gear were hauled up. Tents were then erected and the work of hut-building at once commenced. The site selected for our home was six hundred and forty yards inland from the spot where the stores were landed, and, as the edge of the glacier was very badly broken, I was anxious to get a supply of food, clothing and fuel moved back from the edge to safety as soon as possible.

Of the twenty-eight Greenland dogs that had reached Antarctica in the *Aurora*, nineteen were landed in Adelie Land and nine with us. So far, none of these had been broken in for sledging, and all were in poor condition. Their quarters on the ship had been very cramped, and many times they had been thoroughly soaked in salt water, besides enduring several blizzards in Antarctic waters.

Harrisson, Hoadley, Kennedy and Jones "turned the first sod" in the foundations of the hut, while Dovers, Moyes, Watson and I sledged along supplies of timber and

stores. Inward from the brink of the precipice, which was one hundred feet in height, the surface was fairly good for sledges, but, owing to crevasses and pressure-ridges, the course was devious and mostly uphill.

Until the building was completed, the day's work commenced at 6 A.M., and, with only half an hour for a midday meal, continued until 7 P.M. Fortunately, the weather was propitious during the seven days when the carpenters and joiners ruled the situation; the temperature ranging from −12° F. to 25° F., while a moderate blizzard interrupted one day. The chief trouble was that the blizzard deposited six feet of snow around the stack of stores and coal at the landing-place, thereby adding considerably to our labour. As evidence of the force of the wind, the floe was broken and driven out past the foot of the "flying-fox," tearing away the lower anchor and breaking the sheer-legs on the glacier.

An average day's work on the stores consisted in bringing thirteen loads over a total distance of nine and a half miles. First of all, the cases had to be dug out of the snow-drifts, and loading and unloading the sledges was scarcely less arduous.

On February 27, while working on the roof, Harrisson made an addition to our 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, thirty-two miles distant, and seventeen miles north of the mainland. It was twenty miles long and fifteen miles wide, being entirely ice-covered. Later on, it was charted as Masson Island.

On the 28th, the hut was fit for habitation, the stove was installed, and meals were cooked and eaten in moderate comfort. The interior of the house was twenty feet square, but its area was reduced by a lobby entrance, three feet by five feet, a dark-room three feet by six feet situated on one side, and my cabin six feet six inches square in one corner. The others slept in seven bunks which were ranged at

intervals round the walls. Of the remaining space, a large portion was commodiously occupied by the stove and table.

On three sides, the roof projected five feet beyond the walls and formed a veranda which was boarded up, making an excellent store-room and work-room. This was a splendid idea of Dr. Mawson's, enabling us to work during the severest storms when there was no room in the hut, and incidentally supplying extra insulation and rendering the inside much warmer. The main walls and roof were double and covered with weather-proof felt. Daylight was admitted through four plate-glass skylights in the roof.

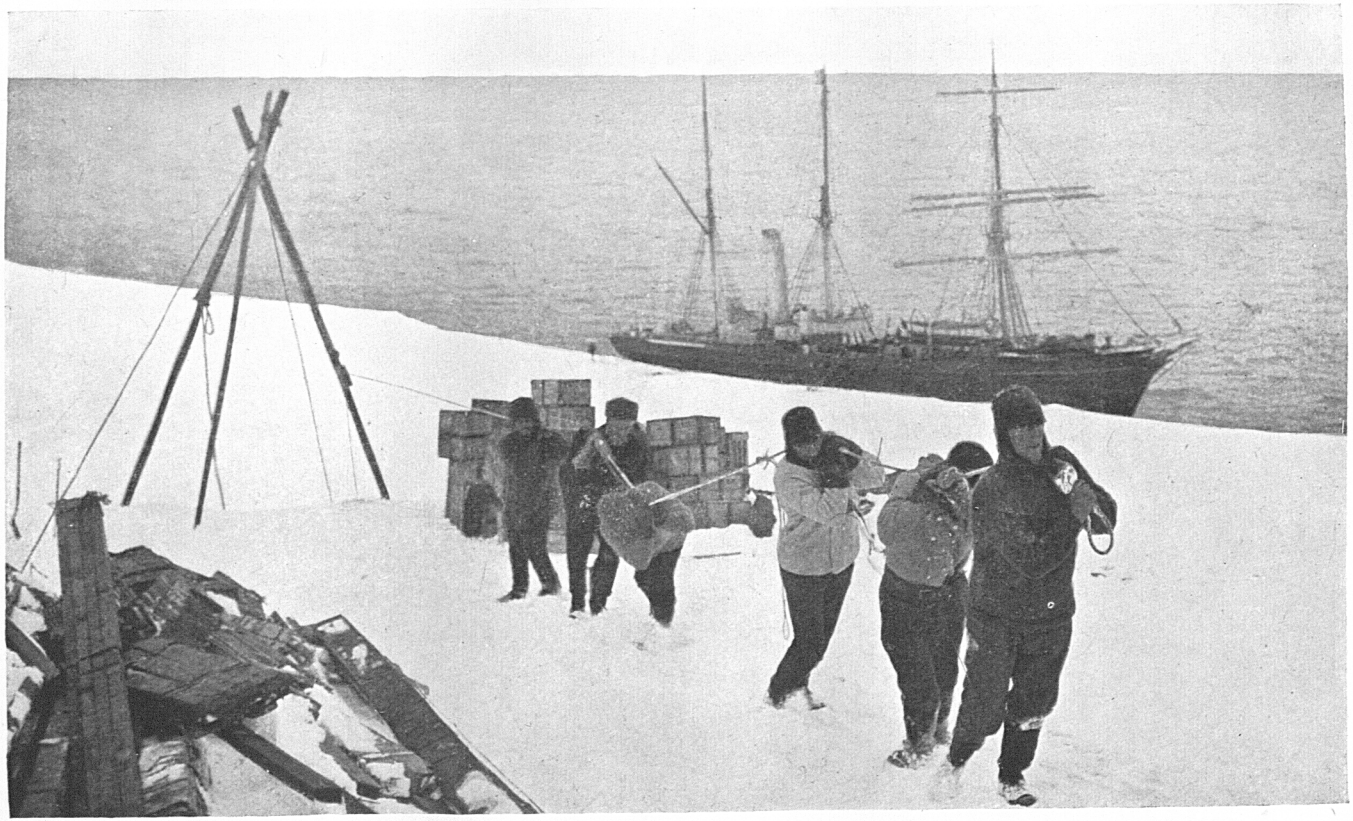
A blizzard effectually prevented outdoor work on February 29, and all hands were employed in the hut, lining the roof and walls and fixing shelves for cooking and other utensils.

An attack was made on the transport of stores next day. As a result of twelve hours' work, five and a half tons of coal were dragged up and stowed under the veranda. It was Hoadley's birthday, and the cook made a special feature of the dinner. With extra dainties like figs, cake and a bottle of wine, we felt that the occasion was fitly celebrated. On March 2, more stores were amassed round the house; Hoadley, Harrisson and I doing odd jobs inside, opening cans, sorting out stores, fitting bunks, shelves and the acetylene gas plant.

While undoing some packages of small boards, Hoadley found that a space had been arranged in the centre of one of the bundles, and a box of cigars inserted by some of the men originally employed upon the construction of the hut in Melbourne. Enclosed was a letter of hearty good wishes.

During the afternoon, Dovers and Kennedy lowered a small sledge down to the floe and brought up a seal and three Adelie penguins. These served for a while as fresh food for ourselves and the dogs.

Sunday March 3 was the finest day we had up till then ex-



THE ESTABLISHMENT OF THE WESTERN BASE. HAULING STORES TO THE TOP OF THE ICE-SHELF *Watson*

perienced, and, since the work was now sufficiently advanced to make us comparatively comfortable and safe, I determined to make a proper Sunday of it. All hands were called at 8.30 A.M. instead of 6 A.M. After breakfast a few necessary jobs were done and at noon a short service was held. When lunch was over, the skis were unpacked, and all went for a run to the east in the direction of Masson Island.

The glacier's surface was excellent for travelling, but I soon found that it would be dangerous to walk about alone without skis, as there were a number of crevasses near the hut, some of considerable size; I opened one twenty-five feet wide. They were all well bridged and would support a man on skis quite easily.

A heavy gale, with falling snow and blinding drift, came on early the next day and continued for forty-eight hours; our worst blizzard up to that time. The temperature, below zero before the storm, rose with the wind to 30° F. Inside, all were employed preparing for a sledging trip I intended to make to the mainland before the winter set in. We were greatly handicapped by the want of a sewing machine.* When unpacked, the one which had been brought was found to be without shuttles, spools and needles. Large canvas bags, made to contain two weeks' provisions for a sledging unit of three men, were in the equipment, but the smaller bags of calico for the different articles of food had to be sewn by hand. Several hundred of these were required, and altogether the time consumed in making them was considerable.

Emerging on the morning of the 6th, after the blizzard had blown itself out, we found that snow-drifts to a depth of twelve feet had collected around the hut. For entrance and exit, a shaft had to be dug and a ladder made. The stores, stacked in heaps close by, were completely covered, and another blizzard swooping down on the 7th made things still worse. This "blow," persisting till the morning

* By accident the small sewing machine belonging to Wild's party was landed at the Main Base.—ED.

of the 9th, was very heavy, the wind frequently attaining velocities judged to reach ninety miles per hour, accompanied by drift so thick that it was impossible to go outside for anything.

Beyond the erection of the wireless masts, everything was now ready for the sledging journey. On the day when the wind abated, a party set to work digging holes for the masts and stay-posts. The former were to be fifty-two feet high, four and a half feet being buried in the ice. Unfortunately, a strong breeze with thick drift sprang up just as hoisting operations had started, and in a few minutes the holes were filled up and the workers had to run for shelter. Meanwhile, four men had succeeded in rescuing all the buried stores, some being stowed alongside the hut, and the remainder stacked up again on a new level.

On came another severe blizzard, which continued with only a few minutes' interval until the evening of the 12th. During the short lull, Jones, Dovers and Hoadley took a sledge for a load of ice from a pressure-ridge rather less than two hundred yards from the hut. While they were absent, the wind freshened again, and they had great difficulty in finding a way to the entrance.

It was very disappointing to be delayed in this manner, but there was consolation in the fact that we were better off in the hut than on the glacier, and that there was plenty of work inside. The interior was thus put in order much earlier than it would otherwise have been.

In erecting the hut, it was found that a case of nuts and bolts was missing, and many places in the frame had in consequence to be secured with nails. For a while I was rather doubtful how the building would stand a really heavy blow. There was, however, no need for uneasiness, as the first two blizzards drifted snow to such a depth in our immediate vicinity that, even with the wind at hurricane force, there was scarcely a tremor in the building.

The morning of Wednesday March 13 was calm and

overcast. Breakfast was served at six o'clock. We then set to work and cleared away the snow from the masts and stay-posts, so that by 8.50 A.M. both masts were in position. Before the job was over, a singular sight was witnessed. A large section of the glacier—many thousands of tons—calved off into the sea. The tremendous waves raised by the fall of this mass smashed into fragments all the floe left in the bay. With the sea-ice went the snow-slopes which were the natural roadway down. A perpendicular cliff, sixty to one hundred feet above the water, was all that remained, and our opportunities of obtaining seals and penguins in the future were cut off. Of course, too, the old landing-place no longer existed.

The whole of the sledging provisions and gear were brought out, weighed and packed on the sledges; the total weight being one thousand two hundred and thirty-three pounds. Dovers, Harrisson, Hoadley, Jones, Moyes and myself were to constitute the party.

It was necessary for two men to remain behind at the base to keep the meteorological records, to wind chronometers, to feed the dogs and to bring up the remainder of the stores from the edge of the ice-cliff. Kennedy, the magnetician, had to stay, as two term days * were due in the next month. It was essential that we should have a medical man with us, so Jones was included in the sledging party; the others drawing lots to decide who should remain with Kennedy. The unlucky one was Watson.

To the south of the Base, seventeen miles distant at the nearest point, the mainland was visible, entirely ice-clad, running almost due east and west. It appeared to rise rapidly to about three thousand feet, and then to ascend more gradually as the great plateau of the Antarctic continent. It was my intention to travel inland beyond the lower ice-falls, which extended in an irregular line of riven bluffs all along the coast, and then to lay a depot or depots which might be useful on the next season's journeys.

* Days set apart by previous arrangement for magnetic "quick runs."

Another reason for making the journey was to give the party some experience in sledging work. The combined weight of both sledges and effects was one thousand two hundred and thirty-three pounds, and the total amount of food carried was four hundred and sixty pounds.

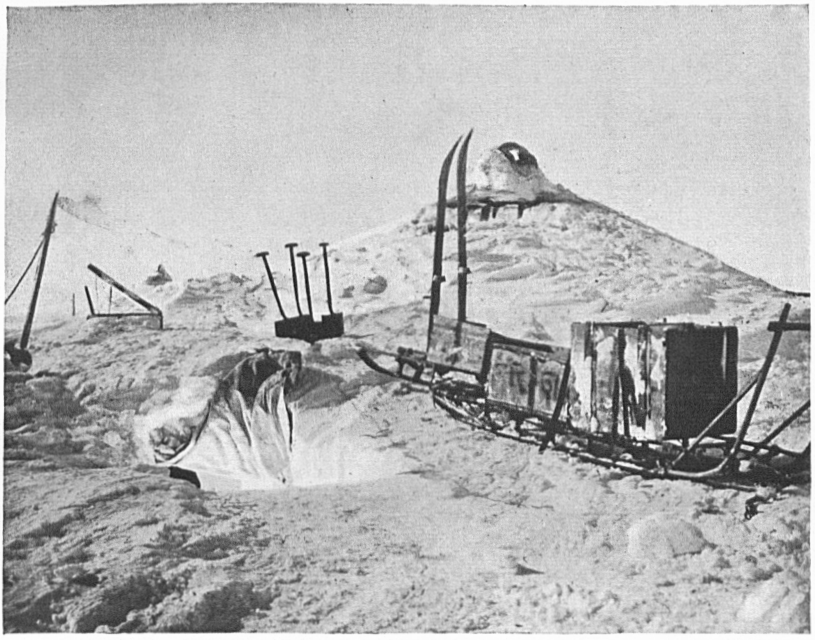
While the sledges were being loaded, ten skua gulls paid us a visit, and, as roast skua is a very pleasant change of food, Jones shot six of them.

At 1 P.M. we left the hut, making an east-south-east course to clear a pressure-ridge; altering the course once more to south-east. The coast in this direction looked accessible, whereas a line running due south would have brought us to some unpromising ice-falls by a shorter route.

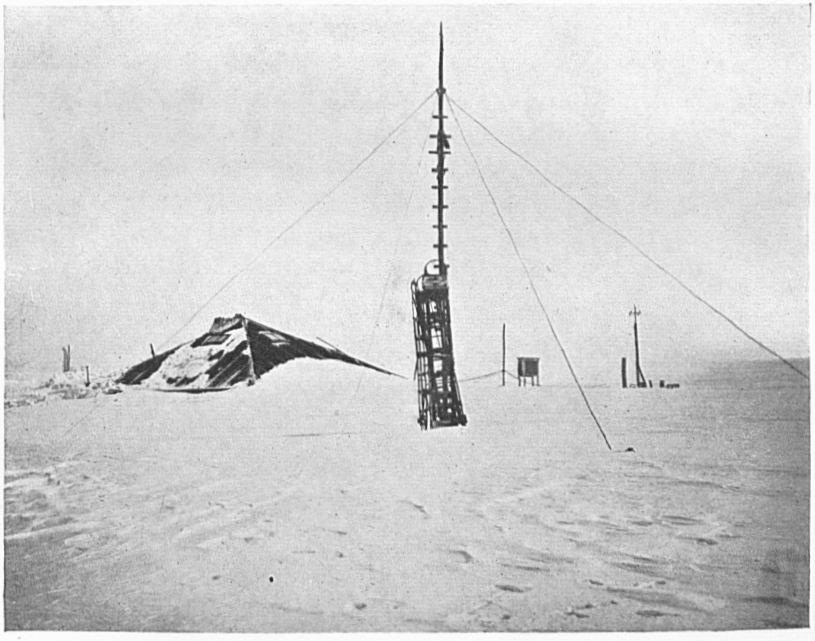
The surface was very good and almost free from crevasses; only one, into which Jones fell to his middle, being seen during the afternoon's march. Not wishing to do too much the first day, especially after the "soft" days we had been forced to spend in the hut during the spell of bad weather, I made two short halts in the afternoon and camped at 5 P.M., having done seven and half miles.

On the 14th we rose at 5 A.M., and at 7 A.M. we were on the march. For the two hours after starting, the surface was tolerable and then changed for the worse; the remainder of the day's work being principally over a hard crust, which was just too brittle to bear the weight of a man, letting him through to a soft substratum, six or eight inches deep in the snow. Only those who have travelled in country like this can properly realize how wearisome it is.

At 9 A.M. the course was altered to south, as there appeared to be a fairly good track up the hills. The surface of the glacier rose and fell in long undulations which became wider and more marked as the land approached. By the time we camped, they were three-quarters of a mile from crest to crest, with a drop of thirty feet from crest to



THE WESTERN BASE HUT IN WINTER. NOTE THE ENTRANCE; A VERTICAL HOLE IN THE SNOW IN THE FOREGROUND *Watson*



THE WESTERN BASE HUT—THE GROTTOES—IN SUMMER *Jones*

trough. Despite the heavy trudging we covered more than thirteen miles.

I made the marching hours 7 A.M. to 5 P.M., so that there was time to get the evening meal before darkness set in; soon after 6 P.M.

The march commenced about seven o'clock on March 15, the thermometer registering −8° F., while a light southerly breeze made it feel much colder. The exercise soon warmed us up and, when the breeze died away, the remainder of the day was perfectly calm.

A surface of "pie-crust" cut down the mileage in the forenoon. At 11 A.M. we encountered many crevasses, from two to five feet wide, with clean-cut sides and shaky bridges. Hoadley went down to his head in one, and we all got our legs in others.

It became evident after lunch that the land was nearing rapidly, its lower slopes obscuring the higher land behind. The crevasses also became wider, so I lengthened the harness with an alpine rope to allow more room and to prevent more than two men from being over a chasm at the same time. At 4 P.M. we were confronted with one sixty feet wide. Crevasses over thirty feet in width usually have very solid bridges and may be considered safe, but this one had badly broken edges and one hundred yards on the right the lid had collapsed. So instead of marching steadily across, we went over singly on the alpine rope and hauled the sledges along in their turn, when all had crossed in safety. Immediately after passing this obstacle the grade became steeper, and, between three and five o'clock, we rose two hundred feet, traversing several large patches of névé.

That night the tent stood on a field of snow covering the lower slopes of the hills. On either hand were magnificent examples of ice-falls, but ahead the way seemed open.

With the exception of a preliminary stiffness, every one felt well after the toil of the first few days.

In bright sunlight next morning all went to examine the ice-falls to the east, which were two miles away.

Roping up, we made an ascent half-way to the top which rose five hundred feet and commanded a grand panorama of glacier and coast. Soon the wind freshened and drift began to fly. When we regained the tents a gale was blowing, with heavy drift, so there was nothing to do but make ourselves as comfortable as possible inside.

All through Saturday night the gale raged and up till 11.30 A.M. on Sunday March 16. On turning out, we found that the tents and sledges were covered deeply in snow, and we dug continuously for more than two hours before we were able to pack up and get away. Both sledges ran easily for nearly a mile over névé, when the gradient increased to one in ten, forcing us to relay. It was found necessary to change our finnesko for spiked boots. Relaying regularly, we gradually mounted six hundred feet over névé and massive sastrugi. With a steep slope in front, a halt was made for the night. The sunset was a picture of prismatic colours reflected over the undulating ice-sheet and the tumbling cascades of the glacier.

On the evening of March 18 the altitude of our camp was one thousand four hundred and ten feet, and the slope was covered with sastrugi ridges, three to four feet in height. Travelling over these on the following day we had frequent capsizes.

The outlook to the south was a series of irregular terraces, varying from half a mile to two miles in breadth and twenty to two hundred feet in height. These were furrowed by small valleys and traversed by ridges, but there was not a sign of rock anywhere.

The temperature varied from 4° to 14° F. during the day, and the minimum recorded at night was - 11° F.

Another nine miles of slow ascent brought us to two thousand feet, followed by a rise of two hundred and twenty feet in seven and three-quarter miles on March 21. Hauling over high broken sastrugi was laborious enough to make every one glad when the day was over. The rations were

found sufficient, but the plasmon biscuits were so hard that they had to be broken with a geological hammer.

There now swept down on us a blizzard * which lasted for a whole week, on the evening of March 21. According to my diary, the record is as follows :

" *Friday, March* 22. Snowing heavily all day, easterly wind : impossible to travel as nothing can be seen more than ten to twelve yards away. Temperature high, 7° to 18° F.

" *Saturday, March* 23. Blowing hard at turn-out time, so did not breakfast until 8.30. Dovers is cook in my tent this week. He got his clothes filled up with snow while bringing in the cooker, food-bag, etc. The wind increased to a fierce gale during the day, and all the loose snow which fell yesterday was shifted.

" About 5 P.M. the snow was partially blown away from the skirt or ground cloth, and the tent bulged in a good deal. I got into burberries and went out to secure it ; it was useless to shovel on snow as it was blown off immediately. I therefore dragged the food-bags off the sledge and dumped them on. The wind and drift were so strong that I had several times to get in the lee of the tent to recover my breath and to clear the mask of snow from my face.

" We are now rather crowded through the tent bulging in so much, and having cooker and food-bag inside.

" *Sunday, March* 24. Had a very bad night. The wind was chopping about from south-east to north and blowing a hurricane. One side of the tent was pressed in past the centre, and I had to turn out and support it with bag lashings. Then the ventilator was blown in and we had a pile of snow two feet high over the sleeping-bags ; this kept us warm, but it was impossible to prevent some of it getting into the bags, and now we are very wet and the bags like sponges. There were quite two hundredweights of snow on us ; all of which came through a hole three inches wide.

* It is a singular fact that this blizzard occurred on the same date as that during which Captain Scott and his party lost their lives.

"According to report from the other tent they are worse off than we are; they say they have four feet of snow in the tent. All this is due to the change of wind, making the ventilator to windward instead of leeward.

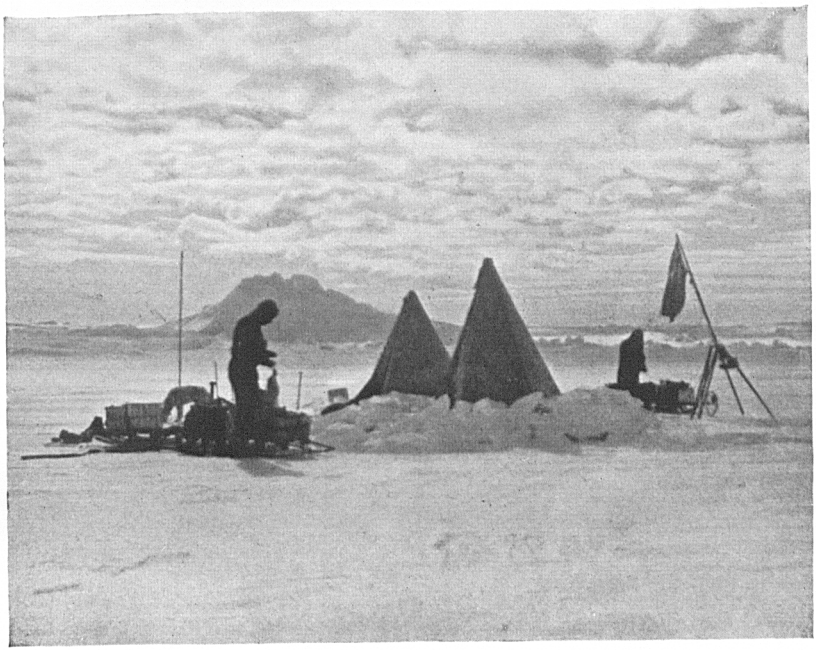
"*March* 25, 26 and 27. Blizzard still continues, less wind but more snowfall.

"*Thursday, March* 28. Heavy falling snow and drift, south-east wind. At noon, the wind eased down and snow ceased falling, so we slipped into our burberry over-suits and climbed out to dig for the sledges.

"Nothing could be seen except about two feet of the tops of the tents, which meant that there was a deposit of five feet of freshly fallen snow. The upper two feet was soft and powdery, offering no resistance; under that it was still soft, so that we sank to our thighs every step and frequently to the waist. By 4.30 P.M. both sledges were rescued, and it was ascertained that no gear had been lost. We all found that the week of idleness and confinement had weakened us, and at first were only able to take short spells at the digging. The sky and barometer promise fine weather to-morrow, but what awful work it will be pulling!"

At 5.30 A.M. on March 29 the weather was bright and calm. As a strong wind had blown throughout the night, a harder surface was expected. Outside, we were surprised to find a fresh wind and thick, low drift; owing to the tents being snowed up so high, the threshing of the drift was not audible. To my disgust the surface was as soft as ever. It appeared that the only resort was to leave the provisions for the depot on the nearest ridge and return to the Base. The temperature was −20° F., and, while digging out the tents, Dovers had his nose frost-bitten.

It took six of us well over an hour to drag the necessary food half a mile up a rise of less than one hundred feet; the load, sledge included, not being five hundred pounds. Nearly all the time we were sinking thigh-deep, and the sledge itself was going down so far that the instrument-box



AN EVENING CAMP, QUEEN MARY LAND *Watson*

A MAN-HAULED SLEDGE *Hurley*

was pushing a mass of snow in front of it. Arriving on the ridge, Moyes found that his foot was frozen and he had to go back to camp, as there was too much wind to bring it round in the open.

Sufficient food and oil were left at this depot for three men for six weeks; also a minimum thermometer.

In a fresh breeze and flying drift we were off at 10 A.M. next day. At first we were ambitious and moved away with two sledges, sinking from two to three feet all the time. Forty yards was as much as we could do without a rest, and by lunch time nine hundred yards was the total. Now the course was downhill, and the two sledges were pulled together, creeping along with painful slowness, as walking was the hardest work imaginable. After one of the most strenuous days I have ever experienced, we camped; the sledge-meter recorded one mile four hundred and fifty yards.

A spell of two days' blizzard cooped us up once more, but improved the surface slightly. Still, it was dreadfully soft, and, but for the falling gradient, we would not have made what we did; five miles six hundred and ten yards, on April 2. On that and the following day it was fortunate that the road chosen was free of crevasses.

At the foot of the hills I had decided to reduce the rations, but, as the track had grown firm once more, and we were only twenty-five miles from the hut, with a week's food, I thought it would be safe to use the full allowance.

Soon after leaving the hills (April 4), a direct course to the hut was made. There was no mark by which to steer, except a "water-sky" to the north, the hinterland being clouded over. During the afternoon, the sun occasionally gleamed through a tract of cirro-stratus cloud and there was a very fine parhelion: signs of an approaching blizzard. At 4.30 P.M. we had done seventeen and a half miles, and, as all hands were fresh and willing, I decided to have a meal and go on again, considering that the moon was full and there were only six miles to be done.

After supper the march was continued till 8.30 P.M.,

by which time we were due for a rest. I had begun to think that we had passed the hut.

April 5 was far from being a Good Friday for us. At 2 A.M. a fresh breeze rose and rapidly increased to a heavy gale. At 10 A.M. Hoadley and I had to go out to secure the tent; the weather-side bulged in more than half the width of the tent and was held by a solid load of drift, but the other sides were flapping so much that almost all the snow had been shaken off the skirt. Though only five yards away from it we could not see the other tent. At noon Hoadley again went out to attend to the tent and entirely lost himself within six feet of it. He immediately started to yell and I guessed what was the matter at once. Dovers and I shouted our best, and Hoadley groped his way in with a mask of snow over his face. He told us that the wind, which was then blowing a good eighty miles an hour, knocked him down immediately he was outside, and, when he struggled to his feet again, he could see nothing and had no idea in what direction lay the tent.

The space inside was now so limited by the combined pressure of wind and snow that we did not light the primus, eating lumps of frozen pemmican for the evening meal.

The blizzard continued with unabated violence until eleven o'clock next morning, when it moderated within an hour to half a gale. We turned out and had a good hot meal. Then we looked to see how the others had fared and found that their tent had collapsed. Getting at once into wind-proof clothing, we rushed out and were horrified to see Harrisson in his bag on the snow. He quickly assured us that he was all right. After carrying him, bag and all, into our tent, he emerged quite undamaged, but very hungry.

Jones and Moyes now had to be rescued; they were in a most uncomfortable position under the fallen tent. It appears that the tent had blown down on the previous morning at ten o'clock, and for thirty-six hours they had had nothing to eat. We did not take long to dig them out.

The wind dropped to a moderate breeze, and, through the falling snow, I could make out a "water-sky" to the west. The three unfortunates said that they felt fit to travel, so we got under way. The surface was soft and the pulling very heavy, and I soon saw that the strain was largely due to the weakness of the three who had been without food. Calling a halt, I asked Jones if it would do to go on; he assured me that they could manage to go on with an effort, and the march was resumed.

Not long after, Dovers sighted the wireless mast, and a quarter of an hour later we were safely in the hut, much to the surprise of Kennedy and Watson, who did not expect us to be travelling in such weather, and greatly to our own relief. According to the sledge-meter, the last camp had only been two miles one hundred yards from home, and if anything had been visible on the night of April 4, we could have got in easily.

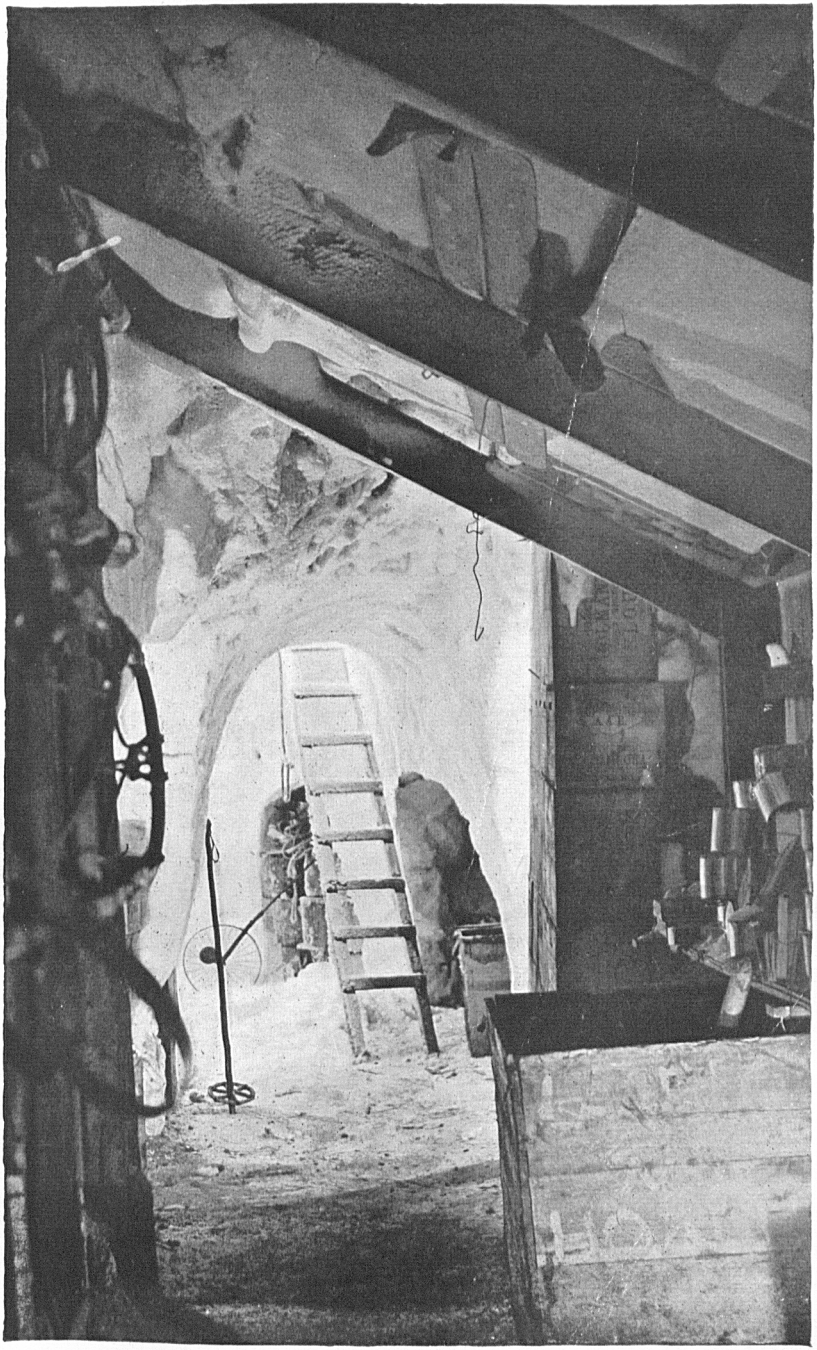
I was very pleased with the way all the party had shaped. They had worked splendidly and were always cheerful, although conditions had been exceptionally trying during this journey. No one was any the worse for the hardships, except for a few blistered fingers from frost-bites. The party lost weight at the average of two and a half pounds; Harrisson was the greatest loser, being reduced six 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 one hundred and twenty-two miles, and the greatest elevation reached on the southern mainland was two thousand six hundred feet above sea-level.

Kennedy and Watson had been very busy during our absence. In a few days they had trained five of the dogs to pull in harness, and transported the remainder of the stores from the landing-place, arranging them in piles round the hut. The weather at the Base had been quite as bad as that experienced by us on the land slopes.

In the first blizzard both wireless masts were broken down. Watson and Kennedy managed to repair and re-erect one of the masts, but it was only thirty-seven feet in height. Any final hopes of hearing wireless signals were dispelled by the discovery that the case containing the detector and several other parts necessary for a receiving-station were missing.

Watson had fitted up a splendid dark-room, as well as plenty of shelves and racks for cooking utensils.

Kennedy was able to secure a series of observations on one of his term days, but, before the next one, the tent he was using was blown to ribbons.



Hoadley

IN THE VERANDA OF THE WESTERN BASE HUT—THE GROTTOES—LOOKING TOWARDS THE ENTRANCE DUG VERTICALLY DOWN THROUGH THE SNOW-DRIFT

CHAPTER XX

THE WESTERN BASE—WINTER AND SPRING

ON Easter Sunday, April 7, 1912, a furious blizzard kept us close prisoners. To meet the occasion, Dovers prepared a special dinner, the principal item being roast mutton, from one of the six carcases landed with the stores. Divine service was held in the forenoon.

The blizzard raged with such force all Sunday and Monday that I dared not let any one go out to feed the dogs, although we found, later, that a fast of three days did not hurt them at all.

I now thought it time to establish a winter routine. Each member had his particular duties to perform, in addition to general work, in which all hands were engaged. Harrisson took charge of the lamps and checked consumption of oil. Hoadley had the care of the provisions, making out lists showing the amount the cook might use of each article of food, besides opening cases and stowing a good assortment on convenient shelves in the veranda. Jones and Kennedy worked the acetylene plant. In connexion with this, I should mention that several parts were missing, including T-pieces for joints and connexions for burners. However Jones, in addition to his ability as a surgeon, showed himself to be an excellent plumber, brazier and tinsmith, and the Hut was well lighted all the time we occupied it. Moyes's duties as meteorologist took him out at all hours. Watson looked after the dogs, while Dovers relieved other members when they were cooks. The duty of cook was taken for a week at a time by every one except myself. A night watch was kept by each in turn. The

watchman went on duty at 9 P.M., usually taking advantage of this night to have a bath and wash his clothes. He prepared breakfast, calling all hands at 8.30 A.M. for this meal at nine o'clock. The cook for the week was exempt from all other work. In the case of Kennedy, whose magnetic work was done principally at night, arrangements were made to assist him with the cooking.

Work commenced during the winter months at ten o'clock and, unless anything special had to be done, finished at 1 P.M., when lunch was served. The afternoon was usually devoted to sport and recreation.

The frequent blizzards and heavy snowfall had by this time buried the Hut so deeply that only the top of the pointed roof was visible and all the outside stores were covered.

My diary for April 9 says :

" The blizzard " (which had commenced on the evening of the 6th) " played itself out during the night and we got to work immediately after breakfast. There was still a fresh breeze and low drift, but this gradually died away.

" We were an hour digging an exit from the Hut. The day has been occupied in cutting a tunnel entrance, forty feet long, through the drift, so that driving snow cannot penetrate, and we shall be able to get out with less trouble.

" As we get time I intend to excavate caverns in the huge drifts packed round the house and stow all our stores inside ; also a good supply of ice for use during blizzards.

" I had intended to make a trip to Masson Island before the winter properly set in, but with the weather behaving as it does, I don't think it would be wise."

The 10th, 11th and 12th being fine, good progress was made in digging out store-rooms on either side of the tunnel, but a blizzard on the 13th and 14th stopped us again.

On going to feed the dogs during the afternoon of the 14th, Watson found that Nansen was dead ; this left us with seven, as Crippen had already died. Of the remainder, only four were of any value ; Sweep and the two bitches,

Tiger and Tich, refusing to do anything in harness, and, as there was less than sufficient food for them, the two latter had to be shot. Sweep would have shared the same fate but he disappeared, probably falling down a crevasse or over the edge of the glacier.

Until the end of April almost all our time was spent in making store-rooms and in searching for buried stores; sometimes a shaft would have to be sunk eight to twelve feet. Bamboo poles stuck in the snow marked the positions of the different stacks. The one marking the carbide was blown away, and it was two days before Dovers finally unearthed it. By the 30th, caves roomy enough to contain everything were completed, all being connected by the tunnel. We were now self-contained, and everything was accessible and immune from the periodic blizzards.

The entrance, by the way, was a trap-door built over the tunnel and raised well above the outside surface to prevent it being drifted over. From below it was approached by a ladder, but the end of the tunnel was left open, so that in fine weather we could run sledges in and out with loads of ice. With each blizzard the entrance was completely choked, and it gave two men a day's work to clear it out once more.

On April 16 Kennedy had a term day. A fresh breeze was blowing and the temperature was −20° F. Some of his observations had to be taken in the open and the remainder in a tent. The series took three hours to complete and by that time he was thoroughly chilled through, his feet and fingers were frost-bitten and his language had grown more incisive than usual.

Between the 10th and the 19th we made a search for penguins and seals. Hoadley and Moyes staying behind, the rest of us with tents and equipment journeyed along the edge of the glacier to the south, without seeing the smallest sign of life. The edge of the shelf-ice was very much fissured, many of the breaches giving no sign of their presence, in consequence of which several falls were

sustained. It should be remarked that the Shackleton Shelf-Ice runs mainly in a southerly direction from the Winter Quarters, joining the mainland at a point, afterwards named Junction Corner. The map of Queen Mary Land illustrates this at a glance.

From the 25th to the 29th, Kennedy, Harrisson and Jones were employed building an igloo to be used as a magnetic observatory. On the afternoon of the 30th, the magnetician invited every one to a tea-party in the igloo to celebrate the opening. He had the place very nicely decorated with flags, and after the reception and the formal inspection of the instruments, we were served with quite a good tea. The outside temperature was — 33° F. and it was not much higher inside the igloo. As a result, no one extended his visit beyond the bounds of politeness.

On May 1, Harrisson, Hoadley and Watson went away south towards the land at the head of the bay, which curved round to Junction Corner, to examine icebergs, take photographs and to search for seals. They took the four dogs with them and, as the load was a light one—three hundred and forty-two pounds—the dogs pulled it easily.

I went with the others to the north, hoping that we might find a portion of the glacier low enough to give access to the sea-ice. There were several spots where the ice-cliffs were not more than forty to fifty feet high, but no convenient ramps led down from the cliffs. In any case neither penguins nor seals were to be had in the vicinity. A great, flat sheet of frozen sea stretched away to the north for quite thirty miles.

May 2 was fine, but the 3rd and 4th were windy once more and we had to remain indoors. Saturday, the 4th, was clean-up day, when the verandas, tunnel and cave were swept and tidied, the stove cleaned, the hut and darkroom scrubbed and the windows cleared. The last was a job which was generally detested. During the week, the windows in the roof collected a coat of ice, from an inch to three inches thick, by condensation of moisture. Chipping

THE WIND-WEATHERED IGLOO BUILT FOR MAGNETIC OBSERVATIONS—WESTERN BASE *Watson*

NUNATAK—QUEEN MARY LAND: SHOWING REMARKABLE MOAT ON WINDWARD SIDE AND RAMP ON LEE *Watson*

this off was a most tedious piece of work, while in the process one's clothes became filled with ice.

One Sunday, Harrisson, Hoadley and Watson returned from their short trip; they had missed the strong winds which had been blowing at the Base, although less than twenty miles away. Some very fine old icebergs were discovered which were of interest to the two geologists and made good subjects for Harrisson's sketches. Watson had had a nasty fall while crossing a patch of rough ice, his nose being rather badly cut in the accident.

On May 7 another blizzard stopped all outside work. Moyes ventured as far as the meteorological screen at noon and got lost, but luckily only for a short time. The barometer behaved very strangely during the blow, rising abruptly during a little more than an hour, and then slowly falling once more. For a few hours on the 8th there was a lull and the store of ice was replenished, but the 9th and 10th were again spent indoors, repairing and refitting tents, poles and other sledging gear during the working hours, and reading or playing chess and bridge in the leisure time. Harrisson carved an excellent set of chessmen, distinguishing the " black " ones by a stain of permanganate of potash.

Bridge was the favourite game all through the winter, and a continuous record of the scores was kept. Two medals were struck: a neat little thing for the highest scorer and a huge affair as large as a plate, slung on a piece of three-and-a-half-inch rope, with " Jonah " inscribed on it, to be worn by the player at the foot of the list.

Divine service was held every Sunday, Moyes and I taking it in turn. There was only one hymn book amongst the party, which made it necessary to write out copies of the hymns each week.

The sleeping-bags used on the first sledging journey had been hung up near the roof. They were now taken down to be thoroughly overhauled. As a consequence of their severe soaking, they had shrunk considerably and required enlarging. Dovers's bag, besides contracting a good deal,

had lost much hair and was cut up to patch the others. He received a spare one to replace it.

May 15 was a beautiful bright morning and I went over to an icy cape two miles southward, with Harrisson, Hoadley, Dovers and Watson, to find a road down to the sea-ice. Here, we had good fortune at last, for, by following down a crevasse which opened out at sea-level into a magnificent cave, we walked straight out on to the level plain. Along the edge of the glacier there was not even a seal's blow-hole. Watson took some photos of the cave and cliff.

It was Kennedy's term night; the work keeping him in the igloo from 10 P.M. until 2.30 A.M. He had had some difficulty in finding a means of warming the observatory—an urgent necessity, since he found it impossible to manipulate delicate magnetic instruments for three or four hours with the temperature from — 25° F. to — 30° F. The trouble was to make a non-magnetic lamp and the problem was finally solved by using one of the aluminium cooking pots; converting it into a blubber stove. The stove smoked a great deal and the white walls were soon besmirched with a layer of soot.

The 17th, 18th and 19th were all calm but dull. One day I laid out a ten-hole golf course and with some home-made balls and hockey sticks for clubs played a game, not devoid of interest and excitement.

During a blizzard which descended on the evening of the 20th, Zip and Sweep disappeared and on the 21st, a search on the glacier having been in vain, Dovers and Hoadley made their way down to the floe. They found Zip well and hearty in spite of having had a drop of at least forty feet off the glacier. A further search for Sweep proved fruitless. We were forced to conclude that he was either killed by falling over the precipice or he had gone far away hunting for penguins.

The regular blizzard immured us on May 22, 23 and 24; the wind at times of terrific force, approaching one hundred miles per hour. It was impossible to secure meteorological

observations or to feed the dogs until noon on the 24th. Moyes and I went out during a slight cessation 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 six feet was as far as one could see.

We did not forget Empire Day and duly "spliced the mainbrace." The most bigoted teetotaller could not call us an intemperate party. On each Saturday night, one drink per man was served out, the popular toast being "Sweethearts and Wives." The only other convivial meetings of our small symposium were on the birthdays of each member, Midwinter's Day and King's Birthday.

On the 25th we were able to make an inventory of a whole series of damages effected outside. The dogs' shelter had entirely carried away; a short mast which had been erected some weeks previously as a holdfast for sledges was snapped off short and the sledges buried, and, worst of all, Kennedy's igloo had parted with its roof, the interior being filled with snow, underneath which the instruments were buried. The dogs were, however, all quite well and lively. It was fortunate for them that the temperature always rose during the blizzards. At this period, when on fine days it was usual to experience $-25°$ to $-37°$ F., the temperature rose in the snowstorms to 25° or even 30° F.

Monday the 27th was beautifully clear. The tunnel entrance was opened and some of the party brought in ice while others undid the rope lashings which had been placed over the hut. This was so compactly covered in snow that the lashings were not required and I wanted to make a rope ladder to enable us to get down to the sea-ice and also to be used by Watson and Hoadley, who were about to dig a shaft in the glacier to examine the structure of the ice.

Fine weather continued until June 2. During this time we were occupied in digging a road from the glacier down to the sea-ice in the forenoons and hunting for seals or skiing in the afternoons. Kennedy and Harrisson rebuilt the magnetic

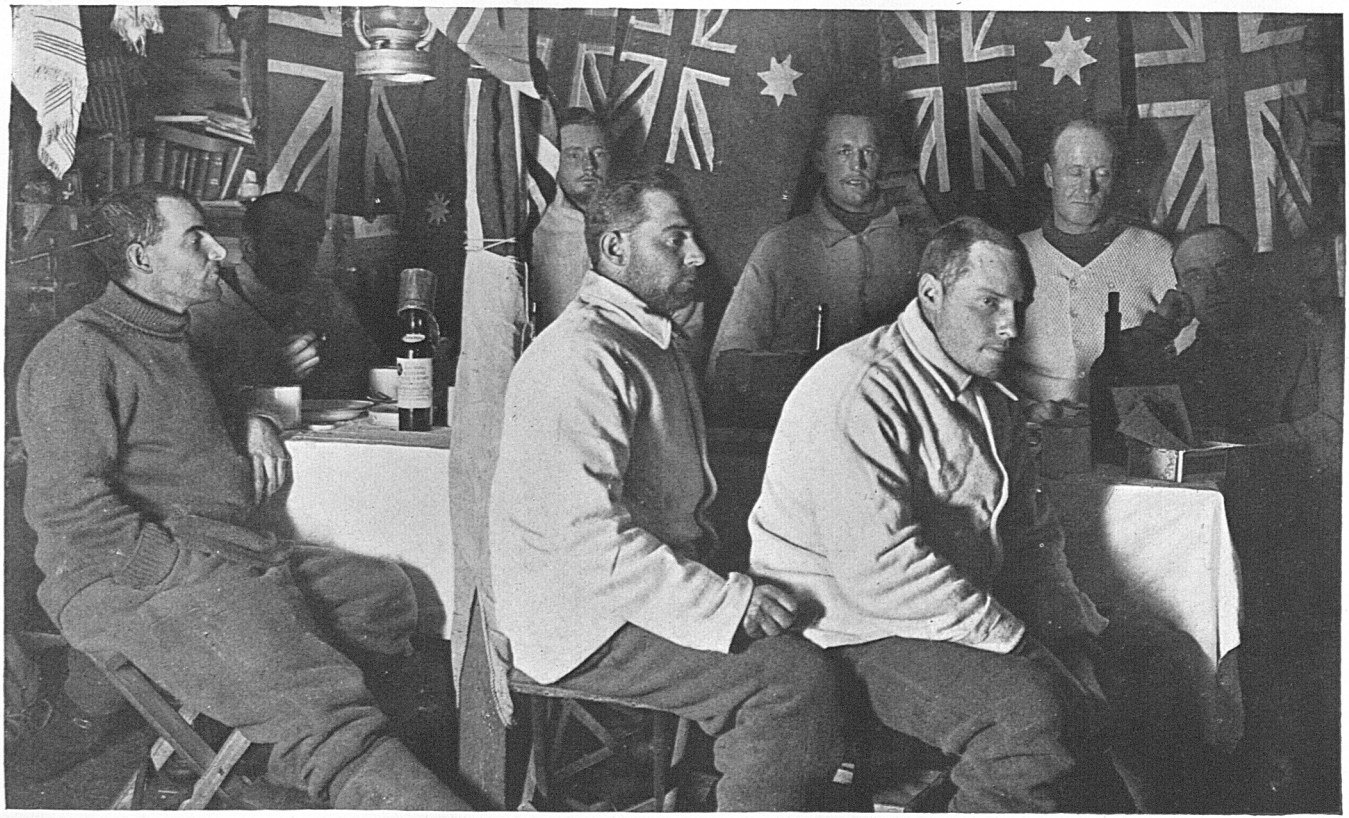
igloo. A seal-hole was eventually found near the foot of the glacier and this was enlarged to enable the seals to come up.

At the end of May, daylight lasted from 9 A.M. until 3 P.M., and the sunrise and sunset were a marvel of exquisite colour. The nightly displays of aurora australis were not very brilliant as the moon was nearing the full.

On the days of blizzards, there was usually sufficient work to be found to keep us all employed. Thus on June 2, Watson and I were making a ladder, Jones was contriving a harpoon for seals, Hoadley was opening cases and stowing stores in the veranda, Dovers cleaning tools, Moyes repairing a thermograph and writing up the meteorological log, Harrisson cooking and Kennedy sleeping after a night-watch.

Between June 4 and 22 there was a remarkably fine spell. It was not calm all the time, as drift flew for a few days, limiting the horizon to a few hundred yards. An igloo was built as a shelter for those sinking the geological shaft, and seal-hunting was a daily recreation. On June 9, Dovers and Watson found a Weddell seal two and a half miles to the west on the sea-ice. They killed the animal but did not cut it up as there were sores on the skin. Jones went over with them afterwards and pronounced the sores to be wounds received from some other animal, so the meat was considered innocuous and fifty pounds were brought in, being very welcome after tinned foods. Jones took culture tubes with him and made smears for bacteria. The tubes were placed in an incubator and several kinds of organisms grew, very similar to those which infect wounds in ordinary climates.

The snowstorms had by this time built up huge drifts under the lee of the ice-cliffs, some of them more than fifty feet in height and reaching almost to the top of the ice-shelf. An exhilarating sport was to ski down these ramps. The majority of them were very steep and irregular and it was seldom that any of us escaped without a fall at one time or another. Several of the party were thrown from thirty to forty feet, and, frequently enough, over twenty



MIDWINTER'S DINNER IN QUEEN MARY LAND, 1912 FROM LEFT TO RIGHT: BEHIND—HOADLEY, DOVERS, WATSON, HARRISSON, WILD IN FRONT—JONES, MOYES, KENNEDY

feet, without being hurt. The only accident serious enough to disable any one happened to Kennedy on June 19, when he twisted his knee and was laid up for a week.

There were many fine displays of the aurora in June, the best being observed on the evening of the 18th. Curtains and streamers were showing from four o'clock in the afternoon. Shortly after midnight, Kennedy, who was taking magnetic observations, called me to see the most remarkable exhibition I have so far seen. There was a double curtain 30° wide unfolded from the eastern horizon through the zenith, with waves shimmering along it so rapidly that they travelled the whole length of the curtain in two seconds. The colouring was brilliant and evanescent. When the waves reached the end of the curtain they spread out to the north and rolled in a voluminous billow slowly back to the east. Kennedy's instruments showed that a very great magnetic disturbance was in progress during the auroral displays, and particularly on this occasion.

Hoadley and Watson set up a line of bamboos, a quarter of a mile apart and three miles long, on the 20th, and from thence onwards took measurements for snowfall every fortnight.

On Midwinter's Day the temperature ranged from − 38° F. to − 25° F. and daylight lasted from 10 A.M. until 4 P.M. We proclaimed a universal holiday throughout Queen Mary Land. Being Saturday, there were a few necessary jobs to be done, but all were finished by 11 A.M. The morning was fine and several of us went down to the floe for skiing, but after twelve o'clock the sky became overcast and the light was dimmed. A strong breeze brought along a trail of drift, and at 6 P.M. a heavy blizzard was in full career. Inside, the hut was decorated with flags and a savoury dinner was in the throes of preparation. To make the repast still more appetising, Harrisson, Hoadley and Dovers devised some very pretty and clever menus. Speeches, toasts and a gramophone concert made the evening pass quickly and enjoyably.

From this time dated our preparations for spring sledging, which I hoped would commence about August 15. Jones made some experiments with "glaxo," of which we had a generous supply. His aim was to make biscuits which would be suitable for sledging, and, after several failures, he succeeded in compressing with a steel die a firm biscuit of glaxo and butter mixed, three ounces of which was the equivalent in theoretical food value to four and a half ounces of plasmon biscuit; thereby affording a pleasant variety in the usual ration.

July came in quietly, though it was dull and cloudy, and we were able to get out on the first two days for work and exercise. On the 2nd a very fine effect was caused by the sun shining through myriads of fog-crystals which a light northerly breeze had brought down from the sea. The sun, which was barely clear of the horizon, was itself a deep red, on either side and above it was a red mock sun and a rainbow-tinted halo connected the three mock suns.

On the 5th and 6th the wind blew a terrific hurricane (judged to reach a velocity of one hundred miles per hour) and, had we not known that nothing short of an earthquake could move the hut, we should have been very uneasy.

All were now busy making food-bags, opening and breaking up pemmican and emergency rations, grinding biscuits, attending to personal gear and doing odd jobs many and various.

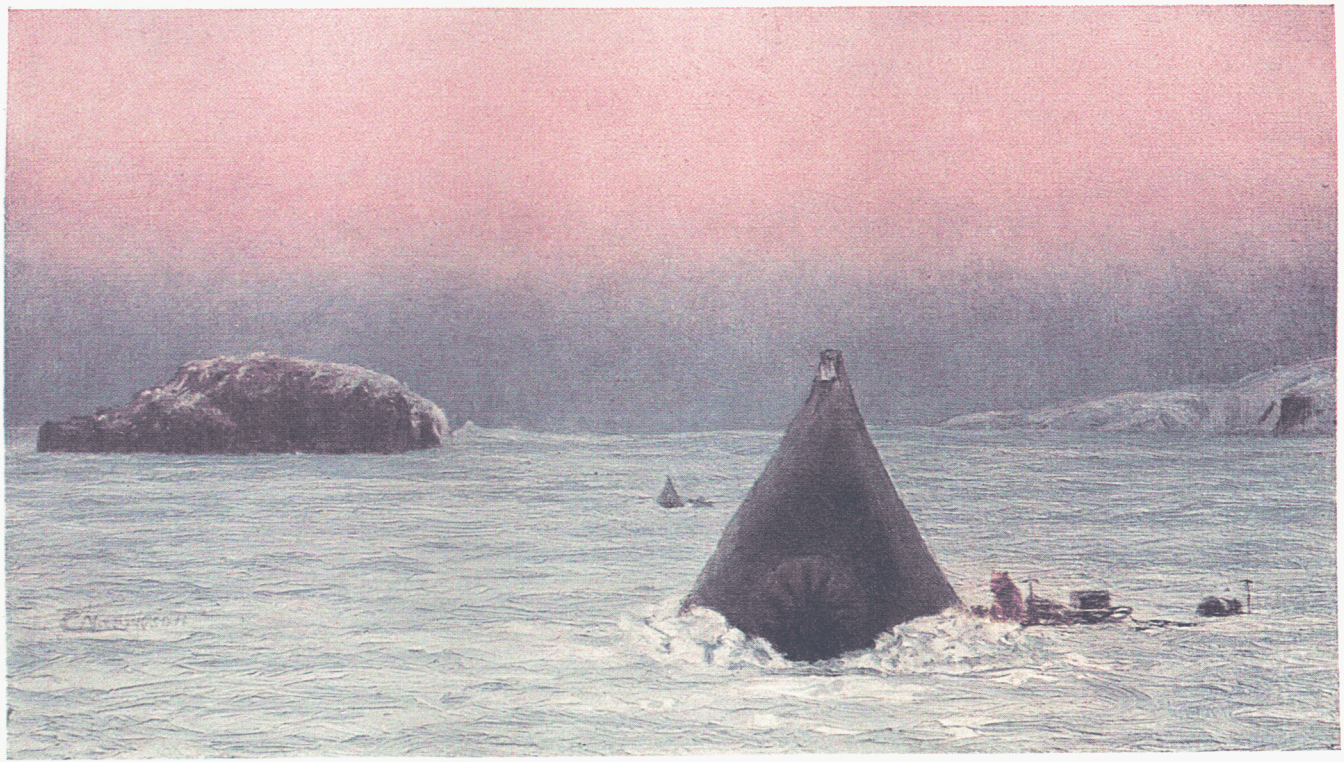
In addition to recreations like chess, cards and dominoes, a competition was started for each member to write a poem and short article, humorous or otherwise, connected with the Expedition. These were all read by the authors after dinner one evening and caused considerable amusement. One man even preferred to sing his poem. These literary efforts were incorporated in a small publication known as "The Glacier Tongue."

Watson and Hoadley put in a good deal of time digging their shaft in the glacier. As a roofed shelter had been built over the top, they were able to work in all but the

BEFORE SUNRISE

CAMPED NEAR THE HIPPO NUNATAK

From a painting by Harrisson



very worst weather. While the rest of us were fitting sledges on the 17th and 18th, they succeeded in getting down to a level of twenty-one feet below the surface of the shelf-ice.

Sandow, the leader of the dogs, disappeared on the 18th. Zip, who had been missed for two days, returned, but Sandow never came back, being killed, doubtless, by a fall of snow from the cliffs. All along the edge of the ice-shelf were snow cornices, some weighing hundreds of tons; and these often broke away, collapsing with a thunderous sound. On July 31, Harrisson and Watson had a narrow escape. After finishing their day's work, they climbed down to the floe by a huge cornice and sloping ramp. A few seconds later, the cornice fell and an immense mass of hard snow crashed down, cracking the sea-ice for more than a hundred yards around.

July had been an inclement month with three really fine and eight tolerable days. In comparison with June's, which was — 14·5° F., the mean temperature of July was high at — 1·5° F. and the early half of August was little better.

Sunday August 11 was rather an eventful day. Dovers and I went out in the wind to attend to the dogs and clear the chimney and, upon our return, found the others just recovering from rather an exciting accident. Jones had been charging the acetylene generators and by some means one of them caught fire. For a while there was the danger of a general conflagration and explosion, as the gas-tank was floating in kerosene. Throwing water over everything would have made matters worse, so blankets were used to smother the flames. As this failed to extinguish them, the whole plant was pulled down and carried into the tunnel, where the fire was at last put out. The damage amounted to two blankets singed and dirtied, Jones's face scorched and hair singed, and Kennedy, one finger jammed. It was a fortunate escape from a calamity.

A large capsized berg had been noticed for some time, eleven miles to the north. On the 14th, Harrisson, Dovers,

Hoadley and Watson took three days' provisions and equipment and went off to examine it. A brief account is extracted from Harrisson's diary :

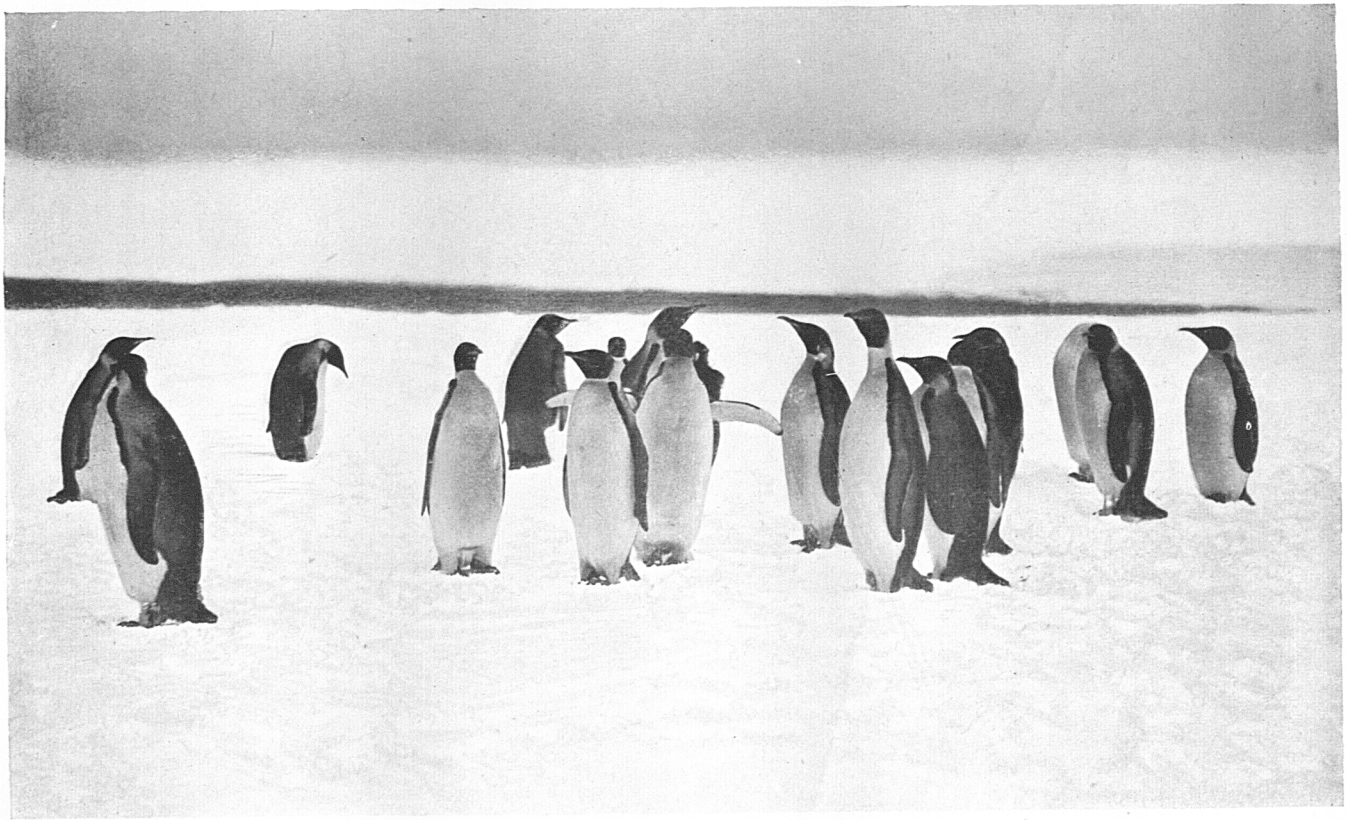
" It was a particularly fine, mild morning ; we made good progress, three dogs dragging the loaded sledge over the smooth floe without difficulty, requiring assistance only when crossing banks of soft snow. One and a half miles from ' The Steps,' we saw the footprints of a penguin.

" Following the cliffs of the shelf-ice for six and three quarter miles, we sighted a Weddell seal sleeping on a drift of snow. Killing the animal, cutting off the meat and burying it in the drift delayed us for about one hour. Continuing our journey under a fine bluff, over floe-ice much cracked by tide-pressure, we crossed a small bay cutting wedge-like into the glacier and camped on its far side.

" After our midday meal we walked to the berg three miles away. When seen on June 28, this berg was tilted to the north-east, but the opposite end, apparently in contact with the ice-cliffs, had lifted higher than the glacier-shelf itself. From a distance it could be seen that the sides, for half their height, were wave-worn and smooth. Three or four acres of environing floe were buckled, ploughed up and in places heaped twenty feet high, while several large fragments of the broken floe were poised aloft on the old ' water-line ' of the berg.

" However, on this visit, we found that the berg had turned completely over towards the cliffs and was now floating on its side surrounded by large separate chunks ; all locked fast 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 !

" Leaving them collecting, I climbed the pitted wave-worn ice, brittle and badly cracked on the higher part. The highest point was fifty feet above the level of the top of the shelf-ice. There was no sign of open water to the north, but a few seals were observed sleeping under the cliffs."



Queen Mary Land A BEVY OF EMPEROR PENGUINS ON THE FLOE *Hurley*

Next morning the weather thickened and the wind arose, so a start was made for the Base. All that day the party groped along in the comparative shelter of the cliff-face until forced to camp. It was not till the next afternoon in moderate drift that a pair of skis which had been left at the foot of "The Steps" were located and the hut reached once again.

After lunch on August 14, while we were excavating some buried kerosene, Jones sighted a group of seven Emperor penguins two miles away over the western floe. Taking a sledge and camera we made after them. A mile off, they saw us and advanced with their usual stately bows. It seemed an awful shame to kill them, but we were sorely in need of fresh meat. The four we secured averaged seventy pounds in weight and were a heavy load up the steep rise to the glacier; but our reward came at dinner-time.

With several fine days to give us confidence, everything was made ready for the sledge journey on August 20. The party was to consist of six men and three dogs, the object of the journey being to lay out a food-depot to the east in view of the long summer journey we were to make in that direction. Hoadley and Kennedy were to remain at the Base, the former to finish the geological shaft and the latter for magnetic work. There remained also a good deal to do preparing stores for later sledge journeys.

The load was to be one thousand four hundred and forty pounds distributed over three sledges; two hundred pounds heavier than on the March journey, but as the dogs pulled one sledge, the actual weight per man was less.

The rations were almost precisely the same as those used by Shackleton during his Expedition, and the daily allowance was exactly the same—thirty-four ounces per man per day. For his one ounce of oatmeal, the same weight of ground biscuit was substituted; the food value being the same. On the second depot journey and the main summer journeys, a

three-ounce glaxo biscuit was used in place of four and a half ounces of plasmon biscuit. Instead of taking cheese and chocolate as the luncheon ration, I took chocolate alone, as on Shackleton's southern journey it was found more satisfactory than the cheese, though the food value was practically the same.

The sledging equipment and clothing were identical with that used by Shackleton. Jaeger fleece combination suits were included in the outfit but, though excellent garments for work at the Base, they were much too heavy for sledging. We therefore wore Jaeger underclothing and burberry wind clothing as overalls.

The weather was not propitious for a start until Thursday, August 22. We turned out at 5.30 A.M., had breakfast, packed up and left the Hut at seven o'clock.

After two good days' work under a magnificently clear sky, with the temperature often as low as − 34° F., we sighted two small nunataks among a cluster of pressure-ridges, eight miles to the south. It was the first land, in the sense of rocks, seen for more than seven months. We hoped to visit the outcrops—Gillies Nunataks—on our return.

The course next day was due east and parallel to the mainland, then ten miles distant. To the north was Masson Island, while at about the same distance and ahead was a smaller island, entirely ice-covered like the former—Henderson Island.

A blizzard of three days' duration kept us in camp between August 27 and 30. Jones, Moyes and I had a three-man sleeping-bag, and the temperature being high, 11° to 15° F., we were very warm, but thoroughly tired of lying down for so long. Harrisson, Dovers and Watson had single bags and therefore less room in the other tent.

The last day of August was beautifully bright: temperature −12° to −15° F. We passed Henderson Island in the forenoon, and, hauling up a rise to the south of it, had a good view of the surroundings. On the right, the

land ran back to form a large bay, seventeen miles wide. This was later named the Bay of Winds, as a "blow" was always encountered while crossing it.

In the centre of the bay was a nunatak, which from its shape at once received the name of the Alligator. In front, apparently fifteen miles off, was another nunatak, the Hippo, and four definite outcrops—Delay Point and Avalanche Rocks—could be seen along the mainland. The sight of this bare rock was very pleasing, as we had begun to think we were going to find nothing but ice-sheathed land. Dovers took a round of angles to all the prominent points.

The Hippo was twenty-two miles away, so deceptive is distance in these latitudes; and in one and a half days, over very heavy sastrugi, we were in its vicinity. The sledges could not be brought very near the rock as it was surrounded by massive ridges of pressure-ice.

We climbed to the top of the nunatak which was four hundred and twenty feet high, four hundred yards long and two hundred yards wide. It was composed of gneissic granite and schists. Dovers took angles from an eminence, Watson collected geological specimens and Harrisson sketched until his fingers were frost-bitten. Moss and lichens were found and a dead snow petrel—a young one—showing that the birds must breed in the vicinity.

To the south, the glacier shelf appeared to be very little broken, but to the north it was terribly torn and twisted. At each end of the nunatak there was a very fine bergschrund.* Twenty miles to the east there appeared to be an uncovered rocky islet; the mainland turning to the southward twelve miles away. During the night the minimum thermometer registered $-47°$ F.

An attempt to get away next morning was frustrated by a strong gale. We were two hundred yards from the shelter of the Hippo and were forced to turn back, since it was

* The term not used in the usual sense. Referring to a wide, imposing crevasse caused by the division of the ice as it presses past the nunatak.—Ed.

difficult to keep one's feet, while the sledges were blown sideways over the névé surface.

I resolved to leave the depot in this place and return to the Base, for our sleeping-bags were getting very wet and none of the party were having sufficient sleep. We were eighty-four miles from the hut; I had hoped to do one hundred miles, but we could make up for that by starting the summer journey a few days earlier. One sledge was left here as well as 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 three feet deep and a mound built around it, six feet high; a bamboo and flag being lashed to the top.

On September 4 we were homeward bound, heading first to the mainland, leaving Delay Point on our left, to examine some of the outcrops of rock. Reaching the coast about 3 P.M., camp was shortly afterwards pitched in a most beautiful spot. A wall of solid rock rose sheer for over four hundred feet and was crowned by an ice-cap half the thickness. Grand ice-falls surged down on either side.

The tents were erected in what appeared to be a sheltered hollow, a quarter of a mile from Avalanche Rocks. One tent was up and we were setting the other in position when the wind, which was blowing fresh from the west, suddenly veered right round to the east and flattened out both tents. It was almost as humorous as annoying. They were soon raised once more, facing the other way.

While preparing for bed, a tremendous avalanche came down. The noise was awful and seemed so close that we all turned to the door and started out. The fastening of the entrance was knotted, the people from the other tent were yelling to us to come out, so we dragged up the bottom of the tent and dived beneath it.

The cliff was entirely hidden by a cloud of snow, and, though the crashing had now almost ceased, we stood ready to run, Dovers thoughtfully seizing a food-bag. However, none of

the blocks had come within a hundred yards of us, and as it was now blowing hard, all hands elected to remain where they were.

Several more avalanches, which had broken away near the edge of the mainland, disturbed our sleep through the night, but they were not quite so alarming as the first one. A strong breeze was blowing at daybreak; still the weather was not too bad for travelling, and so I called the party. Moyes and I lashed up our bags, passed them out and strapped them on the sledge; Jones, in the meantime, starting the cooker. Suddenly a terrific squall struck the front of our tent, the poles burst through the apex, and the material split from top to bottom.

Moyes and I were both knocked down. When we found our feet again, we went to the aid of the other men, whose tent had survived the gust. The wind rushed by more madly than ever, and the only thing to do was to pull away the poles and allow the tent to collapse.

Looking round for a lee where it could be raised, we found the only available shelter to be a crevasse three hundred yards to windward, but the wind was now so strong that it was impossible to convey the gear even to such a short distance. All were frequently upset and blown along the surface twenty or thirty yards, and, even with an ice-axe, one could not always hold his own. The only resort was to dig a shelter.

Setting to work, we excavated a hole three feet deep, twelve feet long and six feet wide; the snow being so compact that the job occupied three hours. The sledges and tent-poles were placed across the hole, the good tent being laid on top and weighted down with snow and blocks of ice. All this sounds very easy, but it was a slow and difficult task. Many of the gusts must have exceeded one hundred miles per hour, since one of them lifted Harrisson who was standing beside me, clean over my head and threw him nearly twenty feet. Everything movable was stowed in the hole, and at noon we had a meal and retired into

sleeping-bags. At three o'clock a weighty avalanche descended, its fearful crash resounding above the roar of the wind. I have never found anything which gave me a more uncomfortable feeling than those avalanches.

The gale continued on September 6, and we still remained packed in the trench. If the latter had been deeper and it had been possible to sit upright, we should have been quite comfortable. To make matters worse, several more avalanches came down, and all of them sounded horribly close.

We were confined in our burrow for five days, the wind continuing to blow with merciless force. Through being closed up so much, the temperature of the hole rose above freezing-point, consequently our sleeping-bags and clothes became very wet.

On Sunday September 8, Moyes went out to feed the dogs and to bring in some biscuit. He found a strong gusty wind with falling snow, and drift so thick that he could not see five yards. We had a cold lunch with nothing to drink, so that the primus should not raise the temperature. In the evening we sang hymns and between us managed to remember the words of at least a dozen.

The long confinement was over on the 10th; the sky was blue and the sun brilliant, though the wind still pulsated with racking gusts. As soon as we were on the ice, away from the land, two men had to hold on to the rear of each sledge, and even then capsizes often occurred. The sledge would turn and slide broadside-on to leeward, tearing the runners badly on the rough ice. Still, by 9.30 A.M. the surface changed to snow and the travelling improved. That night we camped with twenty miles one hundred yards on the meter.

There was a cold blizzard on the 11th with a temperature of — 30° F. Confined in the tents, we found our sleeping-bags still sodden and uncomfortable.

With a strong beam wind and in moderate drift big marches were made for two days, during which the compass and sastrugi determined our course.

AVALANCHE ROCKS

(CLIFF 600 FEET HIGH)

Queen Mary Land. From a crayon by Harrisson

My diary of September 14 runs as follows :

" On the march at 7 A.M. ; by noon we had done twelve miles one thousand five hundred yards. Lunch was hurried, as we were all anxious to get to the hut to-night, especially we in the three-man bag, as it got so wet while we were living underground that we have had very little sleep and plenty of shivering for the last four nights. Last night I had no sleep at all. By some means, in the afternoon, we got on the wrong course. Either the compass was affected or a mistake had been made in some of the bearings, as instead of reaching home by 5 P.M. we were travelling till 8 P.M. and have done thirty-two miles one thousand one hundred yards. Light loads, good surface and a fair wind account for the good travelling, the sail doing almost all the work on the man-hauled sledge.

" The last two hours we were in the dark, except for a young moon, amongst a lot of crevasses and pressure-ridges which none of us could recognize. At one time, we found ourselves on a slope within a dozen yards of the edge of the glacier ; this decided me to camp. Awfully disappointing ; anticipating another wretched night. Temperature −35 ° F."

Next day we reached home. The last camp had been four and a half miles north of the hut. I found that we had gone wrong through using 149° as the bearing of Masson Island from the Base, when it should have been 139°. I believe it was my own mistake, as I gave the bearing to Dovers and he is very careful.

Before having a meal, we were all weighed and found the average loss to be eight pounds. In the evening, Moyes and I weighed ourselves again ; he had gained seven pounds and I five and three-quarter pounds.

Comparing notes with Hoadley and Kennedy, I found that the weather at the Base had been similar to that experienced on the sledging journey.

It was now arranged that Jones was to take charge of the main western journey in the summer. While looking for a

landing-place in the *Aurora*, we had noted to the west an expanse of old, fast floe, extending for at least fifty miles. The idea was for Jones and party to march along this floe and lay a depot on the land as far west as was possible in four weeks. The party included Dovers, Harrisson, Hoadley and Moyes. They were to be assisted by the dogs.

It was my intention to take Kennedy and Watson up to the depot we had left on the hills in March, bringing back the minimum thermometer and probably some of the food. Watson was slightly lame at the time, as he had bruised his foot on the last trip.

Until Jones made a start on September 26, there were ten days of almost continuous wind and drift. The equinox may have accounted for this prolonged period of atrocious weather. No time, however, was wasted indoors. Weighing and bagging food, repairing tents, poles, cookers and other gear damaged on the last journey and sewing and mending clothes gave every man plenty of employment.

At 6 A.M. on the 26th, Jones reported that there was only a little low drift and that the wind was dying away. All hands were therefore called and breakfast served.

Watson, Kennedy and I assisted the others down to the sea-ice by a long sloping snow-drift and saw them off to a good start in a south-westerly direction. We found that the heavy sledge used for carrying ice had been blown more then five hundred yards to the edge of the glacier, capsized among the rough pressure-slabs and broken. Two heavy boxes which were on the sledge had disappeared altogether.

The rest of the day was devoted to clearing stores out of the tunnels. It was evident to us that with the advent of warmer weather, the roof of the caves or grottoes (by the way, the hut received the name of "The Grottoes") would sink, and so it was advisable to repack the cases outside rather than dig them out of the deep snow. By 6 P.M. nearly two hundred boxes were passed up through the trap-door and the caverns were all empty.

After two days of blizzard, Watson, Kennedy and I broke trail with loads of one hundred and seventy pounds per man. Right from the start the surface was so soft that pulling became very severe. On the first day, September 29, we managed to travel more than nine miles, but during the next six days the snow became deeper and more impassable, and only nineteen miles were covered. Crevasses were mostly invisible, and on the slope upwards to the ice-cap more troublesome than usual. The weather kept up its invariable wind and drift. Finally, after making laborious headway to two thousand feet, Kennedy strained his Achilles tendon and I decided to return to "The Grottoes."

At 2 P.M. on October 8, the mast was sighted and we climbed down into the Hut, finding it very cold, empty and dark. The sun had shone powerfully that day and Kennedy and Watson had a touch of snow-blindness.

Two weeks went by and there was no sign of the western depot party. In fact, out of sixteen days, there were thirteen of thick drift and high wind, so that our sympathies went out to the men in tents with soaking bags, waiting patiently for a rift in the driving wall of snow. On October 23 they had been away for four weeks; provisions for that time having been taken. I had no doubt that they would be on reduced rations, and, if the worst came, they could eat the dogs.

During a lull on October 24, I went to the mast-head with the field-glasses but saw nothing of the party. On that day we weighed out provisions and made ready to go in search of them. It was my intention to go on the outward track for a week. I wrote instructions to Jones to hoist a large flag on the mast, and to burn flares each night at 10 P.M. if he should return while I was away.

There was a fresh gale with blinding drift early on the following morning; so we postponed the start. At 4 P.M. the wind subsided to a strong breeze and I again went up the mast to sweep the horizon. Westward from an

icy cape to the south a gale was still blowing and a heavy cloud of drift, fifty to sixty feet high, obscured everything.

An hour later 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 above our heads: a sign of returning summer which was very cheering.

The previous night had promised a fine day and we were not disappointed on October 26. A sledge was packed with fourteen days' provisions for eight men and we started away on a search expedition at 10 A.M.

After doing a little over nine miles we camped at 5.30 P.M. Before retiring to bag, I had a last look round and was delighted to see Jones and his party about a mile to the south. It was now getting dark and we were within two hundred yards of them before being seen, and, as they were to windward, they could not hear our shouts. It was splendid to find them all looking well. They were anxious to get back to "The Grottoes," considering there was only one serviceable tent between them. Kennedy and I offered to change with any of them but, being too eager for warm blankets and a good bed, they trudged on, arriving at the Base at midnight.

Briefly told, their story was that they were stopped in their westerly march, when forty-five miles had been covered, by a badly broken glacier—Helen Glacier—on the far side of which there was open sea. There was only one thing to do and that was to set out for the mainland by a course so circuitous that they were brought a long way eastward, back towards "The Grottoes." They had very rough travelling, bad weather, and were beset with many difficulties in mounting on to the land-ice, where the depot had to be placed. Their distance from the Base at this point was only twenty-eight miles and the altitude was one thousand feet above sea-level. On the ice-cap they were delayed by a blizzard and for seventeen days—an unexampled time—they

Queen Mary Land A YAWNING CREVASSE *Watson*

were unable to move from camp. One tent collapsed and the occupants, Jones, Dovers and Hoadley, had to dig a hole in the snow and lower the tent into it.

These are a few snatches from Jones's diary :

" The next sixteen days (following Wednesday, October 9) were spent at this camp. . . . Harrisson and Moyes occupied one tent and Dovers, Hoadley and myself the other.

" On Saturday, the third day of the blizzard, the wind which had been blowing steadily from the east-south-east veered almost to east and the tents commenced to flog terrifically. This change must have occurred early in the night, for we awoke at 5 A.M. to find clouds of snow blowing under the skirt on one side : the heavy pile on the flounce having been cut away by the wind. As it would have been impossible to do anything outside, we pulled the tent poles together and allowed the tent to collapse. The rest of the day was spent in confined quarters, eating dry rations and melting snow in our mugs by the warmth of our bodies. . . . Although Harrisson and Moyes were no more than twenty feet from us, the noise of the gale and the flogging of our tents rendered communication impossible.

" The terrible flapping at last caused one of the seams of our tent to tear ; we sewed it as well as we were able and hoped that it would hold till daylight.

" On Monday morning, the same seam again parted and we decided to let the tent down again, spending the day in a half-reclining position. . . .

" At 6.30 P.M. the gale eased and, during a comparative lull, Moyes came out to feed the dogs. Noticing our position, he helped us to re-erect the tent and Dovers then went out and piled snow over the torn seam. Moyes said that Harrisson and he had been fairly comfortable, although the cap of their tent was slowly tearing with the pressure of the wind and snow on the weather panels. . . .

"On Friday, the 18th, Swiss, one of the dogs, returned very thin after six days' absence from the camp.

"On the following Monday the blizzard moderated somewhat and we proceeded to make our quarters more roomy by digging out the floor and undercutting the sides; thus lowering the level about eighteen inches.

"Our tent now looks as if it were half blown over. To relieve the tremendous strain on the cap, we lowered the feet of the two lee poles on to the new floor. The tent now offered very little resistance to the wind. We were able to communicate with Harrisson and Moyes and they said they were all right."

When the snow and wind at last held up, they immediately made down to the sea-ice and back towards home, and, when they met us, had done nineteen miles. All were stiff next day, and no wonder; a march of twenty-eight miles after lying low for seventeen days is a very strenuous day's work.

Preparations were made on October 28 for the main eastern summer journey, the object of which was to survey as much coast-line as possible and at the same time to carry on geological work, surveying and magnetics. The party was to consist of Kennedy, Watson and myself.

Jones, Dovers and Hoadley were to start on the main western journey on November 2. I arranged that Harrisson and Moyes should remain at the Hut, the latter to carry on meteorological work, and Harrisson biology and sketching. Later, Harrisson proposed to accompany me as far as the Hippo depot, bringing the dogs and providing a supporting party. At first I did not like the idea, as he would have to travel one hundred miles alone, but he showed me that he could erect a tent by himself and, as summer and better weather were in sight, I agreed that he should come.

Each party was taking fourteen weeks' provisions, and

I had an additional four weeks' supply for Harrisson and the dogs. My total load came to nine hundred and seventy pounds; the dogs pulling four hundred pounds with the assistance of one man and three of us dragging five hundred and seventy pounds.

CHAPTER XXI

THE WESTERN BASE—BLOCKED ON THE SHELF-ICE

By F. WILD

WE started away on the main eastern journey with a spurt of eleven miles on a calm and cloudless day, intending to follow our former track over the shelf-ice to the Hippo Nunatak. The surface varied; soft patches putting a steady brake on the ardour of the first, fresh hours of marching.

In the afternoon, it was only necessary to wear a shirt, singlet, heavy pyjama trousers, finnesko and socks, and even then one perspired freely. The temperature stood at 17° F. The dogs pulled their load well, requiring help only over loose snow.

The evening of Friday November 1, 1912, saw us past Masson Island and about ten miles from the mainland. All day there had been a chill easterly breeze, the temperature being well below zero. The sky was hazy with cirro-stratus and a fine halo " ringed " the sun.

Looking out from the tent in the morning we saw that the clouds were dense and lowering, but the breezes were light and variable until 5 P.M., when an east-north-east wind arose, bringing snow in its train. Travelling through foggy drift, we could just ascertain that the Bay of Winds had opened up on the right. The day's march was a good one of sixteen miles thirty-five yards.

The Bay of Winds did not belie its name. Throughout November 3 the wind veered about in gusts and after lunch settled down to a hard south-easter.

We had made a good start; more than sixty-two miles in a little over four days. The camp was half-way across the Bay of Winds, with the Alligator Nunatak six miles off on the "starboard bow" and the Rock of the Avalanches seventeen miles straight ahead. Passing glimpses were caught of the Hippo twenty-four miles distant.

On November 5, after a day's blizzard, there was much accumulated snow to shovel away from tents and sledges. Finding the hauling very arduous, we headed in for the land to find a better surface, passing the Alligator Nunatak close on its southern side.

At noon on the 6th, the sledges were running parallel to the Rock of the Avalanches, three miles away, and soon afterwards we came to a large boulder; one of four in a line from the rock-cliffs, from which they had been evidently transported, as they were composed of the same gneiss.

The Hippo was close at hand at four o'clock and, on nearing the shattered ice about the depot, we released the dogs and pulled the sledge ourselves. On being freed, they galloped over to the rock and were absent for over an hour. When they returned, Amundsen's head was daubed with egg-yolk, as we thought. This was most probable as scores of snow petrels were flying about the rocks.

A nasty shock was awaiting us at the depot. The sledge, which had been left on end, two feet buried in hard snow and with a mound six feet high built round it, had been blown completely away. The stays, secured to food-bags, were both broken; one food-bag weighing sixty-eight pounds having been lifted ten feet. This was a very serious loss as the total load to be carried now amounted to one thousand one hundred and eighty pounds, which was too great a weight to be supported by one sledge.

It appeared, then, that the only thing to do was to include Harrisson in the party, so that we could have his sledge. This would facilitate our progress considerably, but against that was the fact that Moyes would be left alone at the Base under the belief that Harrisson had perished.

A gale was blowing on the 7th, but as we were partly under the lee of the Hippo, it was only felt in gusts. A visit was made to the Nunatak; Harrisson to examine the birds, Watson for geology and photography, while I climbed to the summit with the field-glasses to look for the missing sledge. Kennedy remained at the camp to take a series of magnetic observations.

There were hundreds of snow petrels pairing off, but no eggs were seen in any of the nest-crevices. They were so tame that it was quite easy to catch them, but they had a habit of ejecting their partially digested food, a yellow oily mess, straight at one. This was the stuff we had thought was egg-yolk on Amundsen's head the previous night.

Upon returning to camp, the search for the sledge was continued. After prospecting with a spade in possible snow-drifts and crevasse-lids, we walked out fanwise, in the direction of the prevailing wind, but with no result. I decided, therefore, to take Harrisson with me. I was extremely sorry for Moyes, but it could not be helped.

On the way back towards the land to the south, we found that the surface had improved in the morning's gale. Camp was finally pitched on a slope close to the high land.

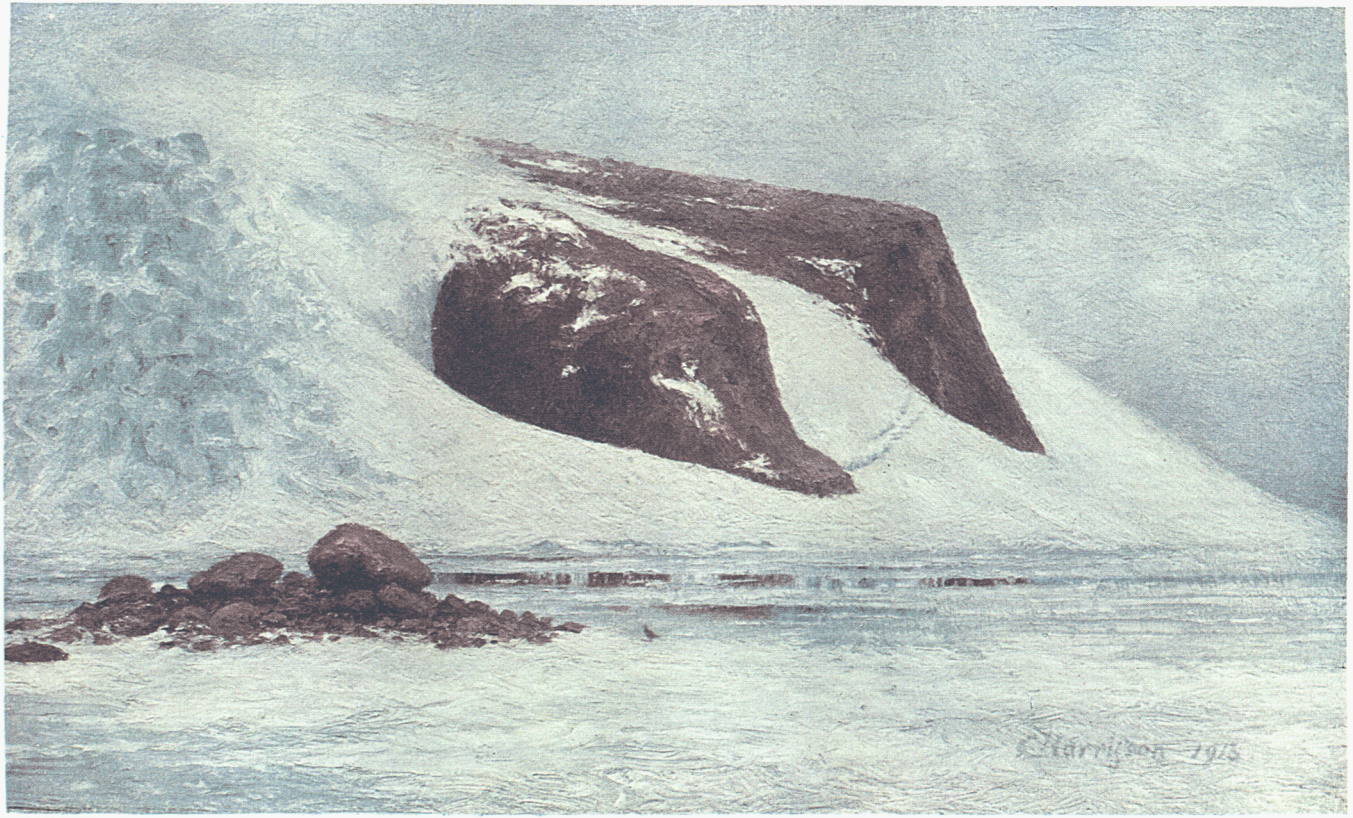
The coast, from the Base to this spot—Delay Point—runs almost due east and west and with no deep indentations except the Bay of Winds. To the west, the slope from the inland plateau is fairly gradual and therefore not badly broken, but still farther west it is much steeper, coming down from two thousand feet in a very short distance, over tumbling ice-fields and frozen cascades. Several outcrops of dark rock lay to the east, one of them only two miles away.

The wind-velocity fluctuated between sixty and eighty miles per hour, keeping us securely penned. Harrisson and Kennedy, after battling their way to our tent for a meal, used the second primus and cooker, brought for Harrisson, in their own tent. All we could do was to smoke and listen to the

DELAY POINT

ICE-FALL ON THE LEFT, MORAINIC DEPOSIT AND POOL OF THAW-WATER IN THE FOREGROUND

Queen Mary Land *From a painting by Harrisson*



fierce squalls and lashing drift. I had brought nothing to read on the trip, making up the weight in tobacco. Watson had Palgrave's *Golden Lyrics*, Kennedy, an engineer's hand-book, and Harrisson, a portion of the *Reign of Mary Tudor*. There was a tiny pack of patience cards, but they were in the instrument-box on the sledge and none of us cared to face the gale to get them.

The wind, on the 10th, saw fit to moderate to half a gale; the drift creeping low and thick over the ground; the land visible above it. Donning burberrys, we made an excursion to the rocks ahead. Two miles and a climb of six hundred feet were rather exhausting in the strong wind. There were about eighty acres of rock exposed on the edge of the ice-cap, mainly composed of mica schists and some granite; the whole extensively weathered. A line of moraine ran from the rocks away in an east-north-east direction.

Most of the next day was broken by a heavy gale and, since the prospect ahead was nothing but bare, rough ice, we passed the day in making everything ready for a start and repaired a torn tent. The rent was made by Amundsen, who dragged up the ice-axe to which he was tethered and, in running round the tent, drove the point of the axe through it, narrowly missing Kennedy's head inside.

Tuesday November 12 was an interesting day. The greater part of the track was over rippled, level ice, thrown into many billows, through devious pressure-hummocks and between the inevitable crevasses. The coast was a kaleidoscope of sable rocks, blue cascades, and fissured ice-falls. Fifteen miles ahead stood an island twenty miles long, rising in bare peaks and dark knolls. This was eventually named David Island.

The dogs were working very well and, if only a little additional food could be procured for them, I knew they could be kept alive. Zip broke loose one night and ate one of my socks which was hanging on the sledge to dry; it prob-

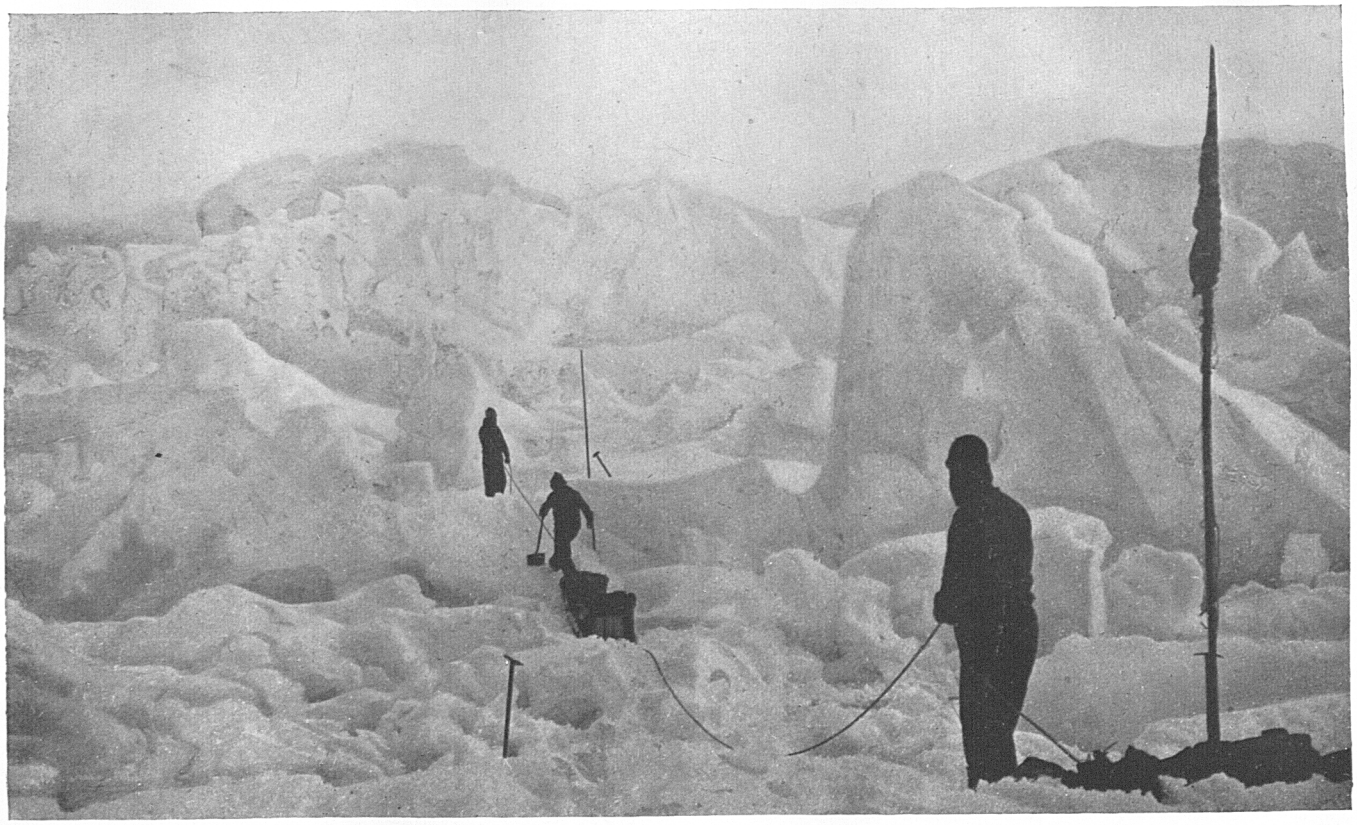
ably tasted of seal blubber from the boots. Switzerland, too, was rather a bother, eating his harness whenever he had a chance.

On the 14th, a depot was formed, consisting of one week's provisions and oil; the bags being buried and a mound erected with a flag on top. Kennedy took a round of angles to determine its position.

At the end of two snowy days, after we had avoided many ugly crevasses, our course in an east-south-east line pointed to a narrow strait between David Island and the mainland. On the southern side of the former, there was a heaped line of pressure-ice, caused by the flow from a narrow bay being stopped by the Island. After lunch, on the 16th, there was an hour's good travelling and then we suddenly pulled into a half-mile of broken surface—the confluence of the slowly moving land-ice and of the more rapidly moving ice from a valley on our right, from which issued Reid Glacier. It was impossible to steer the dogs through it with a load, so we lightened the loads on both sledges and then made several journeys backwards and forwards over the more broken areas, allowing the dogs to run loose. The crevasses ran tortuously in every direction and falls into them were not uncommon. One large lid fell in just as a sledge had cleared it, leaving a hole twelve feet wide, and at least a hundred feet deep. Once over this zone, the sledges were worked along the slope leading to the mainland where we were continually worried by their slipping sideways.

Ahead was a vast sea of crushed ice, tossed and piled in every direction. On the northern horizon rose what we concluded to be a flat-topped, castellated berg. Ten days later, it resolved itself into a tract of heavy pressure ridges.

Camping after nine and a half miles, we were surprised, on moving east in the morning, to sight clearly the point—Cape Gerlache—of a peninsula running inland to the south-west. A glacier from the hinterland, pushing out from its



Queen Mary Land WILD'S PARTY MAKING SLOW PROGRESS IN DANGEROUS COUNTRY *Watson*

valley, had broken up the shelf-ice on which we were travelling to such an extent that nothing without wings could cross it. Our object was to map in the coastline as far east as possible, and the problem, now, was whether to go north or south. From our position the former looked the best, the tumbled shelf-ice appearing to smooth out sufficiently, about ten miles away, to afford a passage east, while, to the south, we scanned the Denman Glacier, as it was named, rolling in magnificent cascades, twelve miles in breadth, from a height of more than three thousand feet. To get round the head of this ice-stream would mean travelling inland for at least thirty miles.

So north we went, getting back to our old surface over a heavy "cross sea," honeycombed with pits and chasms; many of them with no visible bottom. There was half a mile to safety, but the area had to be crossed five times; the load on the twelve-foot sledge being so much, that half the weight was taken off and the empty sledges brought back for the other half. Last of all came the dogs' sledge. Kennedy remarked during the afternoon that he felt like a fly walking on wire-netting.

The camp was pitched in a line of pressure, with wide crevasses and "hell-holes" within a few yards on every side. Altogether the day's march had been a miserable four miles. 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, accompanied by a weird, moaning noise as of the glacier moving over rocks.

November 18 was a fine, bright day: temperature 8° to 20° F. Until lunch, the course was mainly north for more than five miles. Then I went with Watson to trace out a road through a difficult area in front. At this point, there broke on us a most rugged and wonderful vision of ice-scenery.

The Denman Glacier moving much more rapidly than

the Shackleton Shelf, tore through the latter and, in doing so, shattered both its own sides and also a considerable area of the larger ice-sheet. At the actual point of contact was what might be referred to as gigantic bergschrund: an enormous chasm over one thousand feet wide and from three hundred feet to four hundred feet deep, in the bottom of which crevasses appeared to go down for ever. The sides were splintered and crumpled, glittering in the sunlight with a million sparklets of light. Towering above were titanic blocks of carven ice. The whole was the wildest, maddest and yet the grandest thing imaginable.

The turmoil continued to the north, so I resolved to reconnoitre westward and see if a passage were visible from the crest of David Island.

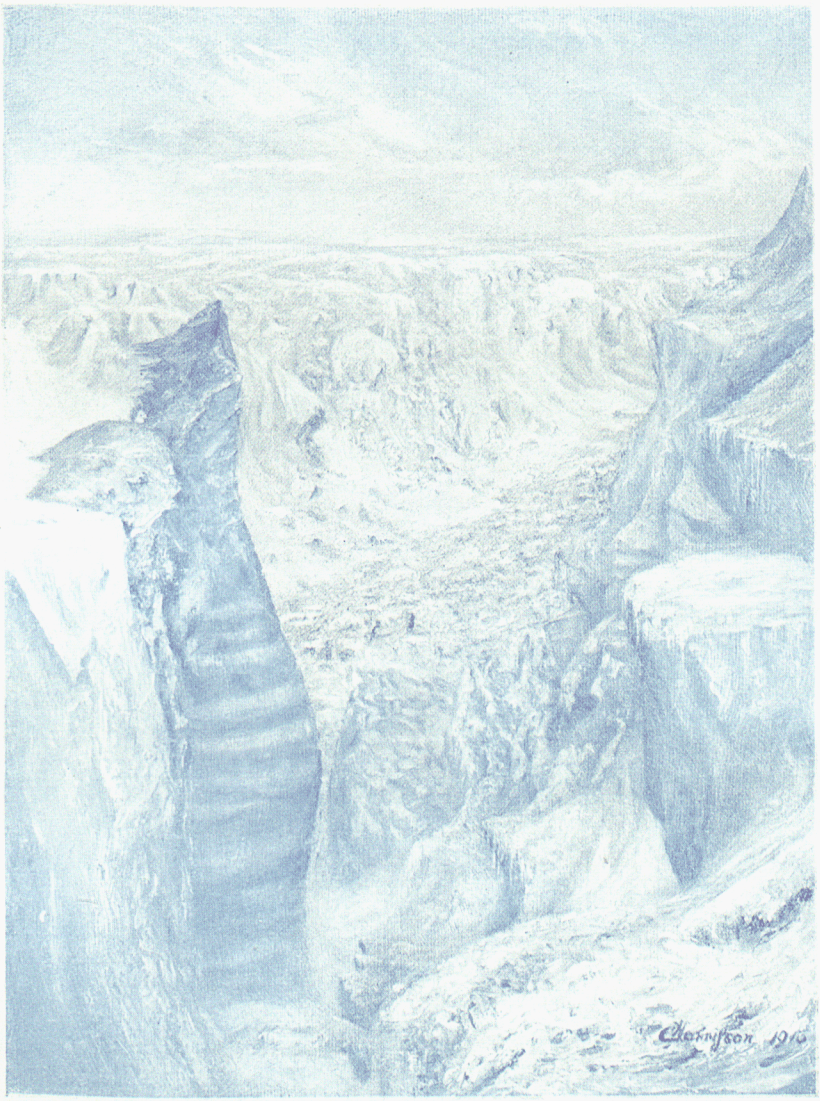
The excursion was postponed till next day, when Kennedy, Watson and I roped up and commenced to thread a tangled belt of crevasses. The island was three and a half miles from the camp, exposing a bare ridge and a jutting bluff, nine hundred feet high—Watson Bluff. At the Bluff the rock was almost all gneiss, very much worn by the action of ice. The face to the summit was so steep and coarsely weathered that we took risks in climbing it. Moss and lichens grew luxuriantly and scores of snow petrels hovered around, but no eggs were seen.

Owing to an overcast sky, the view was not a great deal more enlightening than that which we had had from below. The Denman Glacier swept down for forty miles from over three thousand feet above sea-level. For twenty miles to the east torn ice-masses lay distorted in confusion, and beyond that, probably sixty miles distant, were several large stretches of bare rock-like islands.

On November 20, a strong north-east wind blew, with falling snow. Nothing could be seen but a white blanket, above, below and all around; so, with sudden death lurking in the bottomless crevasses on every hand, we stayed in camp.

THE GREAT BERGSCHRUND OF THE DENMAN GLACIER

From a painting by Harrisson


Eckmansson 1915

A blizzard of great violence blew for two days and the tent occupied by Kennedy and myself threatened to collapse. We stowed all our gear in the sleeping-bags or in a hole from which snow had been dug for cooking. By the second day we had become extremely tired of lying down. One consolation was that our lips, which were very sore from exposure to the sun and wind, had now a chance of healing.

Next afternoon, the gale moderated sufficiently for us to go once more to David Island, in clearer weather, to see the outlook from the bluff. This time the sun was shining on the mainland and on the extension of the glacier past the bluff to the north. The distant southern slopes were seamed with a pattern of crevasses up to a height of three thousand feet. To the north, although the way was certainly impassable for twelve miles, it appeared to become smoother beyond that limit. We decided to try and cross in that direction.

We persevered on the 24th over many lines of pressure-ice and then camped near an especially rough patch. Watson had the worst fall on that day, going down ten feet vertically into a crevasse before his harness stopped him. After supper, we went to locate a trail ahead, and were greatly surprised to find salt water in some of the cracks. It meant that in two days our descent had been considerable, since the great bergschrund farther south was well over three hundred feet in depth and no water had appeared in its depths.

A few extracts from the diary recall a situation which daily became more serious and involved :

" *Monday, November* 25. A beautiful day so far as the weather and scenery are concerned but a very hard one. We have been amongst 'Pressure,' with a capital P, all day, hauling up and lowering the sledges with an alpine rope and twisting and turning in all directions, with waves and hills, monuments, statues, and fairy palaces all around us, from a few feet to over three hundred feet in height. It is impossible to see more than a few hundred yards ahead

at any time, so we go on for a bit, then climb a peak or mound, choose a route and struggle on for another short stage. . . .

"We have all suffered from the sun to-day; Kennedy has caught it worst, his lips, cheeks, nose and forehead are all blistered. He has auburn hair and the tender skin which frequently goes with it. . . .

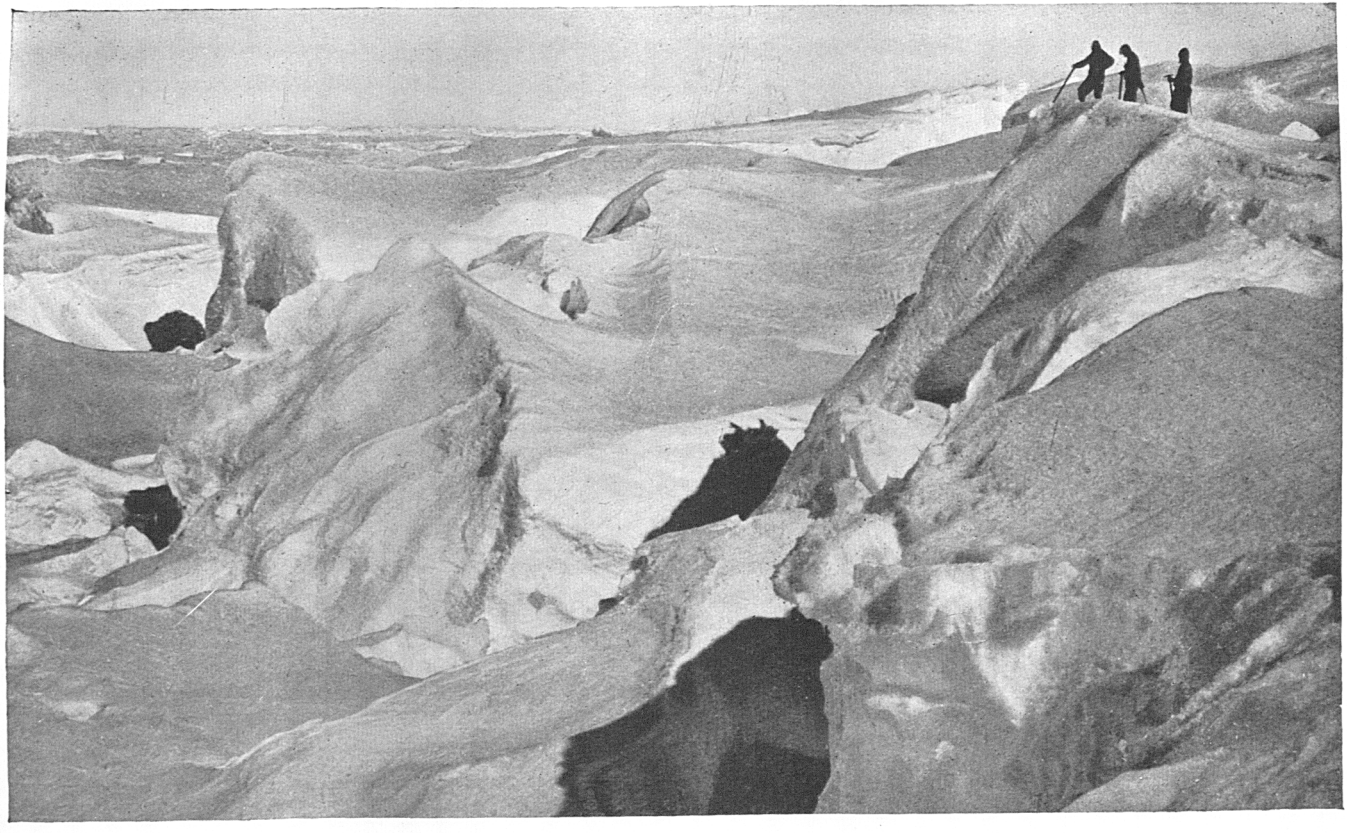
"*Tuesday, November* 26. Another very hard day's work. The first half-mile took three hours to cover; in several places we had to cut roads with ice-axes and shovels and also to build a bridge across a water-lead. At 1 P.M. we had done just one mile. I never saw or dreamt of anything so gloriously beautiful as some of the stuff we have come through this morning. 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, meshed with crevasses. . . .

"We all had falls into these during the day: Harrisson dropping fifteen 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. So far as we can see, the same kind of country continues, and one cannot help thinking about having to return through this infernal mess. The day's distance—only one thousand and fifty yards.

"*Wednesday, November* 27. When I wrote last night about coming back, I little thought it would be so soon. We turn back to-morrow for the simple reason that we cannot go on any farther.

"In the morning, for nearly a mile along a valley running south-east, the travelling was almost good; then our troubles commenced again.

"Several times we had to resort to hand-hauling with the alpine rope through acres of pitfalls. The bridges of those which were covered were generally very rotten, except the wide ones. Just before lunch we had a very stiff



Queen Mary Land WILD, KENNEDY, AND HARRISSON AMONGST THE ABYSSES OF THE DENMAN GLACIER *Watson*

uphill pull and then a drop into a large basin, three-quarters of a mile in diameter.

"The afternoon was spent in vain searching for a road. . . . On every side are huge waves split in every direction by crevasses up to two hundred feet in width. The general trend of the main crevasses is north and south. . . .

"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 push through farther east from here, but it would be by lowering the gear piecemeal into chasms fifty to one hundred feet deep, and hauling it up on 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."

Snow fell for four days, at times thickly, unaccompanied by wind. It was useless to stir in our precarious position. Being a little in hand in the ration of biscuits, we fed the dogs on our food, their own having run out. I was anxious to keep them alive until we were out of the pressure-ice.

From this, our turning-point out on the shelf-ice, the trail lay over eighteen inches of soft snow on December 3, our former tracks, of course, having been entirely obliterated. The bridged crevasses were now entirely hidden and many weak lids were found.

At 9 A.M. Harrisson, Watson and I roped up to mark a course over a very bad place, leaving Kennedy with the dogs. We had only gone about one hundred yards when I got a very heavy jerk on the rope and, on looking round, found that Watson had disappeared. He weighs two hundred pounds in his clothes and the crevasse into which he had fallen was fifteen feet wide. He had broken through on the far side and the rope, cutting through the bridge, stopped in the middle

so that he could not reach the sides to help himself in any way. Kennedy brought another rope over and threw it down to Watson and we were then able to haul him up, but it was twenty minutes before he was out. He reappeared smiling, and, except for a bruise on the shin and the loss of a glove, was no worse for the fall.

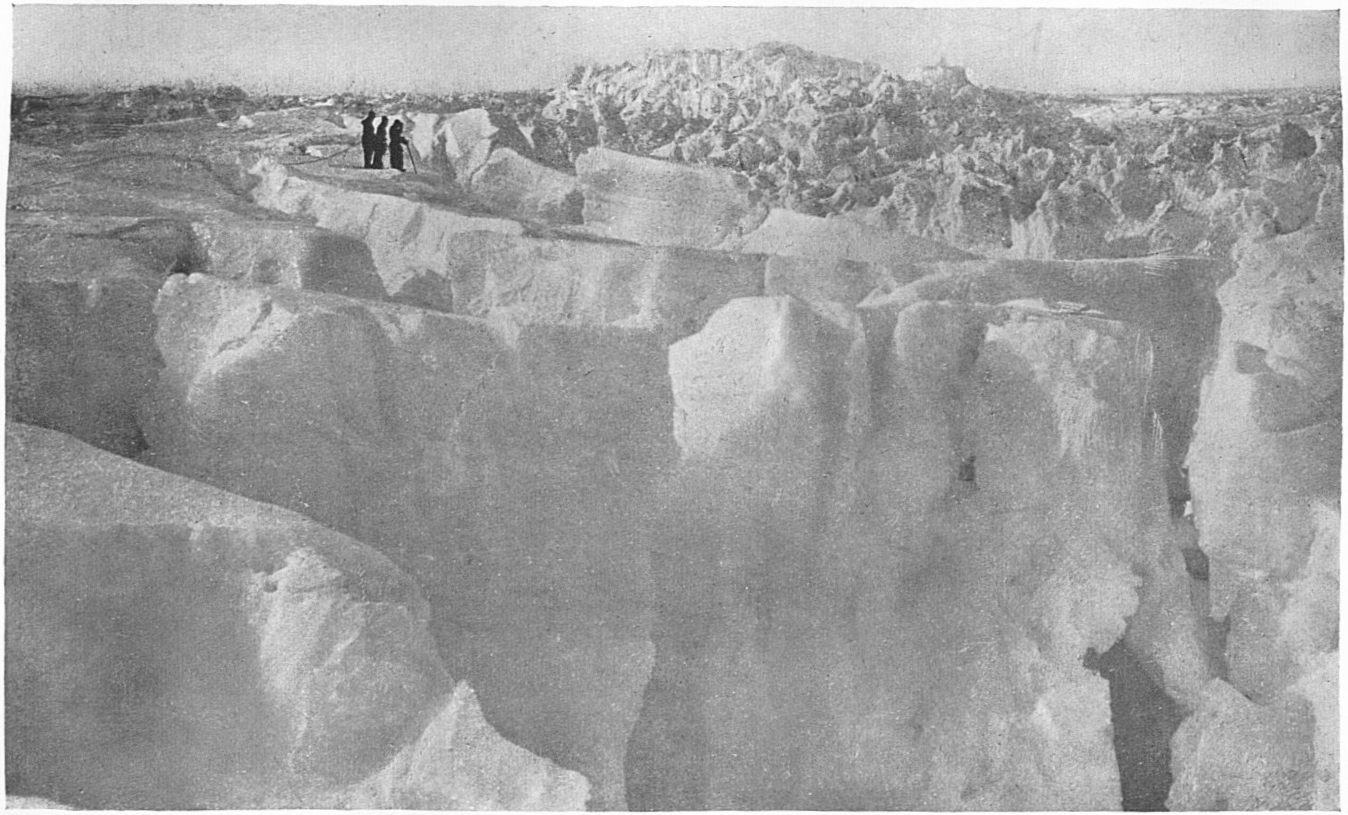
At 2.30 P.M. we were all dead-beat, camping with one mile one thousand seven hundred yards on the meter. One-third of this distance was relay work and, in several places, standing pulls with the alpine rope. The course was a series of Z's, S's, and hairpin turns, the longest straight stretch one hundred and fifty yards, and the whole knee-deep in soft snow; the sledges sinking to the cross-bars.

The 4th was a repetition of the previous day—a terribly hard two and a half miles. We all had " hangman's drops " into crevasses. One snow-bridge, ten feet wide, fell in as the meter following the twelve-foot sledge was going over behind it.

The 5th was a day of wind, scurrying snow and bad light. Harrisson went out to feed the dogs in the morning and broke through the lid of a crevasse, but fortunately caught the side and climbed out.

The diary again :

" *Friday, December* 6. Still bad light and a little snowfall, but we were off at ten o'clock. I was leading and fell into at least a dozen crevasses, but had to be hauled out of one only. At 1.30 P.M. we arrived at the open lead we had crossed on the outward journey and found the same place. There had been much movement since then and we had to make a bridge, cutting away projections in some places and filling up the sea-water channels with snow and ice. Then Harrisson crossed with the aid of two bamboo poles, and hauled me over on a sledge. Harrisson and I on one side and Kennedy and Watson on the other then hauled the sledges backwards and forwards, lightly loaded one way and empty the other, until all was across. The shelf-ice is without doubt afloat, if the presence of sea-water and



Queen Mary Land "THE WHOLE WAS THE WILDEST, MADDEST AND YET THE GRANDEST THING IMAGINABLE" *Watson*

diatomaceous stains on the ice is of any account. We camped to-night in the same place as on the evening of November 25, so with luck we should be out of this mess to-morrow. Switzerland had to be killed as I cannot afford any more biscuit. Amundsen ate his flesh without hesitation, but Zip refused it."

Sure enough, two days sufficed to bring us under the bluff on David Island. As the tents were being pitched, a skua gull flew down. I snared him with a line, using dog's flesh for bait and we had stewed skua for dinner. It was excellent.

While I was cooking the others climbed up the rocks and brought back eight snow petrels and five eggs, with the news that many more birds were nesting. After supper we all went out and secured sixty eggs and fifty-eight birds. It seemed a fearful crime to kill these beautiful, pure white creatures, but it meant fourteen days' life for the dogs and longer marches for us.

Fresh breeze, light snow and a bad light on the 9th; we remained in camp. Two more skuas were snared for the evening's dinner. The snow petrels' eggs were almost as large as hens' eggs and very good to eat when fresh. Many of them had been under the birds rather too long, but although they did not look so nice, there was little difference in the taste. I was very glad to get this fresh food, as we had lived on tinned meat most of the year and there was always the danger of scurvy.

The light was too changeable to make a satisfactory start until the evening of December 11, when we managed to dodge through four and a half miles of broken ice, reaching the mainland close to our position on November 16, and camping for lunch at midnight. In front was a clear mile on a peninsula and then the way led across Robinson Bay, seven miles wide, fed by the Northcliffe Glacier.

Another night march was commenced at 8 P.M. The day had been cloudless and the sun very warm, softening the surface, but at the time of starting it was hardening

rapidly. Crossing the peninsula we resolved to head across Robinson Bay as the glacier's surface was still torn up. We ended with a fine march of twelve miles one thousand two hundred yards.

The fine weather continued and we managed to cross three and a half miles of heavy sastrugi, pressure-ridges and crevasses, attaining the first slopes of the mainland at 10 P.M. on December 14. The discovery of two nunataks springing out of the piedmont glacier to the south, lured us on.

The first rock—Possession Nunataks—loomed ahead, two hundred feet above, up a slope of half a mile. Here a depot of provisions and spare gear was made, sufficient to take us back to the Hippo. The rock was found by Watson to be gneiss, rich in mica, felspar and garnets. We lunched in this place and resumed our march at midnight.

The second nunatak was on the course ; a sharp peak in the south, hidden by the contour of the uprising ridges. In four miles we steadily ascended eight hundred feet. While we were engaged pitching camp, a Cape pigeon flew overhead.

There were advantages in travelling at night. The surface was firmer, our eyes were relieved from the intense glare and our faces no longer blistered. On the other hand, there were disadvantages. The skirt of the tent used to get very wet through the snow thawing on it in the midday sun, and froze solid when packed up ; the floor-cloths and sleeping-bags, also, never had a chance of drying and set to the same icy hardness. When we had mounted higher I intended to return to work by day.

It was not till the altitude was three thousand feet that we came in sight of the far peak to the south. We were then pulling again in daylight. The ice-falls of the Denman Glacier on the left were still seen descending from the plateau, while down on the plain we saw that the zone of disrupted ice, into which the short and intricate track of our northern attempt had been won, extended for quite thirty miles.

The surface then softened in a most amazing fashion and hauling became a slow, dogged strain with frequent spells. A little over four miles was the most we could do on the 18th, and on the 19th the loads were dragging in a deluge of dry, flour-like snow. A long halt was made at lunch to repair a badly torn tent.

The peak ahead was named Mount Barr-Smith. It was fronted by a steep rise which we determined to climb next day. On the eastern margin of the Denman Glacier were several nunataks and higher, rising ground.

Following a twenty-four hours' blizzard, the sky was overcast, with the usual dim light filtering through a mist of snow. We set off to scale the mountain, taking the dip-circle with us. The horizon was so obscured that it was useless to take a round of angles. Fifteen miles south of Mount Barr-Smith, and a little higher there was another peak, to be subsequently called Mount Strathcona; also several intervening outcrops. Not a distinct range of mountains as we had hoped. The Denman Glacier sweeps round these projecting rocks from the south-west, and the general flow of the ice-sheet is thereby concentrated within the neck bounded by the two peaks and the higher land to the east. Propelled by the immense forces of the hinterland, this stream of ice is squeezed down through a steep valley at an accelerated speed, and, meeting the slower moving Shackleton Shelf, rends it from top to bottom and presses onward. Thus chaos, icequake, and ruin.

Our tramp to Mount Barr-Smith was through eighteen inches of soft snow, in many places a full two feet deep. Hard enough for walking, we knew from experience what it was like for sledging. There was only sufficient food for another week and the surface was so abominably heavy that in that time, not allowing for blizzards, it would have been impossible to travel as far as we could see from the summit of Mount Barr-Smith, while four miles a day was the most that could have been done. Our attempt to make east by rounding the Denman Glacier to the south had been foiled, but by

turning back at that point, we stood a chance of saving our two remaining dogs, who had worked so well that they really deserved to live.

Sunday December 22 broke with a fresh breeze and surface drift; overhead a clear sky. We went back to Mount Barr-Smith, Kennedy taking an observation for latitude, Watson making a geological survey and collecting specimens, Harrisson sketching. The rocks at the summit were granites, gneisses and schists. The latitude worked out at 67° 10·4′ S., and we were a little more than one hundred and twenty miles in an air-line from the hut.

In the next two days, downhill, we " bullocked " through eleven miles, reaching a point where the depot at Possession Nunataks was only sixteen miles away. The surface snow was very sticky in places, clogging the runners badly, so that they had to be scraped every half-mile. Stewed skua was the feature of our Christmas Eve supper.

From the diary :

" *Christmas Day, Wednesday.* Turned out and got away at 8 A.M., doing nine miles before lunch down a steep descent. The sun was very hot, and after lunch the surface became sticky, but at 5 P.M. we reached the depot, having done fifteen miles one hundred yards and descended two thousand three hundred feet.

" I am afraid I shall have to go back to travelling by night, as the snow is so very soft down here during the day; not soft in the same way as the freshly fallen powdery stuff we had on the hills, but half-thawed and wet, freezing at night into a splended surface for the runners. The shade temperature at 5.30 P.M. to-day was 29° F., and a thermometer laid in the sun on the dark rocks went up to 87° F.

" Some time ago, a plum-pudding was found in one of our food-bags, put there, I believe, by Moyes. We ate it to-night in addition to the ordinary ration, and, with a small taste of spirits from the medical store, managed to get up quite a festive feeling. After dinner the Union Jack and Australian Ensign were hoisted on the rocks and

Queen Mary Land WILD'S PARTY WORKING THEIR SLEDGES THROUGH THE CRUSHED ICE AT THE FOOT OF DENMAN GLACIER *Watson*

I formally took possession of the land in the name of the Expedition, for King George V. and the Australian Commonwealth."

Queen Mary Land is the name which, by gracious sanction, was eventually affixed to that area of new land.

Night marches commenced at 1 A.M. on December 27. The sail was hoisted for the first time and the fresh breeze was of great assistance. We were once more down on the low peninsula and on its highest point, two hundred feet above the shelf-ice, Kennedy took a round of angles.

Along the margin of the shelf the crevasses were innumerable and, as the sun was hot and the snow soft and mushy, we pitched camp about six miles from the bluff on David Island.

At 6 A.M. on the 28th we rounded the bluff and camped under its leeward face. After lunch there was a hunt for snow petrels. Fifty-six were caught and the eggs, which all contained chicks, were given to the dogs.

It was my intention to touch at all the rocks on the mainland on the way home, as time and weather permitted. Under a light easterly breeze we scudded along with sail set and passed close to several outcrops. Watson examined them, finding gneiss and granite principally, one type being an exceptionally coarse granite, very much weathered. A mile of bad crevasses caused some delay; one of the dogs having a fall of twelve feet into one abyss.

Next day, the Hippo hove in sight and we found the depoted food in good condition. The course had been over high pressure-waves and in some places we had to diverge on account of crevasses and—fresh water! Many of the hollows contained water from thawed snow, and in others there was a treacherous crust which hid a slushy pool. The march of eighteen miles landed us just north of the Avalanche Rocks.

While we were erecting the tents there were several snow-slips, and Watson, Kennedy and I walked landwards after supper to try for a "snap" of one in the act of falling,

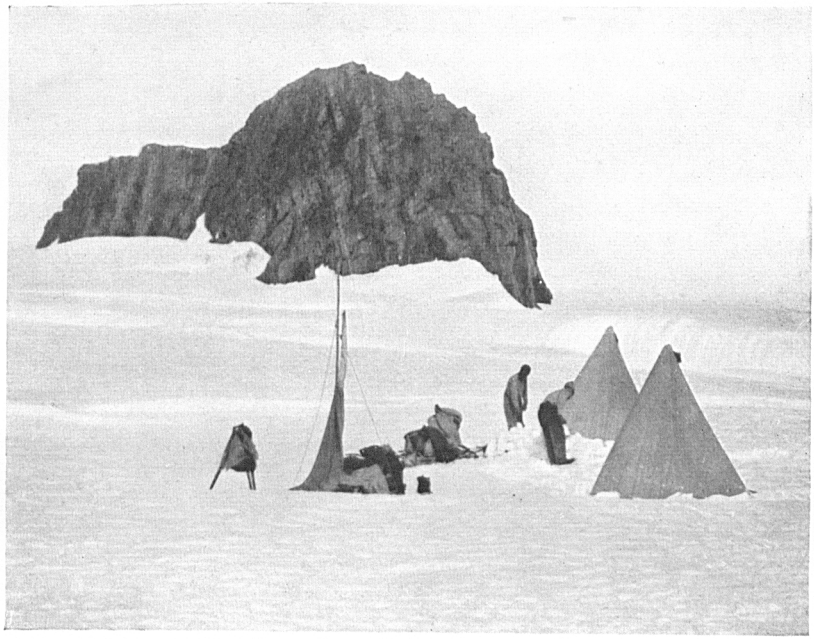
but they refused to oblige us. If was found that one or more avalanches had thrown blocks of ice, weighing at least twenty tons, two hundred yards past the hole in which we spent five days on the depot journey. They had, therefore, travelled six hundred yards from the cliff.

The Alligator Nunatak was explored on January 2, 1913. It was found to be half a mile long, four hundred feet high and four hundred and fifty feet in width, and, like most of the rock we had seen, mainly gneiss.

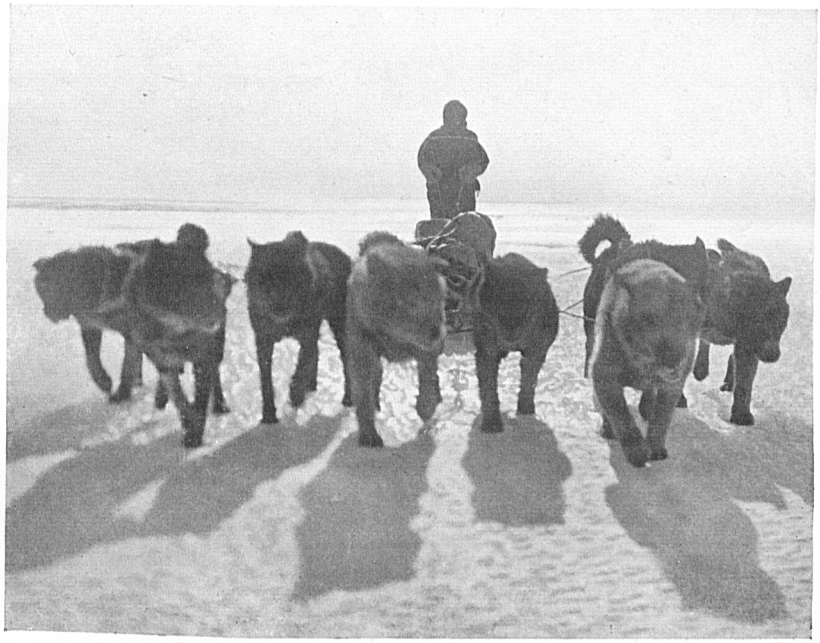
There was half a gale blowing on the 4th and though the wind was abeam, the sail was reefed and we moved quickly. The dogs ran loose, their feet being very sore from pulling on rough, nobbly ice. The day's run was the record up to that time—twenty-two miles. Our camp was in the vicinity of two small nunataks discovered in August 1912. We reckoned to be at the Base in two days and wondered how poor Moyes was faring.

Early on the 5th, the last piece of broken country fell behind, and one sledge being rigged with full sail, the second sledge was taken in tow. Both dogs had bleeding feet and were released, running alongside. During the halt for lunch a sail was raised on the dogs' sledge, using tent poles as a mast, a floor-cloth for a sail, an ice-axe for an upper yard and a bamboo for a lower yard. Getting under way we found that the lighter sledge overran ours; so we cast off and Harrisson took the light sledge, the sail working so well that he rode on top of the load most of the time. Later in the afternoon the wind increased so much that the dogs' sledge was dismasted and taken in tow once more, the sail on the forward sledge being ample for our purpose.

At 4 P.M. we had done twenty miles, and, everybody feeling fresh, I decided to try and reach "The Grottoes," fifteen miles away. The wind increasing to a gale with hurtling drift, the sail was reefed, and even then was more than enough to push along both sledges. Two of us made fast behind and maintained a continual brake to stop



Queen Mary Land THE HIPPO NUNATAK



DOG-SLEDGING *Mertz*

them running away. At 9 P.M. the gale became so strong that we struck sail and camped. Altogether, the day's run was thirty-five miles.

An hour's march next morning, and, through the glasses, we saw the mast and soon afterwards the hut. Just before reaching home, we struck up a song, and in a few seconds Moyes came running out. When he saw there were four of us, he stood on his head.

As we expected, Moyes had never thought of Harrisson coming with me and had quite given him up as dead. When a month had elapsed—the time for which Harrisson had food—Moyes packed a sledge with provisions for Harrisson, himself and the dogs and went out for six days. Then, recognizing the futility of searching for any one in that white waste of nothingness, he returned. He looked well, after his lonely nine weeks, but said that it was the worst time he had ever had in his life. Moyes reported that the Western party were delayed in starting by bad weather until November 7.

The total distance sledged during our main summer eastern journey was two hundred and thirty-seven miles, including thirty-two of relay work, but none of the many reconnoitring miles. Out of seventy days, there were twenty-eight on which the weather was adverse. On the spring depot journey the travelling had been so easy that I fully expected to go four hundred or five hundred miles eastward in the summer. It was therefore, a great disappointment to be blocked as we were.

CHAPTER XXII

THE WESTERN BASE—LINKING UP WITH KAISER WILHELM II LAND

By Dr. S. E. JONES

ON our return from the Western Depot journey towards the end of October 1912, we found preparations completed for the long western trip, towards Gaussberg in Kaiser Wilhelm II Land, which was discovered by the German Antarctic Expedition of 1902. The departure was delayed for several days, but came at last on November 7, Moyes bidding us adieu and wishing us good luck.

The party consisted of Dovers (surveyor), Hoadley (geologist), and myself (surgeon). We were hauling one sledge with rations for nine weeks. Our course, which was almost due south, lay over the glacier-shelf practically parallel to the sea-cliffs. The surface was good, and we covered eleven miles by nightfall, reaching a point some two or three miles from the rising land slopes. As the high land was approached closer, the surface of the glacier-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 floe close to where the seaward wall of the glacier-shelf joined that of the land

ice-sheet. 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, when 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.

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 reached the depot laid on the earlier journey at 5.30 A.M. From this position we had a fine view of the Helen Glacier running out of a bay which opened up ahead.

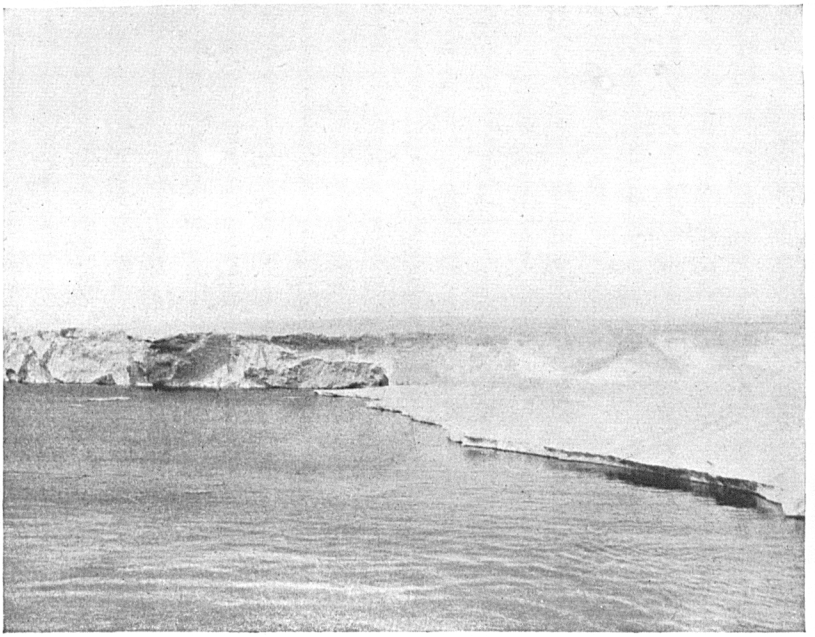
Having picked up the depot next morning, we were disappointed to find that we should have to commence relay work. There were then two sledges with rations for thirteen weeks; the total weight amounting to one thousand two hundred pounds. By making an even division between the two sledges the work was rendered easy but slow. When we camped at 6 P.M., five and a half miles had been covered. The surface was good, but a strong beam wind hindered us while approaching the head of Depot 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. Hoadley complained of snow-blindness and all were suffering with cracked lips; there was consequently a big demand for hazeline cream in the evening.

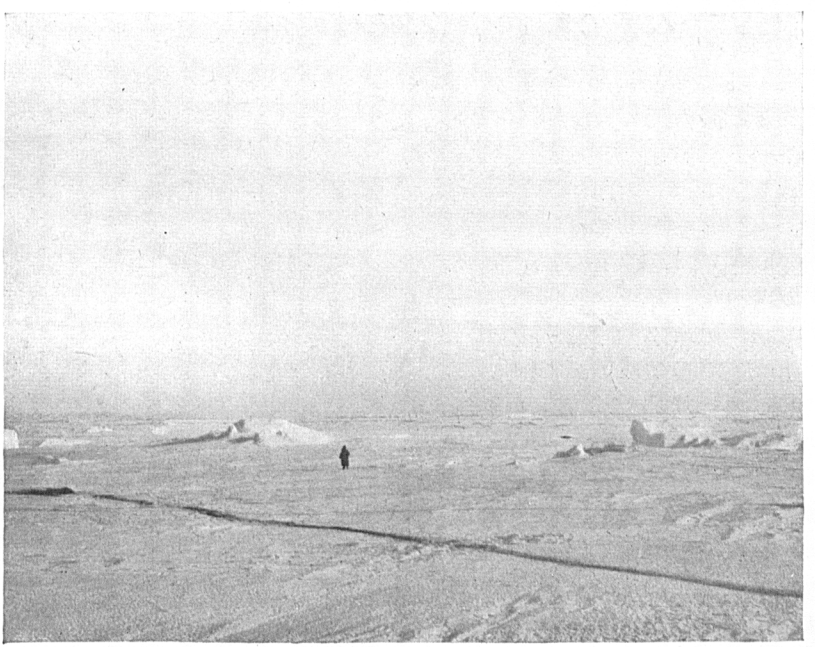
On Wednesday November 13, we started early, and, finding a good firm track over a gently rising plateau, made fair progress. At three o'clock a gale sprang up suddenly; and fortunately the sledges were only a quarter of a mile apart as we were relaying them in stages up the rising plateau. The tent was pitched hurriedly, though with difficulty, on account of the high wind and drift. The distance for the day was four miles one thousand five hundred 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 Depot Bay.

The next sixty hours were spent in sleeping-bags, a heavy snowstorm 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 two and three-quarter 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 Depot 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



WHERE THE FLOE-ICE MEETS THE SHACKLETON SHELF *Davis*



Davis

THE HUMMOCKY FLOE ON THE SOUTHERN MARGIN OF THE DAVIS SEA

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 th eice-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 one thousand feet.

A start was made at 7 A.M. The surface consisted of ice and névé and was badly broken by pressure-mounds, ten to twenty feet high, and by numerous crevasses old and recent; many with sunken or fallen bridges. While crossing a narrow crevasse, about forty 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 four miles. From our camp the eye could range across the Helen Glacier eastward to the shelf-ice of "The Grottoes." 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 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 network of huge crevasses, some open, the majority from fifty to one 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 four 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 two 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 four to five 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 led 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 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 six and a half 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 coast-line. Then the march west was resumed by travelling parallel to the shore at a distance of five to ten 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, Dovers called attention to what appeared to be an ice-covered island lying to the north-north-west, thirty to forty miles away. We watched this carefully during the day, but found its form to be constant. Through binoculars, icy patches and bluff points at the eastern and western ends were distinguishable.*

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 shady 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, the most

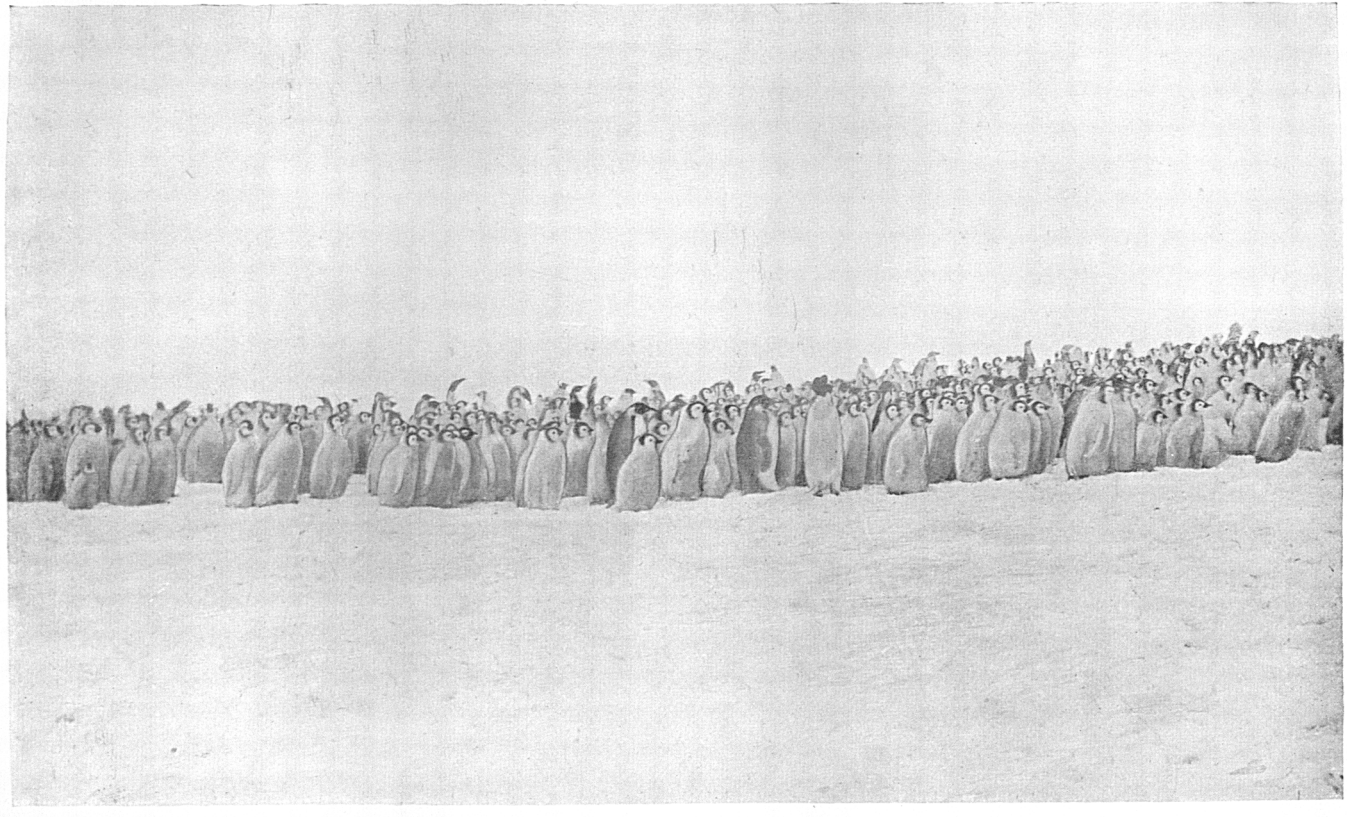
* This was examined in detail from the *Aurora* in January 1913 and found to be an island, which was named Drygalski Island, for it is evidently the ice-covered "high-land" observed by Professor Drygalski (German Expedition, 1902) from his balloon.—Ed.

distant being five miles off the coast. All were surrounded by floe. Descending steeply from the ridge into a valley which ran out to the sea-cliffs, we pitched camp for lunch.

The meal completed, Hoadley and I descended to the edge of the glacier in order to see if there were a passable route to the sea-ice. Crossing wide areas of badly crevassed ice and névé during a descent of nine hundred feet, we reached the sea-front about one and a half 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 floe 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 floe 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 the eleven-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



Queen Mary Land VIEW SHOWING THE YOUNG BIRDS MASSED TOGETHER AT THE EMPEROR PENGUINS' ROOKERY AT HASWELL ISLAND *Hoadley*

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.

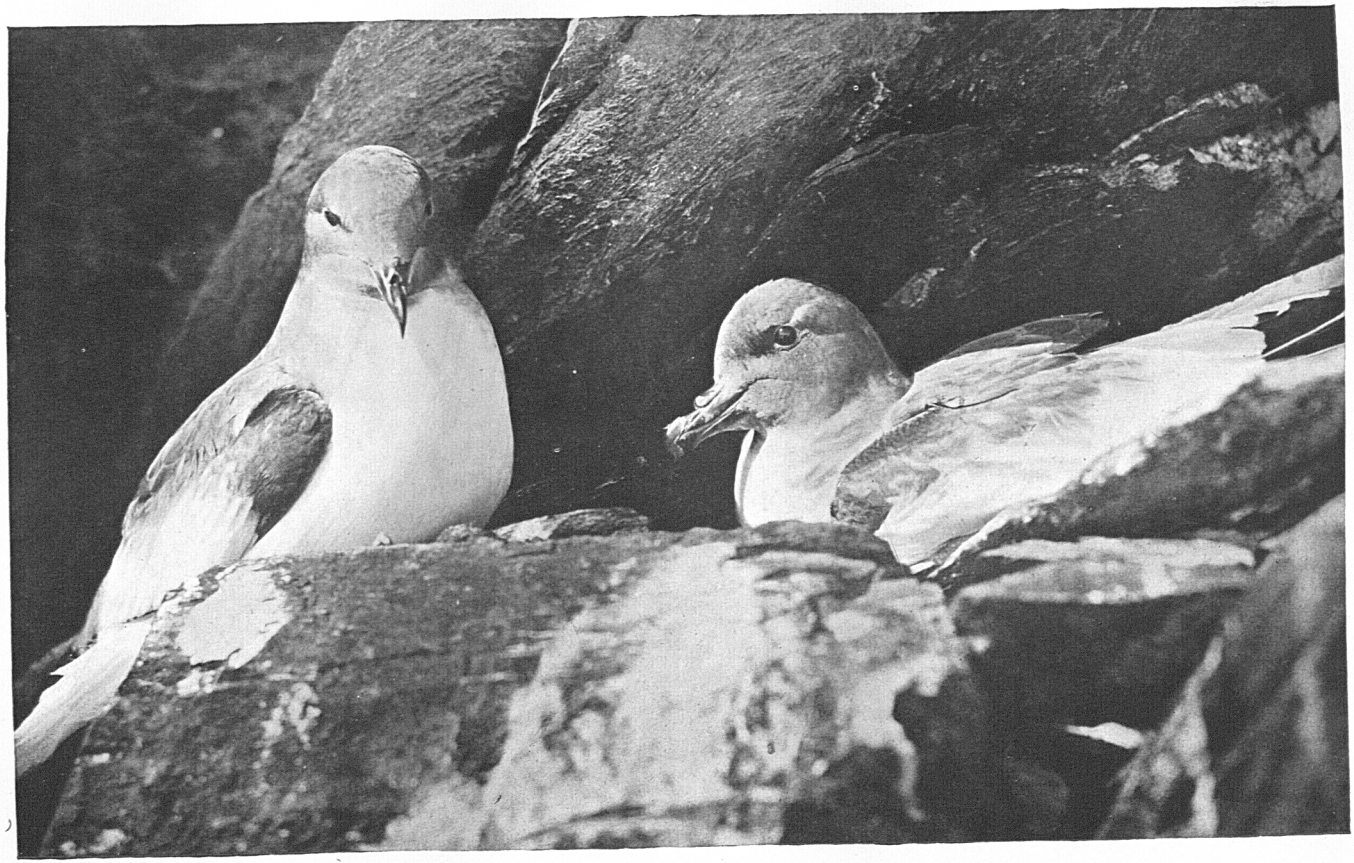
Although the stay was intended to occupy only about twenty-four hours, we were compelled to remain five days on the island on account of a snowstorm which continued for practically the whole of the time. This did not prevent us from leaving the tent and wandering about; Hoadley keen on the geology and 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 in diet. It was agreed that five Adelie penguins or ten Cape pigeons' eggs made a good tasty entrée to the monotonous ration.

The camp was situated on the largest of a group of about twelve small islets, lying within five or six 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 three hundred feet on the highest point. It was surrounded by one

season's floe, 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 floe, 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. Two deep gorges cut through the island from north-west to south-east, in both of which there were small ponds of fresh water.

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. 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 alone 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 floe, about a mile from the island. The birds covered four to five acres, but there were undoubted signs that a much larger area had been occupied. We estimated the numbers to be



ANTARCTIC PETRELS ON THE NEST

Hurley

seven thousand five hundred, the great majority being young birds. These were well grown, most of them standing as high as the shoulders of the adults. 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 twenty miles distant. Although more than once the adults' return 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 so 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 pengiun 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.

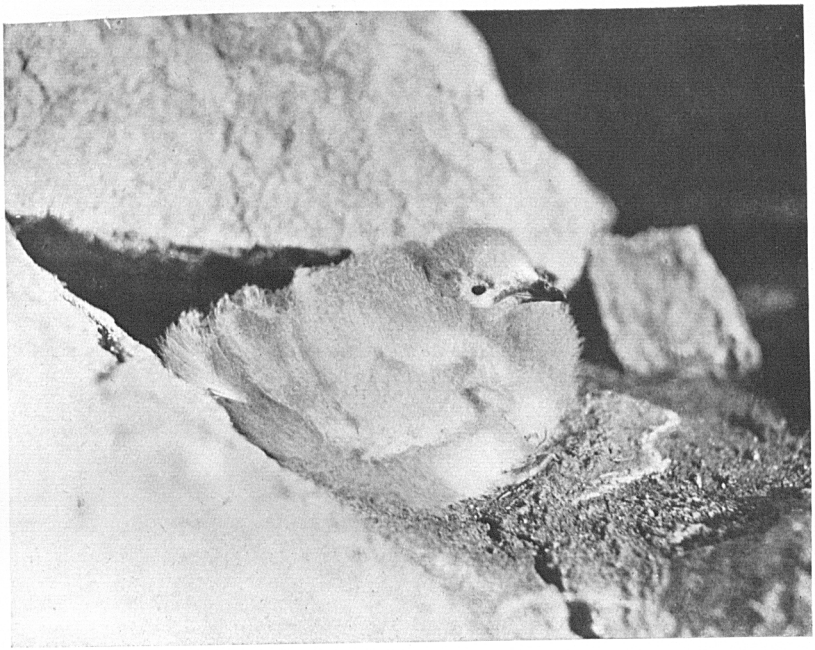
Although many snow petrels were seen flying about, we found only one with an egg. The nests were located in independent rocky niches but never in rookeries.

Vegetable life existed in the form of algæ, in the pools, lichens on the rocks and mosses which grew luxuriantly, chiefly in the Adelie penguin rookeries.

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 2 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 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



A SNOW PETREL CHICK ON THE NEST *Hurley*

SILVER-GREY PETREL ON THE NEST *Hurley*

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 five and a half miles, and the night's camp was at an altitude of about one thousand five hundred feet, located just above the broken coastal ice.

During December 5 and 6 a snowstorm 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 two thousand 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 fifty feet deep and one hundred 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 one thousand 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 two miles one thousand one hundred 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 four and a half miles, we were forced to camp. In the afternoon a heavy snowstorm 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 ten miles from the shore and could see open water some thirty miles to the north. Frozen fast within the floe were great numbers of bergs.

We started off early on December 12 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 seven miles. When we moved off, the wind was blowing at ten to fifteen 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 German "territory"—a small, dark object bearing due west, evidently bare rock and presumably Gaussberg. The course was altered accordingly towards this object and everything went smoothly for ten miles. Then followed an area where the ice fell steeply in waves to the sea, crossed by crevasses which averaged fifty feet in width. The snow-bridges were deeply concave, and the lower side of each chasm was raised into a ridge five to ten 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. After crossing ten or more crevasses in this fashion, 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 one hundred 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 sérac 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 ten miles, a heavy fog brought us to a halt at 5 P.M.

On Friday the 20th, in spite of a sticky surface, thirteen miles was covered on a west-south-west course. The ice-cap continued to be undulating but free of crevasses. The altitude was between two thousand five hundred and three thousand feet.

In the morning, after travelling two miles, we came in sight of Gaussberg again and steered directly towards it. The surface was good with a downward grade. At five and a quarter miles a depot was made of the small 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.

Midsummer's day, December 22, was spent in the tent, a move being impossible on account of the high wind. In

THE SYMMETRICALLY DOMED OUTLINE OF DRYGALSKI ISLAND, LOW ON THE HORIZON.
THE ISLAND IS 1200 FEET HIGH AND 9 MILES IN DIAMETER

Hurley

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 seventeen 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 24 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.

On the southern side, the ice-cap abuts against this extinct volcano at an elevation of about four hundred feet above sea-level; the summit of the mountain rises another eight hundred 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 two hundred and fifteen miles from " The Grottoes," but relay work had made the actual distance covered three hundred 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 26, pursuing a course to the south of our outward track so as to avoid some crevassed ridges. Ascending steadily against a continuous headwind, 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 31, after a day's blizzard, the surface was found to be covered with sastrugi of soft snow eighteen inches to two 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

Watson

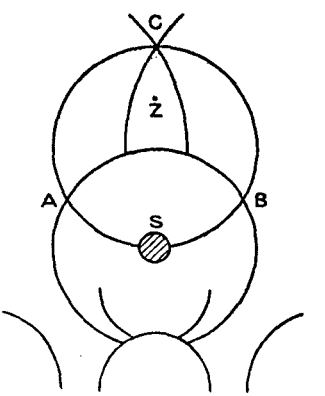
THE MAIN WESTERN PARTY ON THEIR RETURN TO THE *GROTTOES*. FROM THE LEFT: HOADLEY, JONES AND DOVERS

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 thirteen miles before camping.

On January 3 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 eleven 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 9, a fog-bank was observed in the east. This rapidly approached, and in fifteen 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 ten minutes and ended with the disappearance of the ice-crystals.



The diagram (p. 125) shows the arrangement of the arcs :

S = Sun.
Z = Zenith.
At A, B, C, mock suns could be seen.

From our camp on the night of January 10, 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 snowstorm delayed us for two and a half days, and it was not till the afternoon of January 13 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 two 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 18, 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 bridges 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.

Instructions had been given that the Western Base should be in readiness to embark on the *Aurora* not later than January 30, 1913.

When Wild's party had arrived, preparations for departure were immediately made. Geological and biological collections were packed, stores were sorted out and cases containing personal gear were sledged to the edge of the glacier.

Harrisson contrived a winch for sounding and fishing. Fourteen-gauge copper wire was wound on it and, through a crack in the sea-ice a quarter of a mile from the glacier, bottom was reached in two hundred and sixty fathoms. As the water was too deep for dredging, Harrisson manufactured cage-traps and secured some fish, a squid, and other specimens.

At this time there was abundant evidence of life. Skua

gulls frequently flew about the hut, as well as Cape pigeons, Antarctic, snow, Wilson, giant and silver-grey petrels. Out on the sea-ice, there were Adelie and Emperor penguins; the latter moulting. Hundreds of seals were seen with glasses on the edge of the floe, ten miles to the north.

On the whole, January was a very fine month. Some of the days seemed really hot; the shade temperature on one occasion reaching 37° F., and, in several instances, 33° F. It was quite a common thing for a man to work outside in loose, light garments; in fact, with nothing more than a singlet on the upper part of the body.

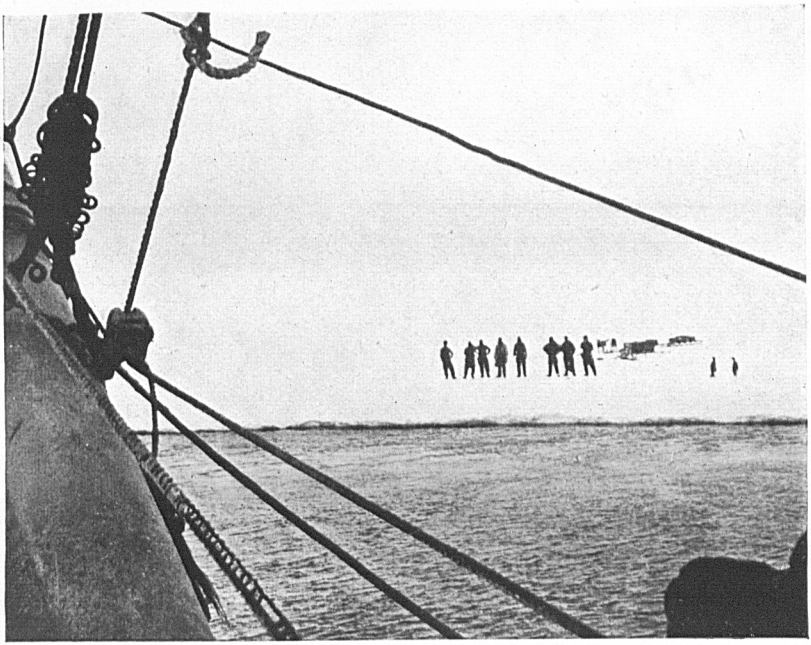
On January 26, while Kennedy took observations, Wild and the others went for a walk towards the open water. The surface was very rough and broken by leads, along which Weddell seals lay in great numbers. Three miles of ice were found to have drifted out, reducing the northern expanse to seven miles.

In view of the possibility of the *Aurora* not relieving them, the party went through their food-supplies, finding that these were sufficient for another year, with the exception of meat. With regard to coal, two tons of briquettes remained, which, augmented by good stock of seal-blubber, would provide sufficient fuel.

Laying in a store of seals' flesh and blubber now became the principal work, and every fine day saw a party out with a sledge. Unfortunately, the nearest crack on the sea-ice was nearly two miles away, so that the return journey, with a heavily laden sledge, was long and tedious. Two holes were dug in the glacier near the hut, one for blubber and the other for meat.

On January 31 six miles of sea-ice still remained, and, if the ship had arrived to time, a good deal of sledging would have been required to transport all the gear aboard.

In February, the weather altered for the worse, and there was not a single fine day until the 20th. A strong east-south-east wind with falling snow prevailed. As the days were



THE RELIEF OF WILD'S PARTY. THE *AURORA* APPROACHING THE FLOE AT THE WESTERN BASE, FEBRUARY 1913 — *Hurley*

PACING THE DECK: CAPT. JOHN KING DAVIS AND CAPT. JAMES DAVIS — *Hurley*

shortening rapidly, all were beginning to feel anxious about the *Aurora*.

Wild erected a flagstaff on the highest ice-pinnacle near "The Grottoes" and flew a large flag on it whenever the wind moderated. On the 16th, a lamp-screen and reflector were fitted at the mast-head and each night a hurricane lamp was placed there, which could be seen eight miles with the naked eye.

On the 20th Dovers and Wild made a large signboard, taking it out to a prominent point on the glacier, three and a half miles to the north. It was lashed to a bamboo pole with a flag flying on it. The open water was then only three miles distant.

Wild writes:

"The 22nd February was the anniversary of the day the *Aurora* left us, but the weather was very different. A heavy blizzard was raging, the wind's velocity ranging up to eighty miles per hour. As it was Saturday, we kept the usual routine, scrubbing out and cleaning up the hut. We could not help speculating as to whether we should have to do it for another whole year. But every one had great faith in 'good old Davis,' and nobody was at all downhearted.

"When we 'turned out' on Sunday there was still a strong wind and drift, but this died away to a light breeze before breakfast was over, and the sun came out. I had a look round with the glasses and saw that the ice had broken away beyond a limit of one and a half miles. As there was a sledge, which Harrisson had been using for sounding, within a few yards of the water's edge, Jones and I went off to bring it in. We had gone less than half a mile when we saw what at first appeared to be a penguin, standing on some pack-ice in the distance, but which we soon saw was the mast-head of the *Aurora*.

"It was evident that she could not be alongside for some time, so Jones went back to the hut to tell the others to bring down a load of gear, and I went on to meet the ship. Before the *Aurora* had reached the fast ice, all the party

were down with two sledge loads, having covered the mile and a half in record time.

"We were all anxious, of course, for news, and the first we received was the sad account of the deaths of Ninnis and Mertz; then of the wonderful march made by Dr. Mawson.

"Before closing, I should like to pay a tribute to the good-fellowship, unfailing industry, enthusiasm and unswerving loyalty which characterized my comrades. During the whole of the Expedition, whether carrying out monotonous routine work at the Base or under the trying conditions of sledging, all duties were performed with never-failing good temper and perseverance.

"Should it ever be my lot to venture on a like expedition I hope to have some, if not all, of the same party with me. But whether we meet again or not, I shall always think of every man of them with the greatest affection and respect."

CHAPTER XXIII

A SECOND WINTER

DURING the first busy year in Adelie Land, when the Hut was full of life and work, there were few moments for reflection. Yet, over the speculative pipe at home after a successful day's labour on the wireless masts, or out on the turbulent plateau when the hour of hoosh brought the strenuous day to a close, more than one man was heard to say, "One year in this country is enough for me." Still, in the early days, no one could predict what would happen, and therefore a change in the perverse climate was always considered probable. So great was the emulation, and so keen were all to extend our geographical boundaries, that the year sped away almost before the meagre opportunity came. With the cheery support of numbers, we did not find it a difficult matter "to drive dull care away."

Now there were only seven of us; we knew what was ahead; the weather had already given ample proof of the early approach of winter; the field of work which once stretched to the west, east and south had no longer the mystery of the "unknown"; the Ship had gone and there was scant hope of relief in March.

Against all this. There remained the Hut—a proven shelter from the wind; and, most vital of all, there was abundant food for another year. Every avenue of scientific work was not yet closed. Even the routine of meteorological and magnetic work was adding in no slight degree to the sum of human knowledge. Our short mile of rocks still held

some geological secrets, and there were biological discoveries yet to make. A wireless telegraphic station had at last been established, and we could confidently expect communication with the outside world at an early date. These were some of the obvious assurances which no one had the heart to think about at first; and then there was always our comradeship, most enduring of all.

February, during 1912, was a tolerable month with a fair proportion of sunny, moderately calm days. A year later, the first eight days of this month were signalized by the blizzard in which the *Aurora* had such a perilous experience. While the winter began in 1912 with the advent of March, now in 1913 it came on definitely in early February. Autumn was a term which applied to a few brilliant days which would suddenly intervene in the dense rack of drift-snow.

We set to work to make the Hut, if anything, safer and snugger. Bage put finishing touches to the break-wind of rock and cases, and with Hodgeman and McLean nailed battens of wood over a large sheet of canvas which had been stretched across the windward side of the roof, overlapping rolls of black paper, scraps of canvas and bagging, which were also battened down to make the eastern and western faces more air-tight.

Before the Ship left us, the remaining coal briquettes had been dug out of a bed of ice and carefully piled on a high point of the rocks. Round them all the spare timber and broken cases were gathered to provide sufficient fuel for the ensuing winter. The penguins' eggs, which had been stored in boxes, were stacked together on the windward side of the Hut, and a choice selection of steaks of seal and penguin for our own use were at the storeman's disposal in the veranda.

Madigan, in addition to his meteorological duties, took charge of the new sledging-dogs which had been presented by Captain Amundsen. A good many seals had been already killed, and a big cache of meat and blubber was made alongside the Hut to last throughout the winter.

"AMUNDSEN," ONE OF THE SLEDGE DOGS SENT DOWN TO US FROM AMUNDSEN'S SOUTH POLAR EXPEDITION *Hurley*

Bickerton found many odd jobs to occupy his time in connexion with the petrol-engine and the wireless installations. He was also busied with the anemometer, which had broken down and needed a strong start for its second year of usefulness.

Bage, following the parting instructions of Webb, became the owner of the Magnetograph House and the Absolute Hut, continuing to keep the magnetic records. As storeman, Bage looked after the food-supplies. The canvas coverings had made the veranda drift-tight, so the storeman could arrange his tins and cases on the shelves with some degree of comfort, and the daily task of shovelling out snow was now at an end. Further, Hodgeman and he built an annex out of spare timber to connect the entrance veranda with the store. This replaced the old snow-tunnel which had melted away, and, when completed and padded outside with old mattresses, was facetiously styled the "North-West Passage." The only thing which later arose to disturb the composure of the storeman was the admission of the dogs to a compartment in the veranda on the eastern side. His constant care then became a heap of mutton carcases which the dogs in passing or during the occasional escapades from their shelter were always eager to attack.

Hodgeman helped to change the appearance of the living-hut by cutting the table in two and, since there was now plenty of room, by putting in more shelves for a larder on which the storeman displayed his inviting wares to the cook, who could think of nothing original for the next meal.

McLean undertook the duties of ice-cutting and coal-carrying throughout the year, kept the biological log and assisted in general observations. He also sent off sealed messages in bottles, regularly, on the chance of their being picked up on the high seas, thereby giving some indication of the direction of currents.

Jeffryes was occupied regularly every night listening attentively for wireless signals and calling at intervals.

The continuous winds soon caused many of the wire stays of the main wireless mast to become slack, and these Jeffryes pulled taut on his daily rounds.

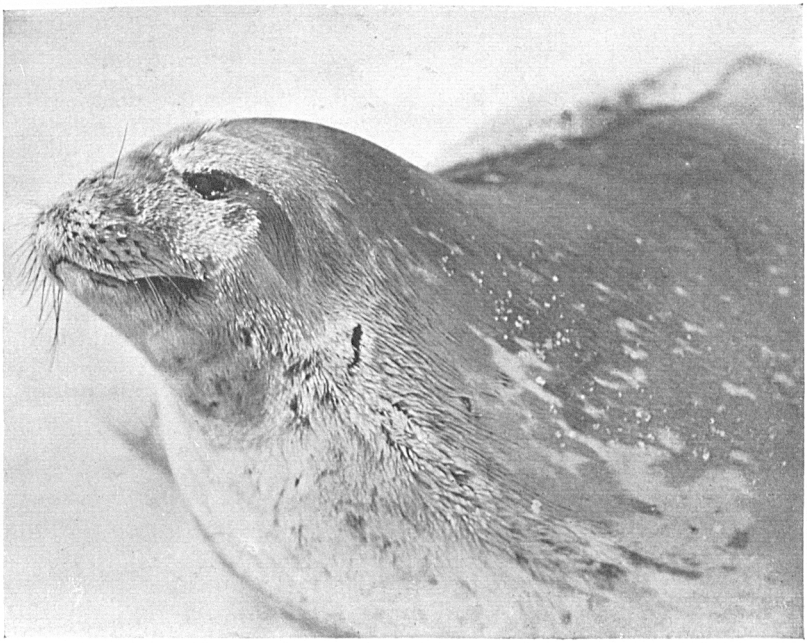
Looking back and forward, we could not but feel that the sledging programme of the previous summer had been so comprehensive that the broad features of the land were ascertained over a wide radius; beyond what we, with our weakened resources of the second year, could reach. The various observations we were carrying on were adding to the value of the scientific results, but we could not help feeling disappointed that our lot was not cast in a new and more clement region.

It was to be a dreary and difficult time for the five men who had volunteered to remain behind in order to make a thorough search for myself and comrades. They were men whom I had learned to appreciate during the first year, and I now saw their sterling characters in a new light. To Jeffreys all was fresh, and we envied him the novelties of a new world, rough and inhospitable though it was. As for me, it was sufficient to feel that

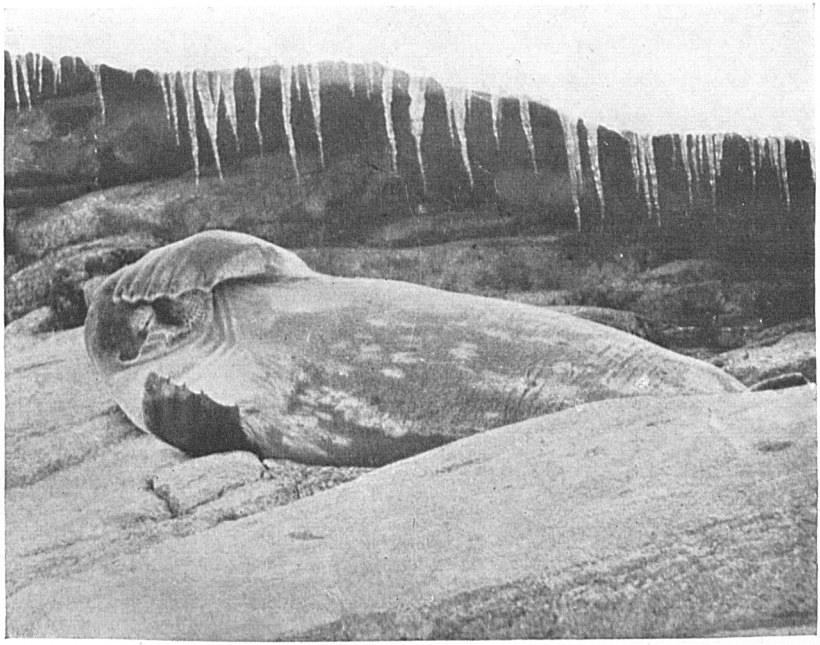
> . . . He that tossed thee down into the Field,
> He knows about it all—He knows, He knows.

On the night of February 15, Jeffryes suddenly surprised us with the exciting intelligence that he had heard Macquarie Island send a coded weather report to Hobart. The engine was immediately set going, but though repeated attempts were made, no answer could be elicited. Each night darkness was more pronounced and signals became more distinct, until, on the 20th, our call reached Sawyer at Macquarie Island, who immediately responded by saying "Good evening." The insulation of a Leyden jar broke down at this point, and nothing more could be done until it was remedied.

At last, on February 21, signals were exchanged, and by the 23rd a message had been dispatched to Lord Denman,



THE HEAD OF A WEDDELL SEAL *Hurley*



A WEDDELL SEAL SCRATCHING HIMSELF. "DRAT THOSE FLIES!" *Hurley*

Governor-General of the Commonwealth, acquainting him with our situation and the loss of our comrades and, through him, one to his Majesty the King requesting his royal permission to name a tract of newly discovered country to the east, "King George V Land." Special messages were also sent to the relatives of Lieutenant B. E. S. Ninnis and Dr. X. Mertz.

The first news received from the outside world was the bare statement that Captain Scott and four of his companions had perished on their journey to the South Pole. It was some time before we knew the tragic details which came home, direct and poignant, to us in Adelie Land.

To Professor David a fuller account of our own calamity was sent and, following this, many kind messages of sympathy and congratulation were received from all over the world. On February 26 Lord Denman sent an acknowledgment of our message to him, expressing his sorrow at the loss of our two companions; and on March 7 his Majesty the King added his gracious sympathy, with permission to affix the name, King George V Land, to that part of the Antarctic continent lying between Adelie Land and Oates Land.

On February 23 there was a spell of dead calm; heavy nimbus clouds and fog lowering over sea and plateau. Fluffy grains of sago snow fell most of the day, covering the dark rocks and the blue glacier. A heaving swell came in from the north, and many seals landed within the boat harbour, where a high tide lapped over the ice-foot. The bergs and islands showed pale and shadowy as the snow ceased or the fog lifted. Then the wind arose and blew hard from the east-south-east for a day, swinging round with added force to its old quarter—south-by-east.

March began in earnest with much snow and monotonous days of wind. By contrast, a few hours of sunny calm were appreciated to the full. The face of the landscape changed; the rocky crevices filling flush with the low mounds of snow which trailed along and off the ridges.

On March 16 every one was relieved to hear that the

Aurora had arrived safely in Hobart, and that Wild and his party were all well. But the news brought disappointment too, for we had always a lingering ray of hope that there might be sufficient coal to bring the vessel back to Adelie Land. Later on we learned that on account of the shortage of funds the Ship was to be laid up at Hobart until the following summer. In the meantime, Professors David and Masson were making every effort to raise the necessary money. In this they were assisted by Captain Davis, who went to London to obtain additional donations.

It was now a common thing for those of us who had gone to bed before midnight to wake up in the morning and find that quite a budget of wireless messages had been received. It took the place of a morning paper and we made the most of the intelligence, discussing it from every possible point of view. Jeffryes and Bickerton worked every night from 8 P.M. until 1 A.M., calling at short intervals and listening attentively at the receiver. In fact, notes were kept of the intensity of the signals, the presence of local atmospheric electrical discharges—" static "—or intermittent sounds due to discharges from snow particles—St. Elmo's fire—and, lastly, of interference in the signals transmitted. The latter phenomenon should lead to interesting deductions, for we had frequent evidence to show that the wireless waves were greatly impeded or completely abolished during times of auroral activity.

Listening at the wireless receiver must have been very tedious and nerve-racking work, as so many adventitious sounds had to be neglected. There was, first of all, the noise of the wind as it swept by the Hut; then there was the occasional crackling of " St. Elmo's fire "; the dogs in the veranda shelter were not always remarkable for their quietness; while within the Hut it was impossible to avoid slight sounds which were often sufficient to interrupt the sequence of a message. At times, when the aurora was visible, signals would often die away, and the only alternative was to wait until they recurred, meanwhile keeping up calls at regular

Adelie Land BLIZZARD-HARASSED PENGUINS, AFTER MANY DAYS BURIED IN THE SNOW *Hurley*

intervals in case the ether was not "blocked." So Jeffryes would sometimes spend the whole evening trying to transmit a single message, or, conversely, trying to receive one. By experience it was found easier to transmit and receive wireless messages between certain hours in the evening, while not infrequently, during the winter months, a whole week would go by and nothing could be done. During such a period auroral displays were usually of nightly occurrence. Then a "freak night" would come along and business would be brisk at both terminals.

It was often possible for Jeffryes to "hear" Wellington, Sydney, Melbourne and Hobart, and once he managed to communicate directly with the last-named. Then there were numerous ships passing along the southern shores of Australia or in the vicinity of New Zealand whose "calls" were audible on "good nights." The warships were at times particularly distinct, and occasionally the "chatter in the ether" was so confusing that Sawyer, at Macquarie Island, would signal that he was "jammed."

The "wireless" gave us another interest in life, and plenty of outside occupation when the stays became loose or an accident occurred. It served to relieve some of the tedium of that second year:

Day after day the same
Only a little worse.

On March 13 there was a tremendous fall of snow, and worst "pea-souper" we had had during the previous year. Next day everything was deluged, and right up the glacier there were two-foot drifts, despite a sixty-mile wind.

It was very interesting to follow the changes which occurred from day to day. First of all, under the flail of the incessant wind, a crust would form on the surface of the snow of the type we knew as "piecrust," when out sledging. It was never strong enough to bear a man, but the sledge-runners would clear it fairly well if the load were not too heavy. Next day the crust would be etched, and small flakes and pellets would be carried away until the snow was like fleece. Assuming

that the wind kept up (which it always did) long, shallow concavities would now be scooped out as the "lobules" of the fleece were carried away piecemeal. These concavities became deeper, hour by hour and day by day, becoming at last the troughs between the crests of the snow-waves or sastrugi. All this time the surface would be gradually hardening and, if the sun chanced to shine for even a few hours every day, a shining glaze would gradually form on the long, bevelled mounds. It was never a wise thing to walk on these polished areas in finnesko and this fact was always learnt by experience.

Above the Hut, where the icy slopes fell quickly to the sea, the snow would lie for a few days at the very most, but, lower down, where the glacier ran almost level for a short distance to the harbour ice, the drifts would lie for months at the mercy of the wind, furrowed and cut into miniature cañons; wearing away in fragments until the blue ice showed once more, clear and wind-swept.

Towards the end of March the wind gave a few exhibitions of its power, which did not augur well for the maximum periods of the winter. A few diary jottings are enough to show this:

"*March* 23. During the previous night the wind steadily rose to an eighty-mile 'touch' and upwards. It was one of those days when it is a perpetual worry to be outside.

"*March* 24. Doing at least seventy miles per hour during the morning. About 8 P.M. there was a temporary lull and a rise of '15 in the barometer. Now, 9.30 P.M., it is going 'big guns.' The drift is fairly thick and snow is probably falling.

"*March* 25. Much the same as yesterday.

"*March* 28. In a seventy-five-mile wind, Hodgeman had several fingers frost-bitten this morning while attending to the anemograph.

"*March* 29. It was quite sunny when we opened the trap-door, though it blew about sixty miles per hour with light drift.

THE ADELIE BLIZZARD

Registered at the General Plateau Office
for transmission by wind as a newspaper.

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VOL. I — No. 1 APRIL 1913

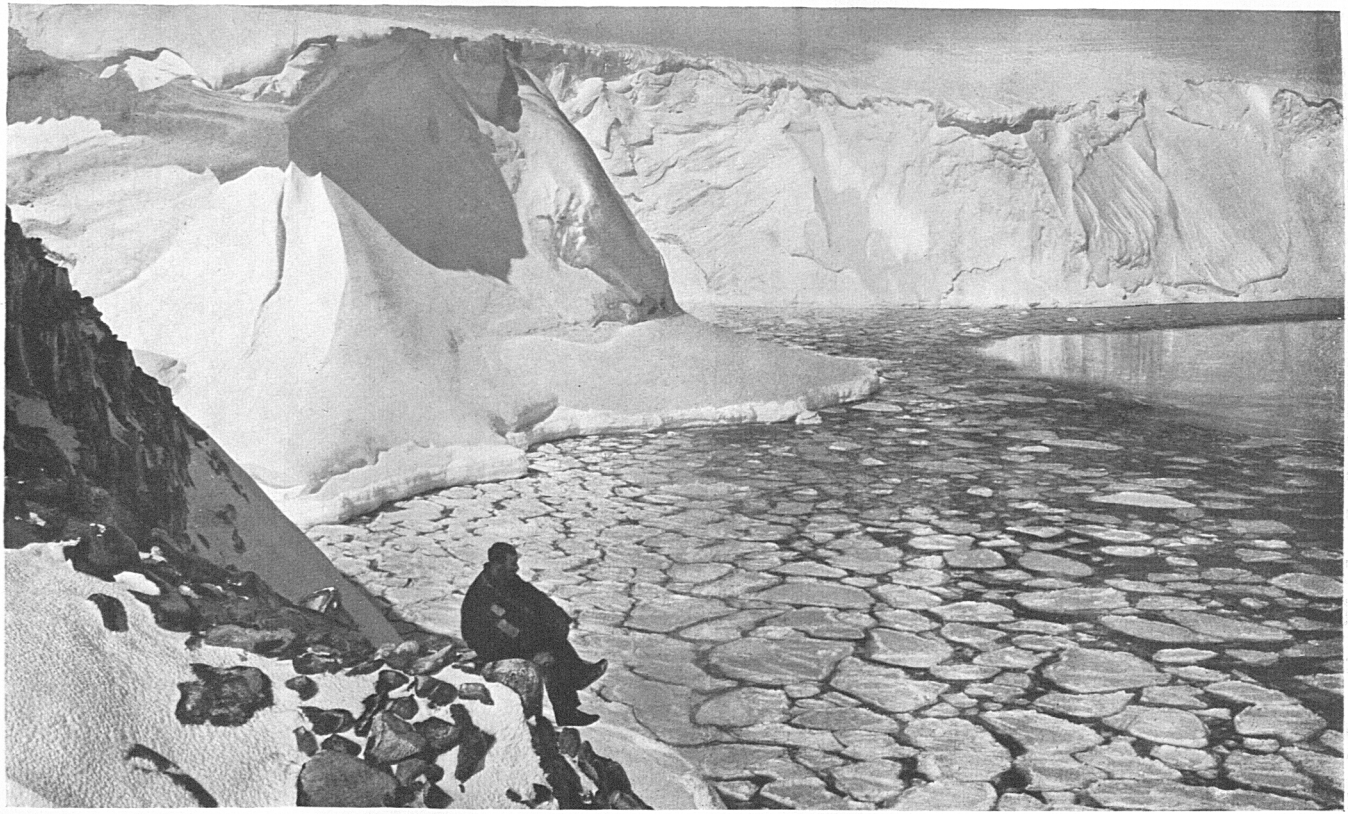
" *March* 30. The wind is doing itself full justice. About 8 P.M. it ranged between ninety-five and one hundred miles per hour, and now the whole hut is tremulous and the stove-pipe vibrates so that the two large pots on the stove rattle."

At the beginning of April, McLean laid the foundations of *The Adelie Blizzard* which recorded our life for the next seven months. It was a monthly publication, and contributions were invited from all on every subject but the wind. Anything from light doggerel to heavy blank verse was welcomed, and original articles, letters to the Editor, plays, reviews on books and serial stories were accepted within the limits of our supply of foolscap paper and type-writer ribbons.

It was the first Antarctic publication which could boast a real cable column of news of the day. Extracts from the April number were read after dinner one evening and excited much amusement. An " Ode to Tobacco " was very popular, and seemed to voice the enthusiasm of our small community, while " The Evolution of Women " introduced us to a once-familiar subject. The Editor was later admitted by wireless to the Journalists' Association (Sydney).

Many have asked the question, " What did you do to fill in the time during the second year ? "

The duties of cook and night-watchman came to each man once every week, and meteorological and magnetic observations went on daily. Then we were able to devote a good deal of time to working up the scientific work accomplished during the sledging journeys. The wireless watches kept two men well occupied, and in spare moments the chief recreation was reading. There was a fine supply of illustrated journals and periodicals which had arrived by the *Aurora,* and with papers like the *Daily Graphic, Illustrated London News, Sphere* and *Punch,* we tried to make up the arrears of a year in exile. The " Encyclopædia Britannica " was a great boon, being always " the last word " in the settlement of a debated point. Chess and cards were played on several occasions. Again, whenever the weather gave the smallest opportunity, there were jobs



Adelie Land THE PANCAKE ICE UNDER THE CLIFFS AT LAND'S END *Hurley*

outside, digging for cases, attending to the wireless mast and, in the spring, geological collecting and dredging. If the air was clear of drift, and the wind not over fifty miles per hour, one could spend a pleasant hour or more walking along the shore watching the birds and noting the changes in " scenery " which were always occurring along our short " selection " of rocks. During 1912 we had been able to study all the typical features of our novel and beautiful environment, but 1913 was the period of " intensive cultivation " and we would have gladly forgone much of it. Divine service was usually held on Sunday mornings, but in place of it we sometimes sang hymns during the evening, or arranged a programme of sacred selections on the gramophone. There was a great loss in our singing volume after the previous year, which Hodgeman endeavoured to remedy by striking up an accompaniment on the organ.

Cooking reached its acme, according to our standard, and each man became remarkable for some particular dish. Bage was the exponent of steam puddings of every variety, and Madigan could always be relied upon for an unfailing batch of puff-pastry. Bickerton once started out with the object of cooking a ginger pudding, and in an unguarded moment used mixed spices instead of ginger. The result was rather appetizing, and " mixed-spice pudding " was added to an original list. McLean specialized in yeast waffles, having acquired the art of tossing pancakes. Jeffryes had come on the scene with a limited experience, but his first milk scones gained him a reputation which he managed to make good. Hodgeman fell back on the cookery book before embarking on the task of preparing dinner, but the end-product, so to speak, which might be invariably expected for " sweets " was tapioca pudding. Penguin meat had always been in favour. Now special care was devoted to seal meat, and, after a while, mainly owing to the rather copious use of onion powder, no one could say for certain which was which.

During the previous year, yeast had been cultivated

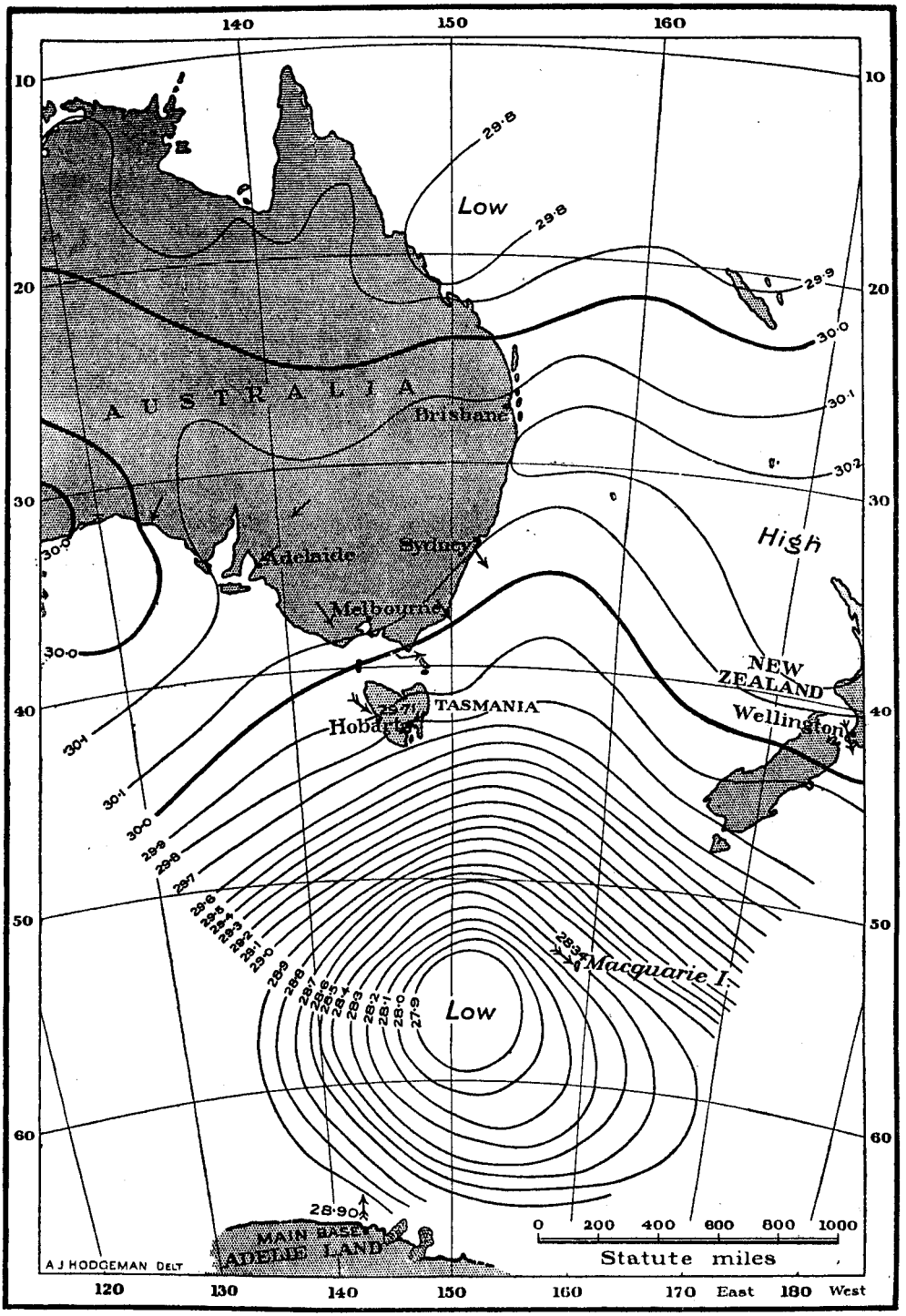
successfully from Russian stout. The experiments were continued, and all available information was gathered from cookery books and the Encyclopædia. Russian stout, barley wine, apple rings, sugar, flour and mould from potatoes were used in several mixtures and eventually fermentation was started. Bread-making was the next difficulty, and various instructions were tried in succession. The method of "trial and error" was at last responsible for the first light spongy loaf, and then every night-watchman cultivated the art and baked for the ensuing day.

On April 8 the snow had gathered deeply everywhere and we had some exercise on skis. Several of the morainic areas were no longer visible, and it was possible to run between the rocks for a considerable distance. A fresh breeze came up during the afternoon and provided a splendid impetus for some good slides. During the short calm, twenty-six seals landed on the harbour-ice.

On the morning of the same day Mary gave birth to five pups in the Transit House. The place was full of cracks, through which snow and wind were always driving, and so we were not surprised when four of them were found to have died. The survivor was named "Hoyle" (a cognomen for our old friend Hurley) and his doings gave us a new fund of entertainment.

The other dogs had been penned in the veranda and in tolerable weather were brought outside to be fed. Carrying an axe, Madigan usually went down to the boat harbour, followed by the expectant pack, to where there were several seal carcases. These lay immovably frozen to the ice, and were cut about and hacked so that the meat in section reminded one of the grain of a log of red gum, and it was certainly quite as hard. When Madigan commenced to chop, the dogs would range themselves on the lee side and "field" the flying chips.

On April 16 the last penguin was seen on a ledge overhanging an icy cove to the east. Apparently its moulting time had not expired, but it was certainly a very miserable



THE METEOROLOGICAL CHART FOR APRIL 12, 1913, COMPILED BY THE COMMONWEALTH METEOROLOGICAL BUREAU

Mr. Hunt appends the following explanation:

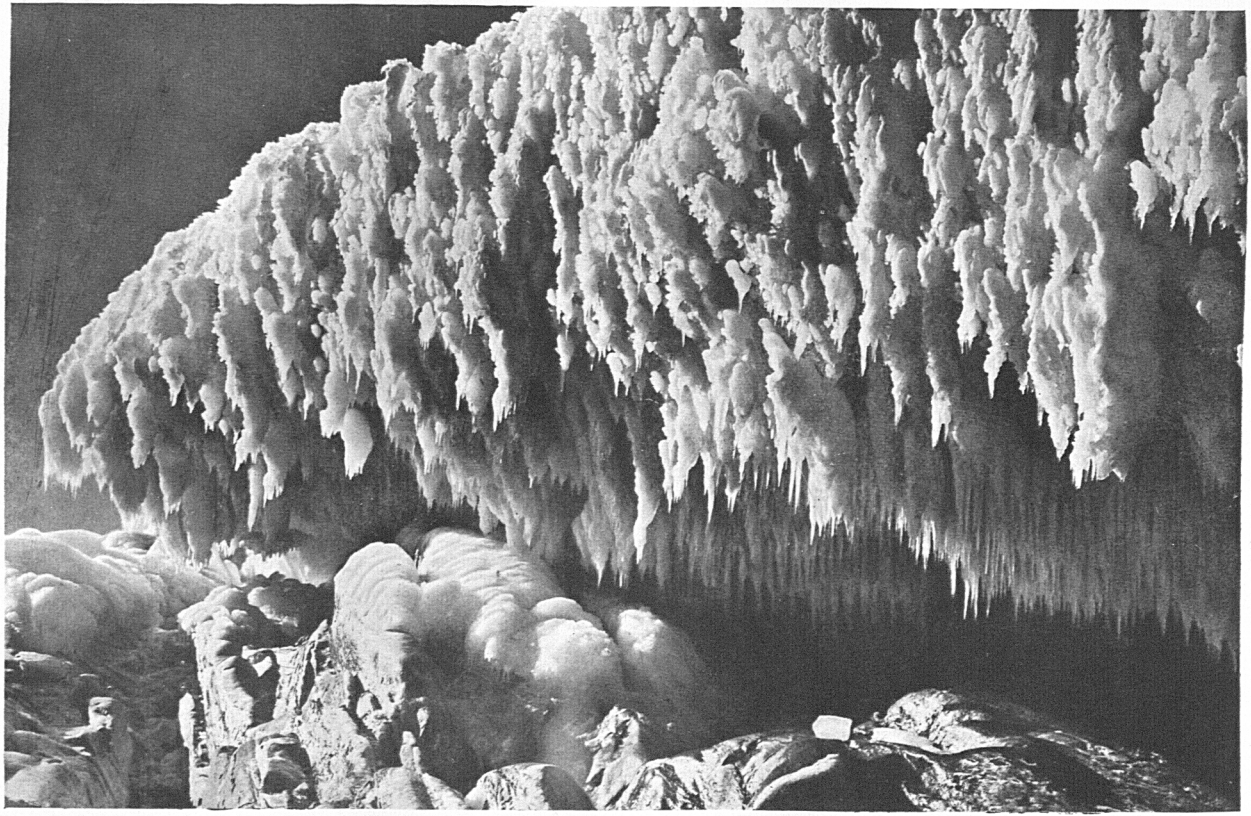
"A very intense cyclone passing south of Macquarie Island, where the barometer fell on the 11th from 29·49 at 9 A.M. to 29·13 at 6 P.M., and the next day to 28·34 at 9 A.M. and 27·91 at 6 P.M. At Adelie Land the barometer was not greatly affected, but rose in sympathy with the passage of the 'low' from 28·70 to 28·90 during the twenty-four hours. The influence of this cyclone was very wide and probably embraced both Adelie Land and Tasmania."

bird, smothered in small icicles and snow and partly exposed to a sixty-five mile wind with the temperature close to −10° F. Petrels were often seen flying along the foreshores and no wind appeared to daunt them. It was certainly a remarkable thing to witness a snow-petrel, small, light and fragile, making headway over the sea in the face of an eighty-mile hurricane, fluttering down through the spindrift to pick up a morsel of food which it had detected. Close to the western cliffs there was a trail of brash-ice where many birds were often observed feeding on Euphausia (crustaceans) in weather when it scarcely seemed possible for any living creature to be abroad.

Throughout April news by wireless came in slowly and spasmodically, and Jeffryes was becoming resigned to the eccentricities of the place. As an example of the unfavourable conditions which sometimes prevailed: on April 14 the wind was steady, in the nineties, with light drift and, at times, the aurora would illumine the north-west sky. Still, during " quiet " intervals, two messages came through and were acknowledged.

A coded weather report, which had priority over all other messages, was sent out each night, and it is surprising how often Jeffryes managed to transmit this important intelligence. On evenings when receiving was an impossibility, owing to a continual stream of St. Elmo's fire, the three code words for the barometric reading, the velocity and direction of the wind were signalled repeatedly and, on the following night, perhaps, Macquarie Island would acknowledge them. Of course we had to use new signs for the higher wind velocities, as no provision had been made for them in our meteorological code-book. The reports from Macquarie Island and Adelie Land were communicated to Mr. Hunt of the Commonwealth Weather Bureau and to Mr. Bates of the Dominion Meteorological Office, who plotted them out for their daily weather forecasts.

It was very gratifying to learn that the Macquarie Island party to a man had consented to remain at their



Adelie Land A WONDERFUL CANOPY OF ICE *Hurley*

lonely post and from Ainsworth, their leader, I received a brief report of the work which had been accomplished by each member. We all could appreciate the sacrifice they were making. Then, too, an account was received of the great sledging efforts which had been made by Wild and his men to the west. But it was not till the end of the year that their adventurous story was related to us in detail.

On the 23rd Lassie, one of the dogs, was badly wounded in a fight and had to be shot. Quarrels amongst the dogs had to be quelled immediately, otherwise they would probably mean the death of some unfortunate animal which happened to be thrown down amongst the pack. Whenever a dog was down, it was the way of these brutes to attack him irrespective of whether they were friends or foes.

Among our dogs there were several groups whose members always consorted together. Thus, George and Lassie were friends and, when the latter was killed, George, who was naturally a miserable, downtrodden creature, became a kind of pariah, morose and solitary and at war with all except Peary and Fix, with whom he and Lassie had been associated in fights against the rest. The other dogs lived together in some kind of harmony, Jack and Amundsen standing out as particular chums, while the "pups," as we called them—D'Urville, Ross and Wilkes ("Monkey")—were a trio born in Adelie Land and, therefore, comrades in misfortune. Hoyle, as a pup, was treated benevolently by all the others, and entered the fellowship of the other three when he grew up. Among the rest, Mikkel stood out as a good fighter, Colonel as the biggest dog and ringleader against the Peary-Fix faction, Fram as a nervous intractable animal, and Mary as the sole representative of the sex.

It was remarkable that Peary, Fix and George in their hatred of the others, who were penned up in the dog shelter during bad weather, would absent themselves for days on a snow ramp near the Magnetograph House, where they were

partly protected from the wind by rocks. George, from being a mere associate of Peary and Fix, became more amiable as the year went by, and at times it was quite pathetic to see his attempts at friendliness.

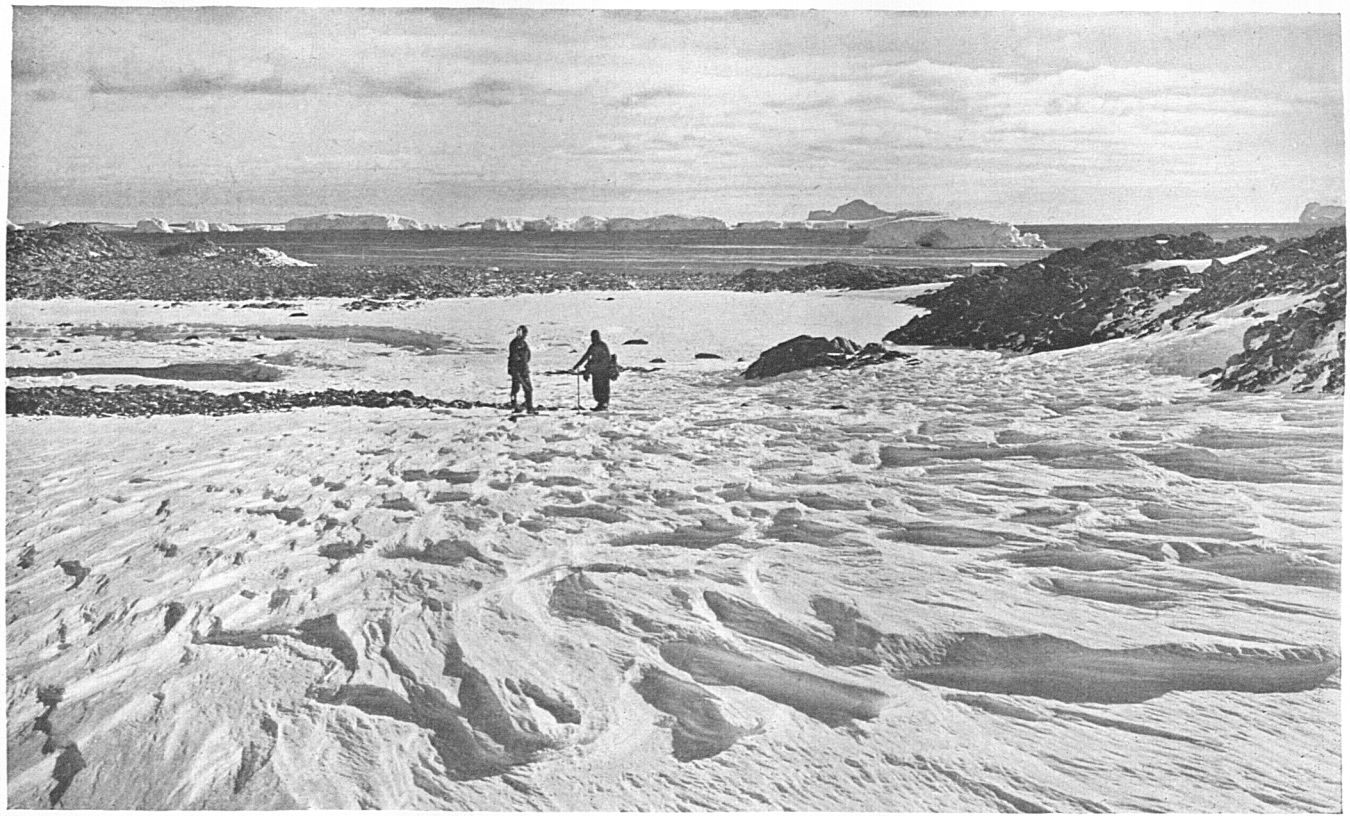
We became very fond of the dogs despite their habit of howling at night and their wolfish ferocity. They always gave one a welcome, in drift or sunshine, and though ruled by the law of force, they had a few domestic traits to make them civilized.

May was a dreaded month because it had been the period of worst wind and drift during 1912. On this occasion the wind velocities over four weeks were not so high and constant, though the snowfall was just as persistent. On the 17th and 18th, however, there was an unexpected "jump" to the nineties. The average over the first twenty-four hours was eighty-three, and on the 18th it attained 93·7 miles per hour. One terrific rise between 6.30 and 7.30 on the night of the 17th was shown as one hundred and three miles on the anemometer—the record up to that time.

Madigan was thrown over and had a hard fall on his arm, smashing a bottle of the special ink which was used for the anemograph pen. Bage related how he had sailed across the Magnetic Flat by sitting down and raising his arms in the air. He was accompanied by Fix, Peary and George, who were blown along the slippery surface for yards. McLean had a "lively time" cutting ice and bringing in the big blocks. Often he would slide away with a large piece, and "pull up" on a snow patch twenty yards to leeward.

On the 22nd there were hours of gusts which came down like thunderbolts, making us apprehensive for the safety of the wireless masts; we had grown to trust the stabilty of the Hut. Every one who went outside came back with a few experiences. Jeffryes was roughly handled through not wearing crampons, and several cases of kerosene, firmly stacked on the break-wind, were dislodged and thrown several yards.

Empire Day was celebrated in Adelie Land with a



Adelie Land SASTRUGI SCULPTURED BY THE INCESSANT BLIZZARDS *Hurley*

small display. At 2.30 P.M. the Union Jack was hoisted to the topmast and three cheers were given for the King. The wind blew at fifty miles an hour with light drift; temperature – 3° F. Empire greetings were sent to the Colonial Secretary, London, and to Mr Fisher, Prime Minister of Australia. These were warmly reciprocated a few days afterwards.

Preceded by a day of whirlies on the 7th and random gusts on the same evening, the wind made a determined attack next morning and carried away the top and part of the middle section of the main wireless mast. It was a very unexpected event, lulled as we were into security by the fact that May, the worst month, had passed. On examination it was found that two of the topmast wire stays had chafed through, whilst another had parted. At first it seemed a hopeless task to re-erect the mast, but gradually ways and means were discussed, and we waited for the first calm day to put the theories into execution.

Meanwhile, it was suggested that if a heavy kite were made and induced to fly in the continuous winds, the aerial thus provided would be sufficient to receive wireless messages. To this end, Bage and Bickerton set to work, and the first invention was a Venesta-box kite which was tried in a steady seventy-mile wind. Despite its weight,—at least ten pounds —*the kite rose immediately, steadied by guys on either side,* and then suddenly descended with a crash on to the glacier ice. After the third fall the kite was too battered to be of any further use. Another device, in which an empty carbide tin was employed, and still another, making use of an old propeller, shared the same fate.

On the evening of the 19th a perfect coloured corona, three degrees in diameter, was observed encircling the moon in a sky which lit up at intervals with dancing auroral curtains. Coronæ or "glories," which closely invest the luminary, are due to diffraction owing to immense numbers of very minute water or ice particles floating in the air between the observer and the source of light. The larger

the particles the smaller the corona, so that by a measurement of the diameter of a corona the size of the particles can be calculated. Earlier in the year, a double corona had been seen when the moon was shining through cirro-cumulus clouds. Haloes, on the other hand, are wide circles (or arcs of circles) in the sky surrounding the sun or moon, and arising from light-refraction in myriads of tiny ice-crystals suspended in the atmosphere. They were very commonly noted in Adelie Land where the conditions were so ideal for their production.

Midwinter's Day 1913! we had reached a turning-point in the season. The Astronomer Royal told us that at eight o'clock on June 22 the sun commenced to return, and every one took note of the fact. The sky was overcast, the air surcharged with drifting snow, and the wind was forty miles an hour—a representative day as far as the climate was concerned. The cook made a special effort and the menu bore the following foreword:

> Now is the winter of our discontent
> Made glorious summer. . . .

On July 6 the wind moderated, and we set about repairing once more the fortunes of the "wireless." The shattered topmast used to sway about in the heavy winds, threatening to bring down the rest of the mast. Bickerton, therefore, climbed up with a saw and cut it almost through above the doubling. All hands then pulled hard, and the upper part cracked off; the lower section being easily removed from the cross-trees. The mast now looked "shipshape" and ready for future improvements.

It was decided to use as a topmast the mast which had been formerly employed to support the northern half of the aerial. So on the 29th this was lowered and removed to the veranda to be fitted for erection.

Almost a fortnight now elapsed, during which the weather was "impossible." In fact, the wind was frightful throughout the whole month of July, surpassing all its previous records and wearing out our much-tried patience. All that

Adelie Land THE TERMINAL MORAINE NEAR THE HUT, CAPE DENISON *Hurley*

one could do was to work on and try grimly to ignore it. On July 2 we noted: "Thick as a wall outside with an eighty-five miler." And so it commenced and continued for a day, subsiding slowly through the seventies to the fifties and then suddenly redoubling in strength, rose to a climax about midnight on the 5th—one hundred and sixteen miles an hour! For eight hours it maintained an average of one hundred and seven miles an hour, and the timbers of the Hut seemed to be jarred and wrenched as the wind throbbed in its mightier gusts. These were the highest wind-velocities recorded during our two years' residence in Adelie Land and are probably the highest sustained velocities ever reported from a meteorological station.

With the exception of a few Antarctic and snow petrels flying over the sea on the calmer days, no life had been seen round the Hut during June. So it was with some surprise that we sighted a Weddell seal on July 9 attempting to land on the harbour-ice in a seventy-five-mile wind. Several times it clambered over the edge and on turning broadside to the wind was actually tumbled back into the water. Eventually it struggled into the lee of some icy hummocks, but only remained there for a few minutes, deciding that the water was much warmer.

On the 11th there was an exceptionally low barometer at 27·794 inches. At the same time the wind ran riot once more—two hundred and ninety-eight miles in three hours. The highest barometric reading was recorded on September 3, 30·4 inches, and the comparison indicates a wide range for a station at sea-level.

To show how quickly conditions would change, it was almost calm next morning, and all hands were in readiness to advance the wireless mast another stage. Previously there had been three masts, one high one in three lengths, and two smaller ones of one length each, between which the aerial stretched; the "lead-in" wires being connected to the middle of the aerial. This is known as an "umbrella aerial." Since we were without one short mast it was resolved to erect a

" directive " Γ-shaped aerial. The mainmast was to be in two instead of three lengths, and we wondered if the aerial would be high enough. In any case, it was so calm early on the 11th that we ventured to erect the topmast and had hauled it half-way, when the wind swooped down from the plateau, and there was just time to make fast the stays and the hauling rope and to leave things " snug " for the next spell of bad weather.

In eight days another opportunity came, and this time the topmast was hoisted, wedged and securely stayed. Bickerton had fixed a long bolt through the middle of the topmast and just above it three additional wire stays were to be placed. Another fine day and we reckoned to finish the work.

From July 26 onwards the sky was cloudless for a week, and each day the northern sun would rise a fraction of a degree higher. The wind was very constant and of high velocity.

It was a grand sight to witness the sea in a hurricane on a driftless, clear day. Crouched under a rock on Azimuth Hill, and looking across to the west along the curving brink of the cliffs, one could watch the water close inshore blacken under the lash of the wind, whiten into foam farther off, and then disappear into the hurrying clouds of spray and sea-smoke. Over the Mackellar Islets and the " Pianoforte Berg " columns of spray would shoot up like geysers, and fly away in the mad race to the north.

Early in July Jeffryes became ill, and for some weeks his symptoms were such as to give every one much anxiety. His work on the wireless had been assiduous at all times, and there is no doubt that the continual and acute strain of sending and receiving messages under unprecedented conditions was such that he eventually had a " nervous breakdown." Unfortunately the weather was so atrocious, and the conditions under which we were placed so peculiarly difficult, that nothing could be done to brighten his prospects.

McLean considered that as the spring returned and it became possible to take more exercise outside, the nervous exhaustion would pass off. In the meantime Jeffryes took a complete rest, and slowly improved as the months went by, and our hopes of relief came nearer. It was a great misfortune for our comrade, especially as it was his first experience of such a climate, and he had applied himself to work with enthusiasm and perhaps in an over-conscientious spirit.

July concluded its stormy career with the astonishing wind-average of 63·6 miles an hour. We were all relieved to see Friday, August 1, appear on the modest calendar, which it was the particular pleasure of each night-watchman to change. More light filtered day by day through the ice on the kitchen window, midwinter lay behind, and we were ready to hail the first signs of returning spring.

CHAPTER XXIV

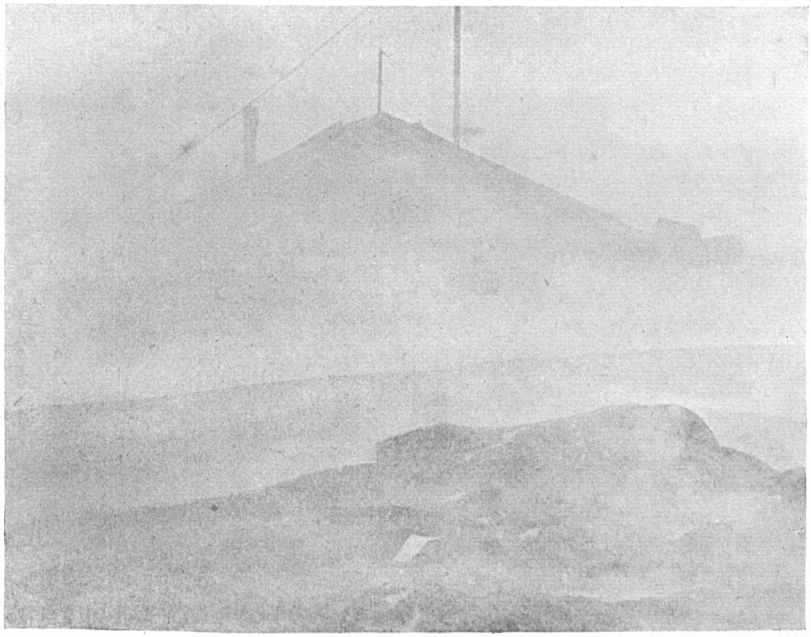
NEARING THE END

> Seven men from all the world, back to town again,
> Seven men from out of hell. . . .
>
> KIPLING

IT is wonderful how quickly the weeks seemed to pass. Situated as we were, Time became quite an object of study to us and its imperceptible drift was almost a reality, considering that each day was another step towards liberty—freedom from the tyranny of the wind. In a sense, the endless surge of the blizzard was a slow form of torture, and the subtle effect it had on the mind was measurable in the delight with which one greeted a calm, fine morning, or noted some insignificant fact which bespoke the approach of a milder season. Thus in August, although the weather was colder, there were the merest signs of thawing along the edges of the snow packed against the rocky faces which looked towards the sun; Weddell seals came back to the land, and the petrels would at times appear in large flocks; all of which are very commonplace events which any one might have expected, but at the time they had more than their face value.

August 5 was undoubtedly a great day from our very provincial point of view. On the 4th there had been a dense drift, during which the Hut was buttressed round with soft snow which rose above the eaves and half filled the entrance-veranda. The only way in which the night-watchman could keep the hourly observations was to dig his way out frequently with a shovel. In the early morning hours of the 5th the wind abated and veered right round

Adelie Land DISAPPEARING IN THE DRIFT *Hurley*



Adelie Land THE HUT LOOMING THROUGH THE DRIFT *Hurley*

from south through east to north-east, from which quarter it remained as a fresh breeze with falling snow. By 7 A.M. the air was still, and outside there was a dead world of whiteness; flocculent heaps of down rolling up to where glimpses of rock streaked black near the skyline of the ridges, striated masses of livid cloud overhead, and to the horizon the dark berg-strewn sea, over which the snow birds fluttered.

We did not linger over the scenery, but set to work to hoist to the head of the mainmast the aerial, which had been hurriedly put together. The job occupied till lunch-time, and then a jury-mast was fixed to the southern supporting mast, and by dusk the aerial hung in position. Bickerton was the leading spirit in the work and subsequently steadied the mainmast with eighteen wire stays, in the determination to make it stable enough to weather the worst hurricane. The attempt was so successful that in an ordinary fifty-mile "blow" the mast vibrated slightly, and in higher winds exhibited the smallest degree of movement.

At eight o'clock that night, Jeffryes, who felt so benefited by his rest that he was eager to commence operating once more, had soon "attuned" his instrument to Macquarie Island, and in a few minutes communication was re-established.

We learned from the Governor-General, Lord Denman, that her Majesty the Queen was "graciously pleased to consent to the name 'Queen Mary Land' being given to newly discovered land." The message referred to the tract of Antarctic coast which had been discovered and mapped by Wild and his party to the west.

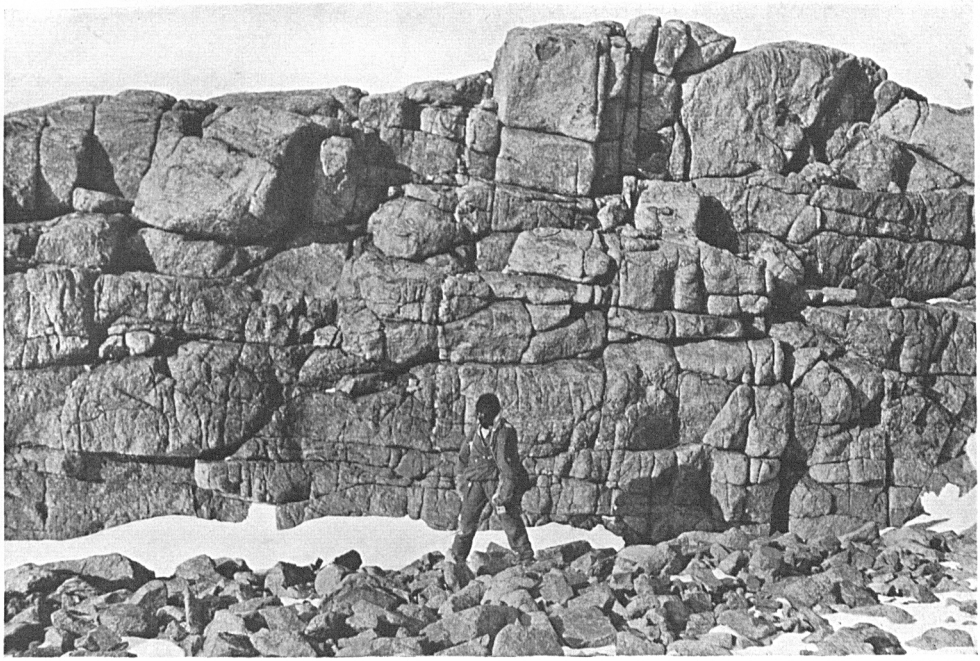
On August 6 Macquarie Island signalled that they had run short of provisions. The message was rather a paradox: "Food done, but otherwise all right." However, on August 11, we were reassured to hear that the *Tutanekai*, a New Zealand Government steamer, had been commissioned to relieve the party, and that Sawyer through ill-health had been obliged to return to Australia. A sealing-ship,

the *Rachel Cohen*, after battling for almost the whole month of July against gales, in an endeavour to reach the island, with stores for our party and the sealers, had returned damaged to port.

Marvellous to relate we had two calm days in succession, and on the 6th the snow lay so deeply round the Hut that progression without skis was a laborious flounder. The dogs plunged about in great glee, rolling in the snow and "playing off" their surplus energy after being penned for a long spell in the shelter.

On skis one could push up the first slopes of the glacier for a long distance. Soft snow had settled two feet thick even on the steep icy downfalls. The sea to the north was frozen into large cakes between which ran a network of dark water "leads." With glasses we could make out in the near distance five seals and two tall solitary figures which were doubtless Emperor penguins. During the whole day nimbus clouds had hung heavily from the sky, and snow had fallen in grains and star-like crystals. Gradually the nimbus lightened, a rift appeared overhead, and the edges of the billowy cumulus were burnished in the light of the low sun. The sea-horizon came sharply into sight through fading mist. Bergs and islands, from being ghostly images, rose into sharp-featured reality. The masts and Hut, with a dark riband of smoke floating from the chimney, lay just below, and two of the men were walking out to the harbour-ice where a seal had just landed, while round them scampered the dogs in high spirits. That was sufficient to set us sliding downhill, ploughing deep furrows through the soft drift and reaching the Hut in quick time.

During August we were able to do more work outside, thus enlarging our sphere of interest. Bage, who had been busy up till August 8 with his daily magnetograph records, ran short of bromide papers and now had to be contented with taking "quick runs" at intervals, especially when the aurora was active. His astronomical observations had been very disappointing owing to the continuous wind and



Adelie Land A WALL OF SOLID GNEISS NEAR WINTER QUARTERS *Hurley*

Adelie Land AN ERRATIC ON THE MORAINE. CAPE DENISON *Hurley*

drift. Still, in September, which was marked by periods of fine weather, a few good star observations were possible. Shafts were sunk in the sea-ice and up on the glacier, just above the zone where the ice was loaded with stones and debris—the lower moraine. The glacier shaft was dug to a depth of twenty-four feet, and several erratics were met with embedded in the ice. In this particular part the crystalline structure of the ice resembled that of a gneiss, showing that it had flowed under pressure. I was able to make measurements of ablation on the glacier, to take observations of the temperature and salinity of the sea-water, and to estimate the forward movement of the seaward cliffs of the ice-cap.

Geological collecting now became quite a popular diversion. With a slight smattering of "gneiss," "felspar," "weathered limestone," "garnets," and "glacial markings" the amateurs went off and made many finds on the moraines, and the specimens were cached in heaps, to be later brought home by the dogs, some of which were receiving their first lessons in sledge-pulling.

Rather belated, but none the less welcome, our midwinter wireless greetings arrived on August 17 from many friends who could only imagine how much they were appreciated, and from various members of the Expedition who had spent the previous year in Adelie Land and who knew the meaning of an Antarctic winter. A few evenings later, Macquarie Islanders had their reward in the arrival of the *Tutanekai* from New Zealand with supplies of food, and, piecing together a few fragments of evidence "dropped in the ether," we judged that they were having a night of revelry.

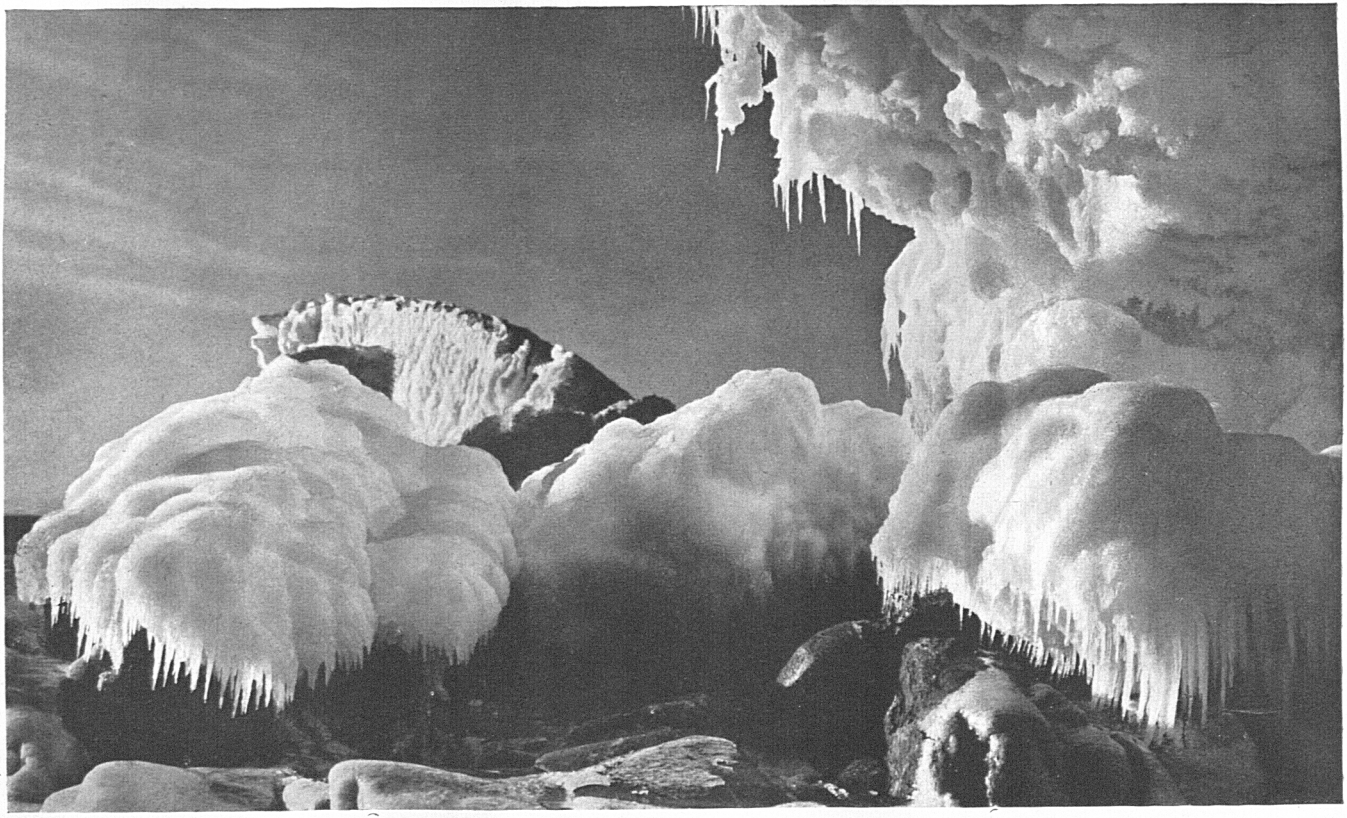
The wind was in a fierce humour on the morning of August 16, mounting to one hundred and five miles per hour between 9 and 10 A.M., and carrying with it a very dense drift.

We were now in a position to sit down and generalize about the wind. It is a tiresome thing to have it as the recurring insistent theme of our story, but to have had it as

the continual obstacle to our activity, the opposing barrier to the simplest task, was even more tedious.

A river, rather a torrent, of air rushes from the hinterland northward year after year, replenished from a source which never fails. We had reason to believe that it was local in character, as apparently a gulf of open water about one hundred miles in width—the D'Urville Sea—exists to the north of Adelie Land. Thus, far back in the interior—back to the South Geographical Pole itself—across one thousand six hundred miles of lofty plateau—is a zone of high barometric pressure, while to the north lies the D'Urville Sea and beyond it the Southern Ocean—a zone of low pressure. As if through a contracted outlet, thereby increasing the velocity of the flow, the wind sweeps down over Adelie Land to equalize the great air-pressure system. And so, in winter, the chilling of the plateau leads to the development of a higher barometric pressure and, as the open water to the north persists, to higher winds. In summer the suns shines on the Pole for six months, the uplands of the continent are warmed and the northern zone of low pressure pushes southward. So, in Adelie Land, short spells of calm weather may be expected over a period of barely three months around the summer solstice. This explanation is intentionally popular. The meteorological problem is one which can only be fully discussed when all the manifold observations have been gathered together, from other contemporary Antarctic expeditions, from our two stations on the Antarctic continent, and from Macquarie Island; all taken in conjunction with weather conditions around Australia and New Zealand. Then, when all the evidence is arrayed and compared, some general truths of particular value to science and, maybe, to commerce, should emerge.

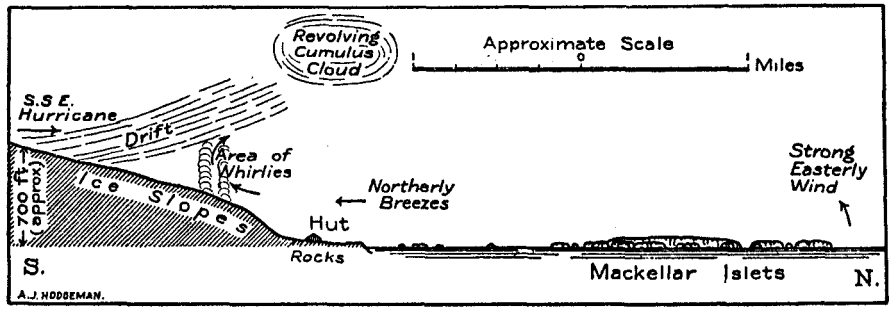
Of one thing we were certain, and that was that Adelie Land was the windiest place in the world. To state the fact more accurately: such wind-velocities as prevail at sea-level in Adelie Land are known in other parts of the world only at great elevations in the atmosphere. The



Adelie Land FROZEN SPRAY BUILT UP BY THE BLIZZARDS ALONG THE SHORE *Hurley*

average wind-velocity for our first year proved to be approximately fifty miles per hour. The bare figures convey more when they are compared with the following average annual wind-velocities quoted from a book of reference: Europe, 10·3 miles per hour; United States, 9·5 miles per hour; Southern Asia, 6·5 miles per hour; West Indies, 6·2 miles per hour.

Reference has already been made to the fact that often the high winds ceased abruptly for a short interval. Many times during 1913 we had opportunities of judging this phenomenon and, as an example, may be quoted September 6.



A DIAGRAMMATIC SKETCH ILLUSTRATING THE METEOROLOGICAL CONDITIONS AT THE MAIN BASE, NOON, SEPTEMBER 6, 1913

On that day a south-by-east hurricane fell off and the drift cleared suddenly from about the Hut at 11.20 A.M. On the hills to the south there was a dense grey wall of flying snow. Whirlies tracked about at intervals and overhead a fine cumulus cloud formed, revolving rapidly. Over the recently frozen sea there was an easterly breeze, while about the Hut itself there were light northerly airs. Later in the day the zone of southern wind and drift crept down and once more overwhelmed us. Evidently the " eye " of a cyclonic storm had passed over.

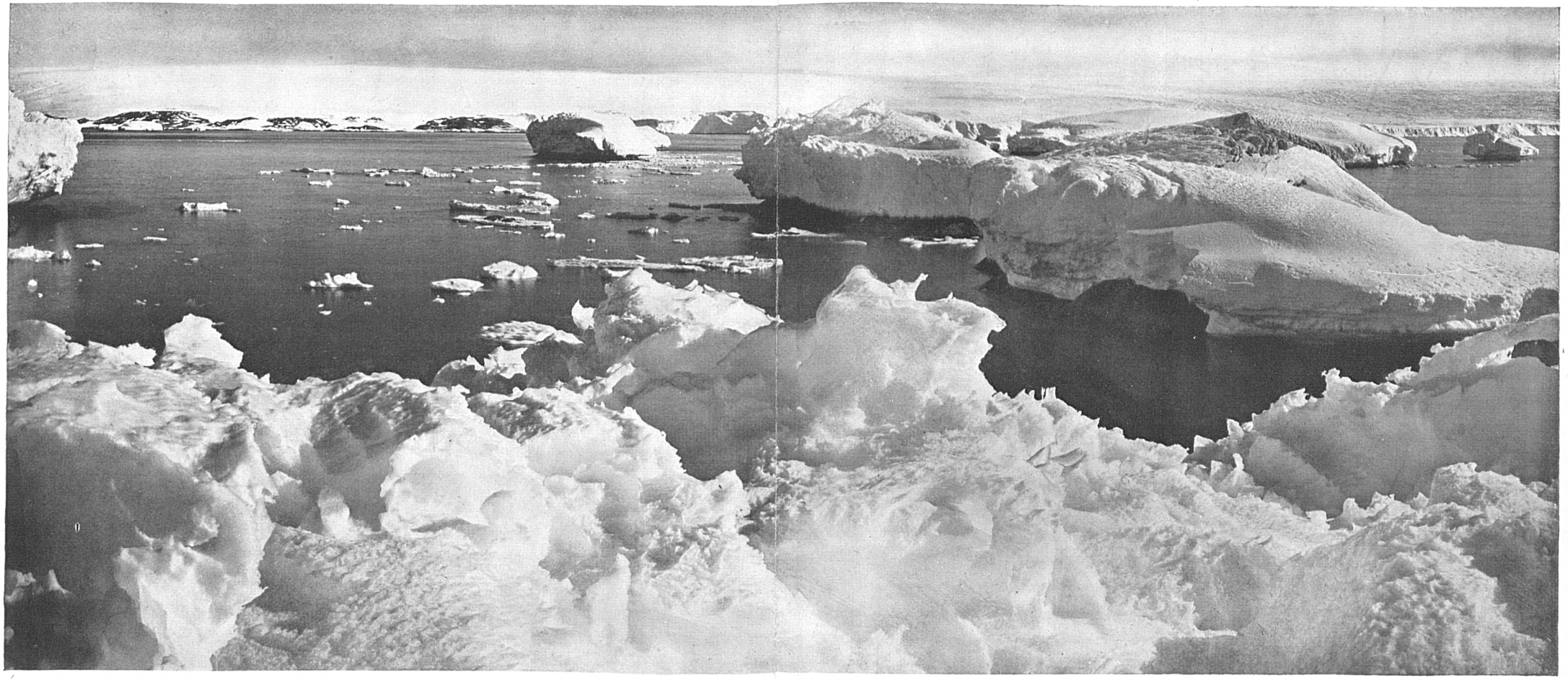
During September the sea was frozen over for more than two weeks, and the meteorological conditions varied from their normal phase. It appeared as if we were situated on the battlefield, so to speak, of opposing forces. The pacific influence of the " north " would hold sway for a few hours,

a whole day, or even for a few days. Then the vast energies of the " south " would rise to bursting-point and a " through blizzard " would be the result.

On September 11, although there was a wind of seventy miles per hour, the sea-ice which had become very solid during a few days of low temperature was not dispersed. Next day we found it possible to walk in safety to the Mackellar Islets. On the way rushes of southerly wind accompanied by a misty drift followed behind us. Then a calm intervened, and the sun momentarily appeared and shone warmly. Suddenly from the north-west came breezy puffs which settled into a light wind as we went north. On the way home we could not see the mainland for clouds of drift, and, when approaching the mouth of the boat-harbour, these clouds were observed to roll down the lower slopes of the glacier and, reaching the shore, rise into the air in columns. They then sailed away northward at a higher altitude, almost obscuring the sun with a fine fog. On the same night the "south" had gained the mastery, and the wind blew with its accustomed strength.

Again, on September 24, McLean had a unique experience. He was digging ice in a fifty-mile wind with moderate drift close to the Hut and, on finishing his work, walked down to the harbour-ice to see if there were any birds about. He was suddenly surprised to leave the wind and drift behind and to walk out into an area of calm. The water lapped alongside the ice-foot, blue in the brilliant sunlight. Away to the west a few miles distant a fierce wind was blowing snow like fine spume over the brink of the cliffs. Towards the north-west one could plainly see the junction between calm water and foam-crested waves. To the south the drift drove off the hills, passed the Hut, and then gyrated upwards and thinned away seawards at an altitude of several hundred feet.

The wind average for September was 36·8 miles per hour, as against 53·7 for September of the previous year. There were nine " pleasant " days, that is, days on which it was



Adelie Land A VIEW OF THE MAINLAND FROM THE MACKELLAR ISLETS: ICE-CAPPED ISLETS IN THE FOREGROUND: THE ROCK VISIBLE ON THE MAINLAND IS CAPE DENISON *Hurley*

possible to walk about outside and enjoy oneself. On the 27th there was a very severe blizzard. The wind was from the south-east: the first occasion on which it had blown from any direction but south-by-east at a high velocity. The drift was extremely dense, the roof of the Hut being invisible at a distance of six feet. Enormous ramps of snow formed in the vicinity, burying most of the cases and the air-tractor sledge completely. The anemograph screen was blown over and smashed beyond all repair. So said the Meteorological Notes in the October number of the *Adelïe Blizzard.*

Speaking of temperature in general, it was found that the mean-temperature for the first year was just above zero; a very low temperature for a station situated near the Circle. The continual flow of cold air from the elevated interior of the continent accounts for this. If Adelie Land were a region of calms or of northerly winds, the average temperature would be very much higher. On the other hand, the temperature at sea-level was never depressed below −28° F., though with a high wind we found that uncomfortable enough, even in burberrys. During the spring sledging in 1912 the lowest temperature recorded was −35° F. and it was hard to keep warm in sleeping-bags. The wind made all the difference to one's resistance.

There was an unusually heavy snowfall during 1913. When the air was heavily charged with moisture, as in mid-summer, the falls would consist of small (sago) or larger (tapioca) rounded pellets. Occasionally one would see beautiful complicated patterns in the form of hexagonal flakes. When low temperatures were the rule, small, plain, hexagonal stars or spicules fell. Often throughout a single snowfall many types would be precipitated. Thus, in September, in one instance, the fall commenced with fluffy balls and then passed to tapioca snow, sago snow, six-rayed stars and spicules.

Wireless communication was still maintained, though September was found to be such a "disturbed" month—

possibly owing to the brilliant auroræ—that not a great many messages were exchanged. Jeffryes was not in the best of health, so that Bickerton took over the operating work. Though at first signals could only be received slowly, Bickerton gradually improved with practice and was able to "keep up his end" until November 20, when daylight became continuous. One great advantage, which by itself justified the existence of the wireless plant, was the fact that time-signals were successfully received from Melbourne Observatory by way of Macquarie Island, and Bage was thus able to improve on his earlier determinations and to establish a fundamental longitude.

During this same happy month of September, whose first day marked the event of "One hundred days to the coming of the Ship" there was a great revival in biological work. Hodgeman made several varieties of bag-traps which were lowered over the edge of the harbour-ice, and many large "worms" and crustaceans were caught and preserved.

On September 14 Bickerton started to construct a hand-dredge, which was ready for use by the next evening. It was a lovely, cloudless day on the 16th and the sea-ice, after more than two weeks, still spread to the north in a firm, unbroken sheet. We went out on skis to reconnoitre, and found that the nearest "lead" was too far away to make dredging a safe proposition. So we were contented to kill a seal and bring it home before lunch, continuing to sink the ice-shaft above the moraine for the rest of the day.

The wind rose to the "seventies" on September 17, and the sea-ice was scattered to the north. On the 19th—a fine day—there were many detached pieces of floe which drifted in with a northerly breeze, and on one of these, floating in an ice-girt cove to the west, a sea-leopard was observed sunning himself. He was a big, vicious-looking brute, and we determined to secure him if possible. The first thing was to dispatch him before he escaped from the floe. This Madigan did in three shots from a Winchester rifle.

A WILSON PETREL ON THE NEST, MACKELLAR ISLETS *Hurley*

A long steel-shod sledge was then dragged from the Hut and used to bridge the interval between the ice-foot and the floe. After the specimen had been flayed, the skin and a good supply of dogs' meat were hauled across and sledged home. On the 30th another sea-leopard came swimming in near the harbour's entrance, apparently on the look-out for seals or penguins. Including the one seen during 1912, only three of these animals were observed during our two years' sojourn in Adelie Land.

Dredgings in depths up to five fathoms were done inside the boat harbour and just off its entrance on five separate occasions between September 22 and the end of the month. Many "worms," crustaceans, pteropods, asteroids, gastropods and hydroids were obtained, and McLean and I had many interesting hours classifying the specimens. The former preserved and labelled them, establishing a small laboratory in the loft above the "dining-room." The only disadvantage of this arrangement was that various "foreign bodies" would occasionally come tumbling through the interspaces between the flooring boards of the loft while a meal was in progress.

Some Antarctic petrels were shot and examined for external and internal parasites. Fish were caught in two traps made by Hodgeman and myself in October, but unfortunately the larger of the two was lost during a blizzard. However, on October 11 a haul of fifty-two fish was made with hand-lines off the boat harbour, and we had a pleasant change in the menu for dinner. They were of the type known as Notothenia, to which reference has already been made.

By October 13, when a stray silver-grey petrel appeared, every one was on the qui vive for the coming of the penguins. In 1912 they had arrived on October 12, and as there was much floating ice on the northern horizon, we wondered if their migration to land had been impeded.

The winds were very high for the ensuing two days, and on the 17th the horizon was clearer and more "water sky"

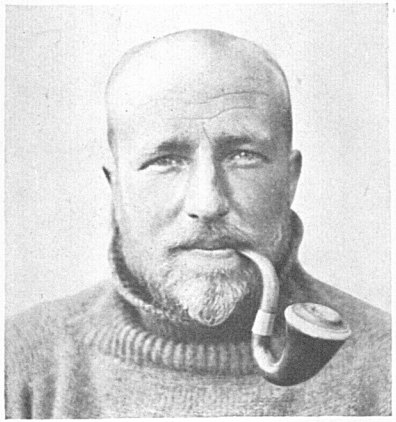
was visible. Before lunch on that day there was not a living thing along the steep, overhanging ice-foot, but by the late afternoon thirteen birds had effected a landing, and those who were not resting after their long swim were hopping about making a survey of the nearest rookeries. One always has a " soft spot " for these game little creatures —there is something irresistibly human about them—and, situated as we were, the wind seemed of little account now that the foreshores were to be populated by the penguins—our harbingers of summer and the good times to be. Three days later, at the call of the season, a skua gull came flapping over the Hut.

It was rather a singular circumstance that on the evening of the 17th, coincident with the disappearance of the ice on the horizon, wireless signals suddenly came through very strongly in the twilight at 9.30 P.M., and for many succeeding nights continued at the same intensity. On the other hand, during September, when the sea was either firmly frozen or strewn thickly with floe-ice, communication was very fitful and uncertain. The fact is therefore suggested that wireless waves are for some reason more readily transmitted across a surface of water than across ice.

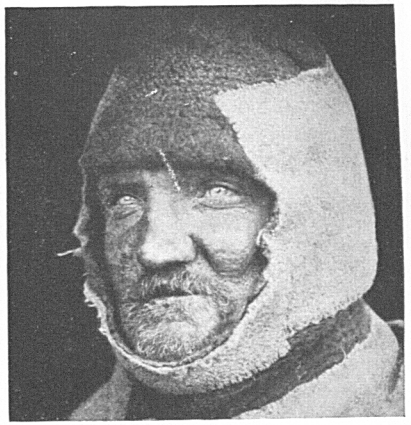
The weather during the rest of October and for the first weeks of November took on a phase of heavy snowfalls which we knew were inevitable before summer could be really established. The winds were very often in the " eighties " and every four or five days a calm might be expected.

The penguins had a tempestuous time building their nests, and resuming once more the quaint routine of their rookery life. In the hurricanes they usually ceased work and crouched behind rocks until the worst was over. A great number of birds were observed to have small wounds on the body which had bled and discoloured their feathers. In one case a penguin had escaped, presumably from a sea-leopard, with several serious wounds, and had staggered up to a rookery, dying there from loss of blood. Almost imme-

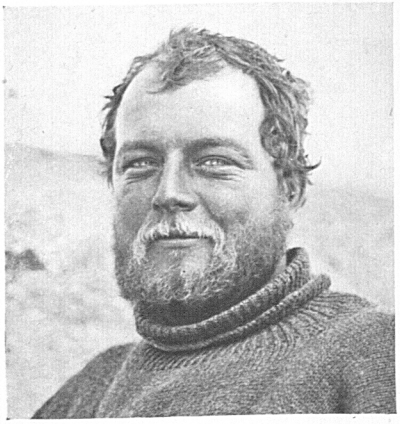
CORRELL



BAGE

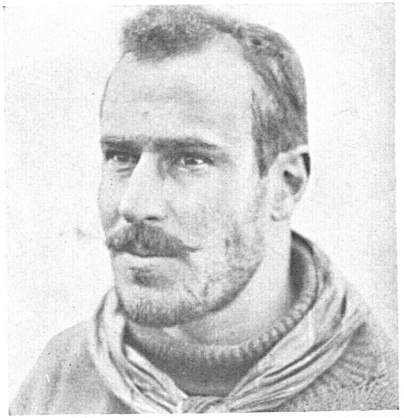


McLEAN



HODGEMAN

HUNTER



BICKERTON *Hurley*

diately the frozen carcase was mutilated and torn by skua gulls.

On October 31 the good news was received that the *Aurora* would leave Australia on November 15. There were a great number of things to be packed, including the lathe, the motor and dynamos, the air-tractor engine, the wireless " set," and magnetic and meteorological instruments. Outside the Hut, many cases of kerosene and provisions, which might be required for the Ship, had been buried to a depth of twelve feet in places during the south-east hurricane in September. So we set to work in great spirits to prepare for the future.

McLean was busy collecting biological specimens, managing to secure a large number of parasites from penguins, skua gulls, giant petrels, snow petrels, Wilson petrels, seals and an Emperor penguin, which came up on the harbour-ice. On several beautiful days, with a sea-breeze wafting in from the north, large purple and brown jelly-fish came floating to the ice-foot. Many were caught in a hand-net and preserved in formalin. In his shooting excursions McLean happened on a small rocky ravine to the east where, hovering among nests of snow and Wilson petrels, a small bluish-grey bird,* not unlike Prion Banksii, was discovered. Four specimens were shot, and, later, several old nests were found containing the unhatched eggs of previous years.

On the highest point of Azimuth Hill, overlooking the sea, a Memorial Cross was raised to our two lost comrades.

A calm evening in November! At ten o'clock a natural picture in shining colours is painted on the canvas of sea and sky. The northern dome is a blush of rose deepening to a warm terra-cotta along the horizon, and the water reflects it upward to the gaze. Tiny Wilson petrels flit by like swallows; seals shove their dark forms above the placid surface; the shore is lined with penguins squatting

* On arrival in Australia this bird proved to be new to science.

in grotesque repose. The south is pallid with light—the circling sun. Adelie Land is at peace!

For some time Madigan, Hodgeman and I had been prepared to set out on a short sledging journey to visit Mount Murchison and to recover if possible the instruments cached by the Eastern Coastal and the Southern Parties. It was not until November 23 that the weather "broke" definitely, and we started up the old glacier "trail" assisted by a good team of dogs.

Aladdin's Cave was much the same as we had left it in the previous February, except that a fine crop of delicate ice-crystals had formed on its walls. We carried with us a small home-made wireless receiving set, and arrangements were made with Bickerton and Bage to call at certain hours. As an "aerial" a couple of lengths of copper wire were run out on the surface of the ice. At the first "call" Madigan heard the signals strongly and distinctly, but beyond five and a half miles nothing more was received.

Resuming the journey on the following day, we made a direct course for Madigan Nunatak and then steered south-east for Mount Murchison, pitching camp at its summit on the night of November 28.

On the 29th Madigan and Hodgeman made a descent into the valley, on whose southern side rose Aurora Peak. The former slid away on skis and had a fine run to the bottom, while Hodgeman followed on the sledge drawn by Monkey and D'Urville, braking with an ice-axe driven into the snow between the cross-bars. Their object was to find the depot of instruments and rocks which the Eastern Coastal Party were forced to abandon when fifty-three miles from home. They were unsuccessful in the search, as an enormous amount of snow had fallen on the old surface during the interval of almost a year. Indeed, on the knoll crowning Mount Murchison, where a ten-foot flagpole had been left, snow had accumulated so that less than a foot of the top of the pole was showing. Nine feet of hard compressed

Adelie Land THE *AURORA* LYING AT ANCHOR, COMMONWEALTH BAY. IN THE DISTANCE THE ICE SLOPES OF THE MAINLAND ARE VISIBLE RISING TO A HEIGHT OF 2000 FEET. IN THE FOREGROUND IS A STRIKING FORMATION ORIGINATING BY THE FREEZING OF SPRAY DASHED UP BY THE HURRICANE WIND *Hurley*

snow scarcely marked by one's footsteps—the contribution of one year! To such a high isolated spot drift-snow would not reach, so that the annual snowfall must greatly exceed the residuum found by us, for the effect of the prevailing winds would be to reduce it greatly.

On the third day after leaving Mount Murchison for the Southern Party's depot, sixty-seven miles south of Winter Quarters, driving snow commenced, and a blizzard kept us in camp for seven days. When the drift at last moderated we were forced to make direct for the Hut, as the time when the Ship was expected to arrive had passed.

Descending the long blue slopes of the glacier just before midnight on December 12, we became aware of a faint black bar on the seaward horizon. Soon a black speck had moved to the windward side of the bar—and it could be nothing but the smoke of the *Aurora*. The moment of which we had dreamt for months had assuredly come. The Ship was in sight!

There were wild cheers down at the Hut when they heard the news. They could not believe us and immediately rushed up with glasses to the nearest ridge to get the evidence of their own senses. The masts, the funnel and the staunch hull rose out of the ocean as we watched on the hills through the early hours of a superb morning. The sun was streaming warmly over the plateau and a cool land breeze had sprung up from the south, as the *Aurora* rounded the Mackellar Islets and steamed up to her old anchorage. We picked out familiar figures on the bridge and poop, and made a bonfire of kerosene, benzine and lubricating oil in a rocky crevice in their honour.

The indescribable moment was when Davis came ashore in the whale-boat, manned by two of the Macquarie Islanders (Hamilton and Blake), Hurley and Hunter. They rushed into the Hut, and we tried to tell the story of a year in a few minutes.

On the Ship we greeted Gillies, Gray, de la Motte, Ainsworth, Sandell and Correll. It was splendid to know

that the world contained so many people, and to see these men who had stuck to the Expedition through " thick and thin." Then came the fusillade of letters, magazines and " mysterious " parcels and boxes. At dinner we sat down reunited in the freshly painted ward-room, striving to collect our bewildered thoughts at the sight of a white tablecloth, Australian mutton, fresh vegetables, fruit and cigars.

The two long years were over—for the moment they were to be effaced in the glorious present. We were to live in a land where drift and wind were unknown, where rain fell in mild, refreshing showers, where the sky was blue for long weeks, and where the memories of the past were to fade into a dream—a nightmare ?

TUSSOCK SLOPES AND MISTY HIGHLANDS
Macquarie Island

THE SHACK AND ITS VICINITY
Macquarie Island. Paget colour photo by Correll

CHAPTER XXV

LIFE ON MACQUARIE ISLAND

By G. F. AINSWORTH

LEFT on an island in mid-ocean! It suggests the romances of youthful days—Crusoe, Sindbad and all their glorious company. Still, when this narrative is completed, imagination will be seen to have played a small part. In fact, it is a plain tale of our experiences, descriptive of a place where we spent nearly two years and of the work accomplished during our stay.

The island was discovered in 1810 by Captain Hasselborough of the ship *Perseverance*, which had been dispatched by Campbell and Sons, of Sydney, under his command to look for islands inhabited by fur seals. Macquarie Islands, named by Hasselborough after the Governor of New South Wales, were found to be swarming with these valuable animals, and for two years after their discovery was made known, many vessels visited the place, landing gangs of men to procure skins and returning at frequent intervals to carry the proceeds of their labours to the markets of the world.

The slaughter of the seals was so great that the animals were almost exterminated within a few years. One ship is known to have left Macquarie Island with a cargo of 35,000 skins during the first year of operations. High prices were obtained for them in London and China, and many American, British and Sydney firms were engaged in the enterprise.

The value of a skin is determined by the condition of the fur, which is often damaged by the animals fighting amongst themselves. Furthermore, at a certain season of the year, the seals moult, and if taken within a certain time of this natural process, the skin is almost valueless. These facts were ignored by the sealers, who killed without discrimination.

Again, both male and female, old and young were ruthlessly slaughtered, with the obvious result—the extermination of the species. If supervision had been exercised and restrictions imposed, there is no doubt that the island would still have been used by the fur seal as a breeding-ground. During our stay none were seen, but Mr. Bauer, who acts as sealing herdsman and who had visited the island in that capacity each summer for eleven years, stated that he had seen odd ones at infrequent intervals.

Associated as the island has been since the year 1812 with sealing and oil ventures, it follows that a history has been gradually developed; somewhat traditional, though many occurrences to which we shall refer are well authenticated.

It might be supposed from the foregoing, that a good deal is known about the place, but such is not the case, except in a general sense. Several scientific men from New Zealand, recognizing the importance of the island as a link between Australasia and Antarctica, visited it at different times within the past twenty years, only remaining long enough to make a cursory examination of the eastern side. They had to depend on the courtesy of the sealing ships' captains for a passage, and the stormy conditions which are ever prevalent made their stay too brief for any exhaustive work.

A Russian Antarctic expedition, under Bellingshausen's command, called there in 1821 and stayed for two days, collecting a few bird and animal specimens. They referred to the island as being "half-cooled down," in a short but interesting account of their visit, and remarked upon the large number of sea-elephants lying on the shores.

In 1840 the ship *Peacock*, one of the exploring vessels of the American Expedition under Wilkes, landed several men after much difficulty on the south-west end of the island, but they remained only a few hours, returning to their ship after securing some specimens of birds. Expressing astonishment at the " myriads of birds," they remarked, " Macquarie Islands offer no inducement for a visit, and as far as our examination showed, have no suitable place for landing with a boat."

The next call of an Antarctic expedition was made by Captain Scott in the *Discovery* in November 1901. He, with several naturalists, landed on the eastern side to collect specimens, but remained only a few hours. He refers to the penguins, kelp-weed and tussock-grass ; certainly three characteristic features.

Captain Davis, during his search for charted sub-antarctic islands, when connected with Sir Ernest Shackleton's expedition, called there in the *Nimrod* in 1909. He landed a party of men who secured several sea-elephants and some penguins.

It will thus be seen that very little had been done which was scientifically important or generally interesting. Sealers came and went as a matter of business, and probably the arduous nature of their work and the rugged topography of the island combined to prevent the more curious from exploring far afield.

Captain Scott was desirous of establishing a base on Macquarie Island in 1910, but circumstances compelled him to abandon the idea. And so it came that we five men of Dr. Mawson's Expedition were landed on December 22, 1911, with a programme of work outlined by our leader. H. Hamilton was biologist, L. R. Blake surveyor and geologist, C. A. Sandell and A. J. Sawyer were wireless operators, the former being also a mechanic, and I was appointed meteorologist and leader of the party.

We stood on the beach in the dusk, watching the boat's party struggle back to the *Aurora*, which lay at anchor one

and a half miles from the north-west shore. Having received a soaking landing in the surf and being tired out with the exertions of the day, we started back to our temporary shelter. We had not gone very far when a mysterious sound, followed by a shaking of the earth, made us glance at each other and exclaim, "An earthquake!" The occurrence gave rise to a discussion which carried us to bed.

Seeing that we were to spend a long time on the island, the question of building a hut was the first consideration. Through the kindness of Mr. Bauer, who had just left the island in the s.s. *Toroa*, we were able to live for the time being in the sealers' hut.

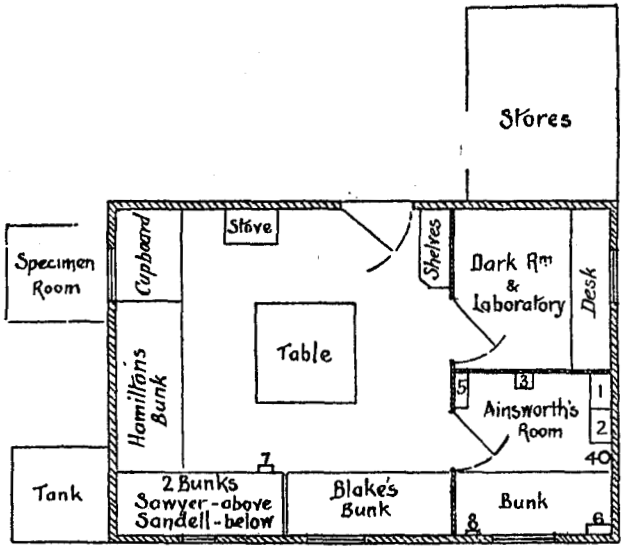
It was urgent to get the wireless station into working order as soon as possible. The masts and operating-hut had been erected during the stay of the *Aurora*, but there yet remained the building of the engine-hut and the installation of the machinery and instruments, as well as the construction and erection of the aerial. Accordingly we proceeded with the living-hut and the job on Wireless Hill at the same time, working on the hill most of the day and at the hut in the evening.

Wireless Hill rose to three hundred and fifty feet in height, and formed part of a peninsula running in a north-easterly direction from the main island. It had been chosen by Mr. Hannam of the Adelie Land party because of its open northerly aspect, and because "wireless" waves would probably have a good "set-off," southward to the Main Base in Antarctica.

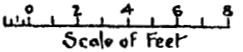
Just a few yards from the base of the hill on its south-western side was a huge rock, upon the easterly side of which we decided to build our dwelling. The timbers for the hut had been cut and fitted in Hobart, so all that remained for us was to put them together.

After working at high pressure until December 30, we were able to establish ourselves in a home. The doorway faced to the east, and the rock protected the small place

from the strong westerly weather which is invariable in these latitudes. The dimensions were twenty feet by thirteen feet, the front wall being nine feet six inches high, sloping to seven feet six inches at the back. All the timbers were of oregon and deal, and particular attention was paid to bracing and strengthening the building, which rested on piles just clear of the sandy surface. The inside was lined



Plan of Hut - Macquarie Island



and ceiled, and the roof of galvanized iron was set flush with the front wall, fascia boards along the front and sides being designed to keep the fine snow from blowing under the corrugations and lodging on the ceiling. "George V Villa" was fixed upon as the name, but the hut was never at any time referred to as the villa, and in future will always be known as the Shack.

Twelve live sheep had been landed, and these had been driven on to Wireless Hill so as to be accessible. We decided

to kill one for Christmas, so on December 24 Sandell and I, leaving the others at work on the Shack, started out.

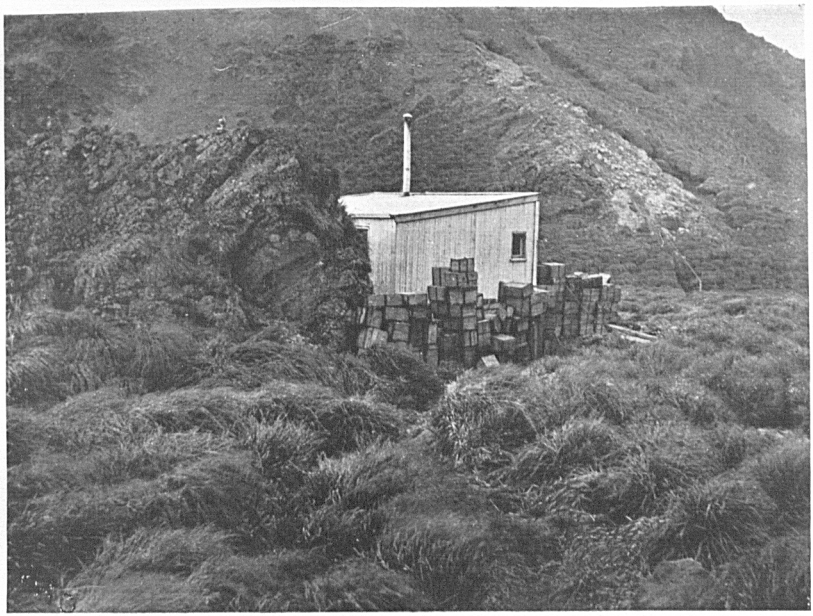
The hillsides are deeply ravined and the slopes covered with a dense growth of tussock, which renders progress uncertain and laborious. Our experience was a foretaste of many to come. We found the sheep huddled together in a deep gully on the eastern side, and drove them round to the front of the hill, where one was caught, killed and dressed.

Christmas Day dawned fine and sunny, and we decided to make some attempt at a dinner. Blake produced a plum pudding, and this, together with roast mutton and several kinds of vegetables, washed down with a little claret, constituted our first Christmas dinner.

The sealing schooner, *Clyde,* had been wrecked without loss of life on November 14, 1911, on the east coast, and was now lying on the beach nearly half a mile away. A two-hundred-gallon tank had been saved from the wreck and we managed on Christmas morning, after two hours of carrying and trundling, to place it at the end of the Shack. This was a valuable find, ensuring in the future a constant, convenient supply of rain water. Further, we made use of the timber of the wreck for building, and the broken pieces strewn about were stored up as firewood.

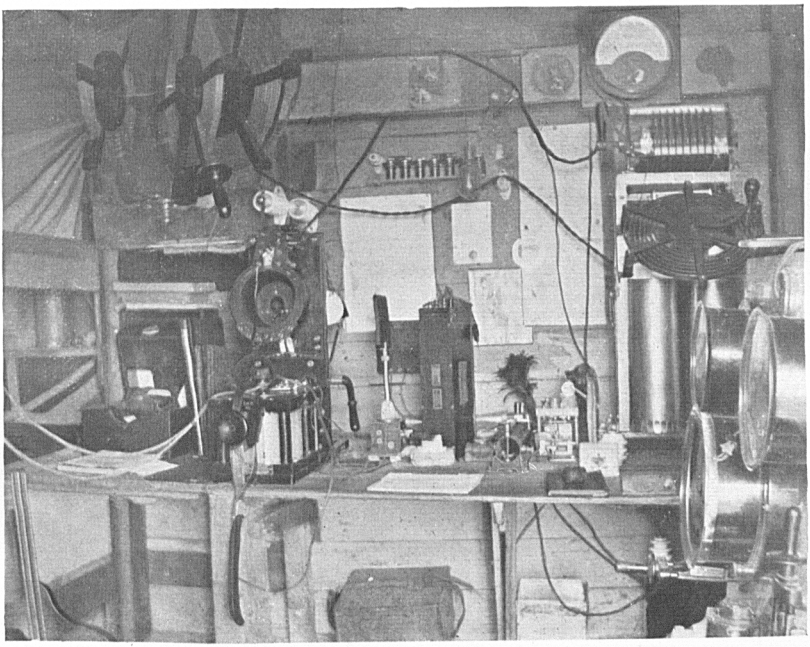
On the 26th we all went to the wireless station, and, as Sandell had the aerial made, we pulled it into position. In the afternoon I unpacked all my instruments and started them off so as to make sure that all were working correctly. I did not intend to record any observations till January 1, 1912, and therefore did not erect the meteorological screen until the 28th.

On moving into our abode domestic arrangements were made. With regard to cooking, each man took duty for a week, during which he was able to write up his work and to wash and mend clothes. To Hamilton and Sandell, who had had previous experience, frequent appeals were made as to methods of cooking various dishes, but by degrees each



Macquarie Island *Sandell*

THE SHACK: SHOWING THE NATURAL ROCKY PROTECTION ON THE WINDWARD SIDE



Macquarie Island *Sawyer*

THE INTERIOR OF THE OPERATING HUT ON WIRELESS HILL

one asserted his independence. There were several cookery books for reference and each week saw the appearance of some new pudding, in each instance prefaced by the boast: "This is going to be the best pudding ever turned out on the island!" The promise was not always made good.

We had a good deal of difficulty at first in making bread and several batches were very "heavy" failures. This difficulty, however, was soon overcome and, after the first few months, the cooking standard was high and well maintained. Our stove was very small and only two loaves of bread could be cooked at once. It frequently happened, therefore, that the others, which would go on rising in the tins, overflowed; a matter which could only be set right by experience.

On New Year's Day, 1912, we carried timber in relays from the wreck to the top of Wireless Hill, so that the building of the engine-hut could be started. The next few days were occupied in getting food-stuffs, medicines, stationery, clothing and other necessaries over to the Shack from the landing-place on the beach. Blake and Hamilton unpacked their instruments and appliances, fitting up a small laboratory and photographic dark-room in one corner of the hut.

Some kind Hobart friend had sent four fowls to me on the day of sailing, requesting me to take them to Macquarie island. They were housed in one of the meteorological screens, but on the third day from Hobart a heavy sea broke on board, upset the temporary fowl-house and crushed the rooster's head. The three hens were landed safely and appeared to be thoroughly reconciled to their strange surroundings, though the presence of so many large birds soaring about overhead had a terrifying effect on them for several days. They did not appear to pick up much food amongst the grass, but scratched away industriously all the same. I must say that they were very friendly and gave the place quite a homely aspect. One of them was

christened " Ma " on account of her maternal and somewhat fussy disposition.

On the first Sunday in the new year all except myself went along the coast towards West Point. The party reported immense numbers of sea-elephants, especially young ones. They also saw many wekas and three ducks, shooting nine of the former for the kitchen.

The wekas or Maori hens are small, flightless birds, averaging when full grown about two and three-quarter pounds. They were introduced twenty-five years ago by Mr. Elder, of New Zealand, a former lessee of the island, and multiplied so fast that they are now very numerous. They live among the tussocks, and subsist for the most part upon the larvæ of the kelp-fly, small fish and other marine life which they catch under the stones along the rocky shores at low tide. They are exceedingly inquisitive and pugnacious and may easily be caught by hand.

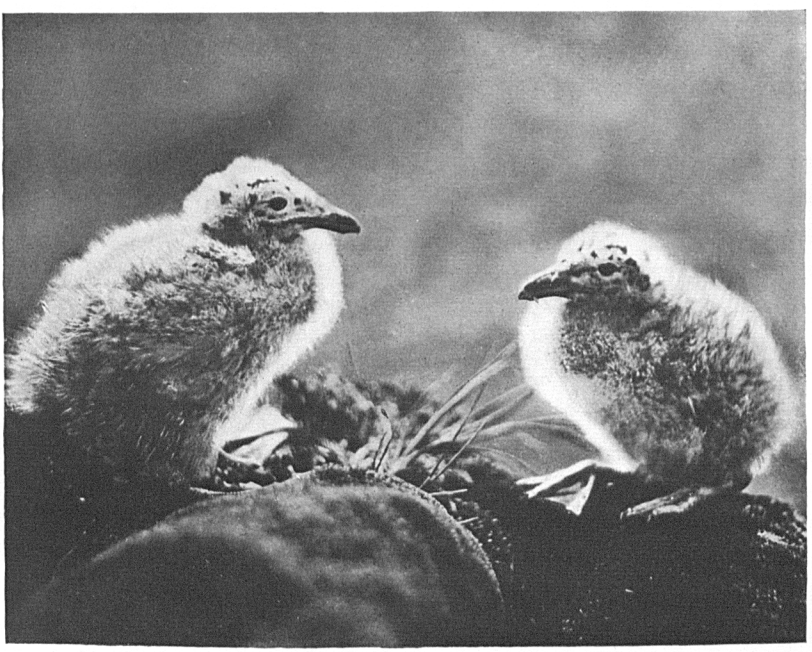
Usually, when disturbed, they will pop under a rock, and on being seized immediately commence to squeak. This is sufficient to bring every weka within a quarter of a mile hurrying to the spot, and, in a few minutes, heads may be seen poking out of the grass in every direction. The man holding the bird then crouches down, preferably just on the border of the tussock, holding the protesting bird in one hand. Soon there will be a rustle, then a rush, and another furious weka will attack the decoy. The newcomer is grabbed and, if the birds are plentiful, five or six of them may be taken in one spot.

Their call is peculiarly plaintive and wild and may be heard night and day. Though we saw and caught innumerable young ones of all sizes, we were never able to find the nests of these Maori hens.

A depot of stores had been laid by the *Aurora* at Caroline Cove, twenty miles from the Shack at the south end of the island, and it was deemed advisable to lay several more intermediate food-depots along the east coast.

The sealers had a motor-launch which they kindly

Macquarie Island WEKA PECKING ON THE BEACH *Mawson*



Macquarie Island CHICKS OF THE DOMINICAN GULL *Hamilton*

placed at our disposal, and a supply of stores was put on board for transport. At 8 A.M., January 9, Sandell, Blake, Sawyer and Hamilton started out accompanied by two sealers who offered to point out the positions of several old huts along the coast. These huts had been built by sealing gangs many years ago and were in a sad state of disrepair.

The first call was made at Sandy Bay, about five miles from the Shack. Stores were landed and placed in the hut, and the party proceeded to Lusitania Bay, eleven miles farther on, where they stayed for the night. At this place (named after an old sealing craft, the *Lusitania*) there were two huts, one being a work-hut and the other a living-hut. They had not been used for sixteen years and, as a result, were found to be much dilapidated. In the locality is a large King penguin rookery, the only one on the island, and two dozen eggs were obtained on this visit, some fresh and some otherwise.

As the next morning was squally, it was decided that the stores should be deposited in the hut at the south end; a distance of five miles across country. Through bog and tussock it took the party four hours to accomplish this journey. The hut was found in the same condition as the others and a rather miserable night was spent. A short distance from this spot is situated the largest penguin rookery on the island. On returning to the launch, the six men had a quick run of three hours back to the north end.

During the absence of the party I had been busy erecting a stand for the anemo-biagraph. Ordinarily, such an instrument is kept in a house, the upper section only being exposed through the roof. The Shack was in a position too sheltered for my purpose, so I built a place for the anemo-biagraph behind a low rock well out on the isthmus.

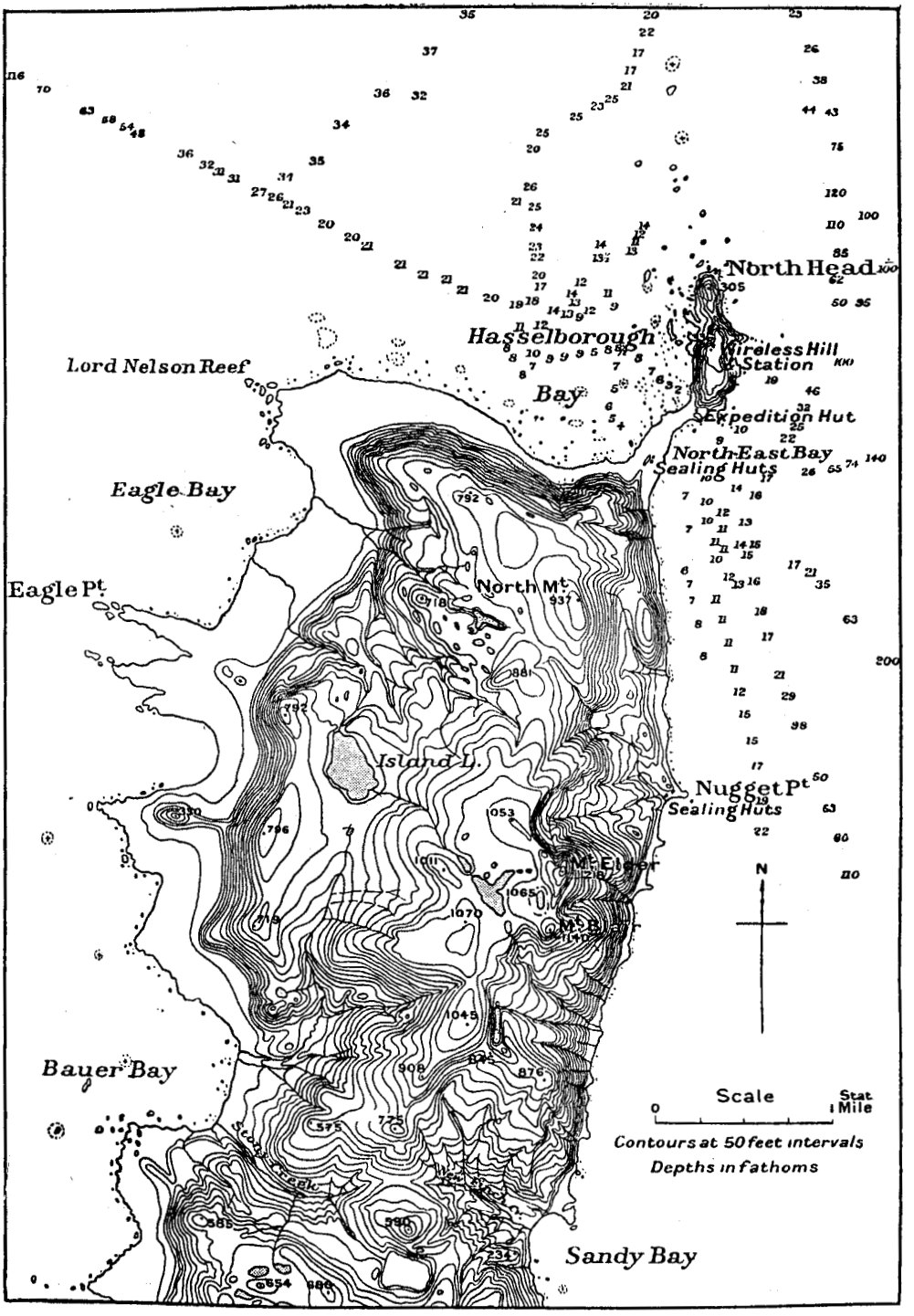
Sandell and Sawyer reported on the 16th that the wireless station was ready for testing. Therefore, on the following day, the three of us erected a small set on the farthest point of the peninsula—North Head. The set had been made in order to test the large station. Sawyer then returned

to the operating-hut and received signals sent from North Head by Sandell, who in return received Sawyer's signals, thus showing that so far everything was satisfactory. It was thought, after the tests, that the " earth " was not by any means good and Sawyer erected a counterpoise, which, however, failed to give anything like the " earth " results. More " earths " (connexions by wire with the ground) were now put in from day to day, and on the 27th Sawyer noted an improvement. Successful tests were again made on the 30th. The wireless men now expected communication with Australia.

Blake and Hamilton were soon making inroads, each on his own particular sphere of work. On the 17th a base-line was laid down on the plateau, and Blake was able to commence his survey of the island. He had already made some geological investigations in the vicinity of North Head and West Point, as well as for a short distance along the east coast. Hamilton had visited nearly all the penguin rookeries in the vicinity, and already had several fine specimens. Marine collecting occupied part of his time and plant life promised to provide an interesting field.

From the intermediate position that Macquarie Island occupies relative to Australasia and the Antarctic continent, it was highly important that its biology should be fully determined. Investigation of the marine and terrestrial fauna and flora shows several facts indicating the part this island has played in the supposed connexion of the great land masses of the southern hemispheres. It is an established fact that the flora of New Zealand has strong sub-antarctic and South American affinities and the problem is to account for this distribution. Many forms of plant and animal life are circumaustral, being found in all suitable sub-antarctic situations. To account for this fact two theories have been advanced, namely, the Relict theory (Dahl, Schenck and others) and the Antarctic theory.

The first theory supposes that the inhabitants of the sub-antarctic islands are the remnants of groups of animals



THE NORTH END OF MACQUARIE ISLAND

developed in some northern land-mass, and driven south by more highly developed forms. Again, that these sub-antarctic islands have always been separated from continents, and that the distribution of life on the former must have proceeded over wide stretches of sea.

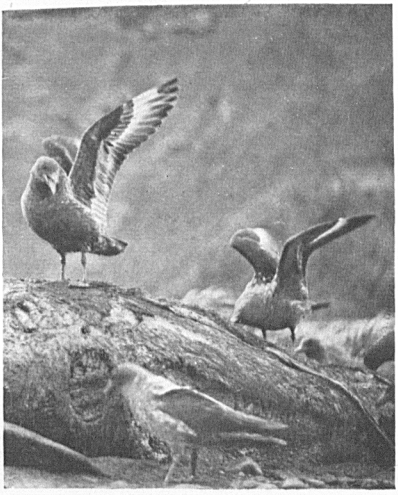
The Antarctic theory accounts for the distribution and similarity of sub-antarctic fauna and flora by establishing a connexion between the sub-antarctic islands and the Antarctic continent. At the same period, the Antarctic continent was assumed to be connected by land with South America, South Africa and Australia, and the similar life forms now found in these continents were driven northward by a subsequent colder period. This theory is strengthened by several facts, chief of which are, (1) the existence of an Antarctic continent, and (2) the comparatively shallow waters between it, South Africa, Australia and South America.

Whichever theory is adopted, it is evident that our scientific opportunities were unique.

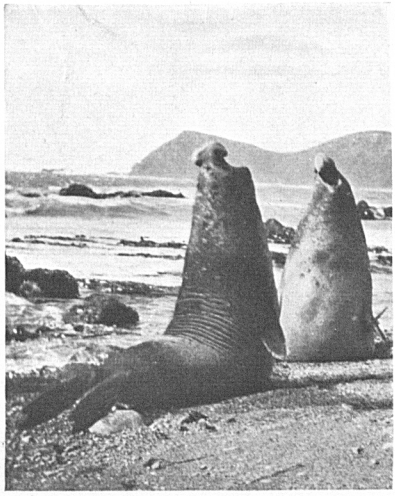
On the 28th, Sandell, Sawyer and I decided to climb on to the main ridge or plateau of the island. We had already discovered that the easiest way to get on to the hills was to follow up one of the many ravines or gullies which run down to the sea. This necessitates walking in water most of the way, but one soon gets accustomed to wet feet on Macquarie Island.

The slopes rise in a series of terraces which are generally soggy and covered with tussock (pleurophyllum) and with scattered cushions of Azorella. The summit of the ridge is a barren waste, over which loose rocks are scattered in every direction, while a wavy effect due to the action of wind is plainly visible over the surface of the ground. The steep, descending sides are very soft and sodden, supporting a scanty growth of vegetation, including the small burr known as the "biddy-bid."

Hundreds of tarns and lakes are visible along the plateau-like ridge which extends throughout the length of the island. Several of the lakes are half a mile long and very deep.



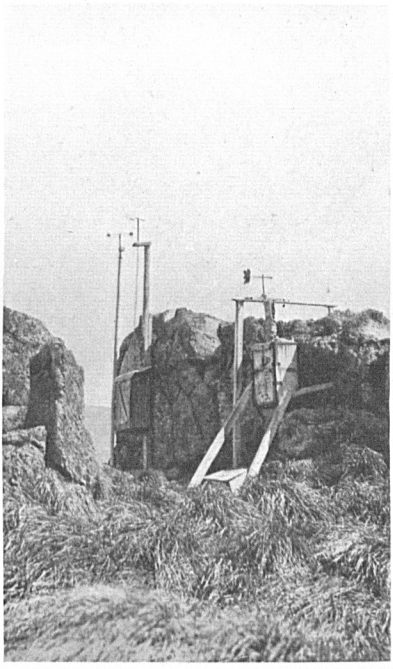
MACQUARIE ISLAND SKUAS FEEDING



BULL SEA ELEPHANTS FIGHTING *Hamilton*

Blake

THE THERMOMETER SCREEN,
MACQUARIE ISLAND



Blake

THE WIND-RECORDING INSTRUMENTS,
MACQUARIE ISLAND

The tarns are, for the most part, shallow with hard stony bottoms. The water is beautifully fresh and apparently contains no life.

Skua gulls were plentiful and washed themselves, with a great flapping of wings, in the shallow waters at the edge of the lakes. They paid particular attention to our dog "Mac," swooping down and attempting to strike her with their wings. A yelp at intervals came from Mac if they were successful, though the former, if she were quick enough, would spring at the bird and retaliate by getting a mouthful of feathers.

We eventually came out on to a point about seven hundred feet high, overlooking the west coast, and it could be seen that the space between the base of the hills and the ocean was occupied by a plain which sloped very gradually to the beach. Here and there across its surface were huge mounds of earth and rock and, occasionally, a small lakelet fringed with a dense growth of tussock and Maori cabbage.

A descent was made to explore the place. A fairly large volume of water flowed rapidly downward by several deep gullies and, coming to the terrace, cut narrow, sinuous channels which were soon lost to view in the tussocks. Examination of the watercourses revealed that this tract was simply a raised beach covered with sodden peat and carrying a rather coarse vegetation. The ground was decidedly springy and shook to our tread; moreover, one sank down over the ankles at each step. Occasionally a more insecure area was encountered, where one of us would go down to the thighs in the boggy ground.

As the shore approached we came to thick tussock and Maori cabbage, and the travelling became much rougher. A group of earthy mounds and rock was sighted some distance away and we decided to reach them and have our lunch. A nearer view showed us a large opening in one of these prominences and we scrambled up to examine it.

Inside there was a small cave, high in front but sloping sharply towards the back for a distance of thirty-five feet.

The roof and walls were blackened by smoke, and spikes and nails driven into crevices were evidences that the place had once been occupied. Eagle Cave it is called and its story was afterwards related to us.

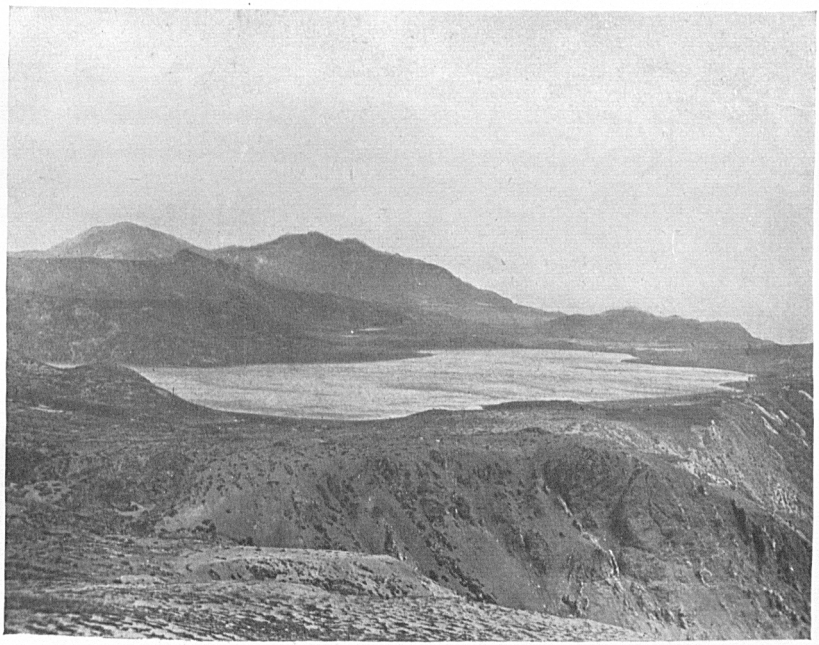
Between thirty and forty years ago the schooner *Eagle*, in attempting to make the island, had been caught in a gale and wrecked on the rock-bound western coast. As far as can be learned, there were nine men and a woman on board, all of whom were saved. They lived in this cave for almost two years, subsisting upon what they could catch. Decayed tussock grass, a foot in depth, now covers the floor, showing that some attempt had been made to improve the comfort of the place, while bones lying strewn about in all directions indicate that gulls, penguins and cormorants must have supplied a good deal of their food. It is presumed that some of them made a journey to North Head periodically to look out for relief, as a well-defined track to that point is still visible in places.

The tale, however, has its tragic side, for the woman died on the very day when the rescuing ship called at the island. She was buried on the isthmus, not far from our Shack. One would think that death was rather a relief from such an existence as this unfortunate woman must have endured, but, at the same time, it seems hard that she did not live to participate in the joy of deliverance.

We ate our lunch and had a smoke, after which we decided to walk homewards along " Feather Bed " terrace. A few minutes after leaving the cave, Sawyer and Sandell caught three young ducks, which they carried back, intending to rear them, but they died several days later. A weary tramp brought us, thoroughly tired, to the Shack, where Hamilton had an excellent meal awaiting us.

The weather during January was rather trying. Precipitation in the form of either rain, hail, sleet or snow occurred on twenty-six days, sometimes all forms being experienced on the same day. As a result, the supply of water was well maintained ; in fact, the amount caught exceeded the

"FEATHER BED" TERRACE NEAR EAGLE POINT, MACQUARIE ISLAND *Blake*



A GLACIAL LAKE (MAJOR LAKE) ON MACQUARIE ISLAND, 600 FEET ABOVE SEA-LEVEL *Blake*

consumption and we finished the month with the tank almost full. Gales were experienced on eight days, the maximum wind-force being forty-two miles an hour. The sky was mostly heavily clouded or absolutely overcast and on many days the sun was not seen. Fog hung about the hills almost continuously, and driving mist accompanied the northerly winds.

January 24 was a glorious day, calm and sunny, with a maximum temperature of 51·3° F. The habit of former days induced Sandell and myself to have a dip in the surf, but as the temperature of the water was about 42° F., we stayed in as many seconds. The mean temperature for the month was 44·9° F.; the minimum being 35·5° F.

My first view of the island when the *Aurora* arrived in December 1911 left rather an agreeable impression. The day of our approach was marked by fine calm weather and the dark-green tussock-clad hillsides were rather attractive. On the other hand, one was immediately struck with the entire absence of trees, the steep precipices, cliffs and the exceedingly rugged nature of the coastline.

Closer scrutiny shows that the tussock grass radiates closely from a semi-decayed mass of leaf-sheaths, with the blades of grass shooting upwards and outwards as high as three or four feet. Scattered through it are patches of Stilbocarpa polaris, locally known as Maori cabbage. It is of a more vivid green than the tussock and is edible, though somewhat stringy and insipid. Our sheep ate it readily, even nibbling the roots after the plant had been cropped down.

There were several Victoria penguin colonies round about the rocky faces of the hills in the vicinity of the Shack, and their hubbub and cackling uproar were something to remember. The rearing of the young appeared to be rather a busy process. The young ones look like bundles of down and seem to grow at a remarkable rate, while the attempt of the parent to shelter the usual two chicks is a very ludicrous thing to watch.

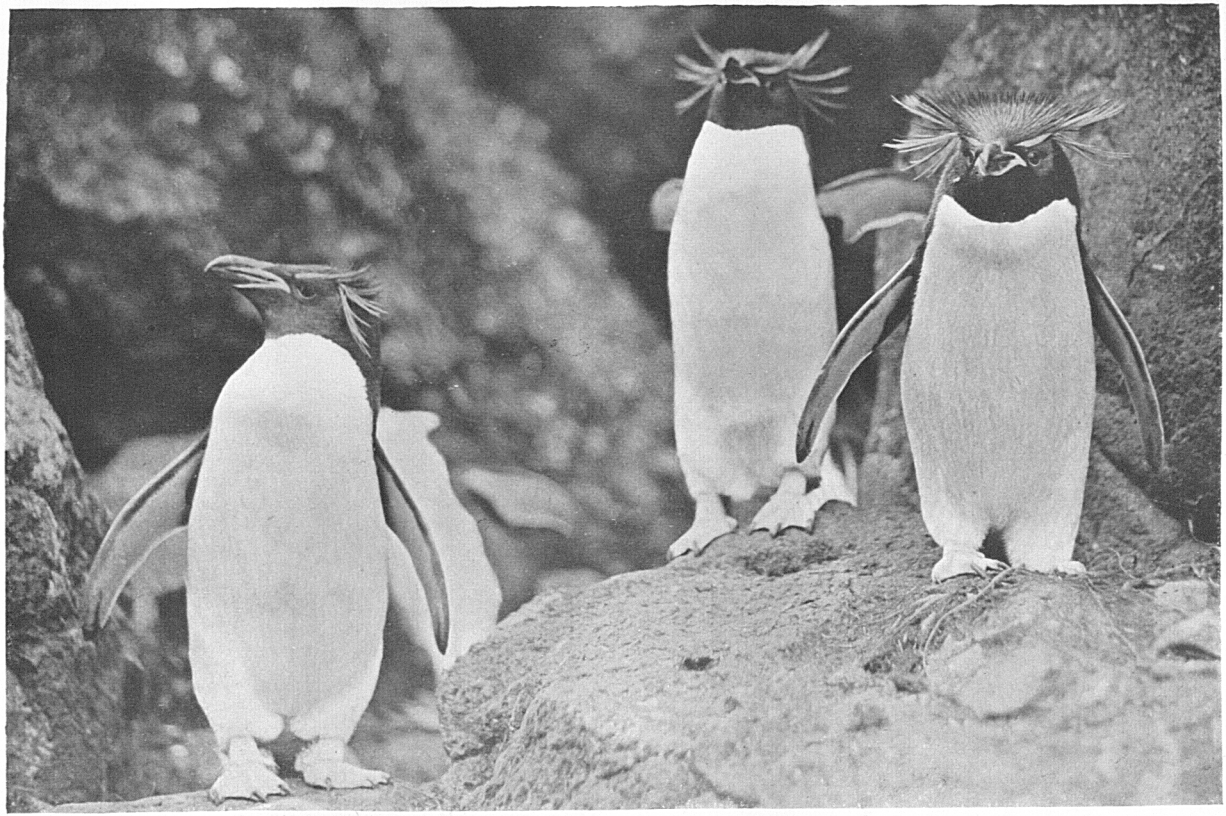
The material for the nest made by these birds seems to depend almost entirely on its immediate surroundings. The rookery is established on a broken rocky face close to the water's edge and the nests are made under rocks, in niches and passages, as well as amongst the tussock growing on the rocks. Those under the rocks are constructed of small stones and a few blades of grass, while those in the passages and fissures are usually depressions in soft mud. Amongst the tussock a hole is first made in the soft earth and then neatly lined with blades of grass.

The birds lay two or three eggs of a white or greenish-white colour, but I have never seen three chicks hatched. The eggs are edible, and we used many dozens of them during our stay.

The period of incubation is about five weeks, and male and female take turns at sitting. A young one is fed by placing its beak within that of the parent bird where the food—mainly crustaceans—is taken as it regurgitates from the stomach of the latter.

Although the smallest species on the island, the Victoria penguins are the most spiteful, and a scramble through the rookery invites many pecks and much disturbance. They have a black head and back, white breast and yellow crest, the feathers of which spread out laterally. During the moulting season they sit in the rookery or perched on surrounding rocks, living apparently on their fat, which is found to have disappeared when at last they take to the sea. They come and go with remarkable regularity, being first seen about the middle of October, and leaving during the first week of May. The same rookeries are occupied year after year, and the departure of the birds adds to the general desolation during the winter months.

Their destination on leaving the land is still a mystery. Although they are never seen, it is conjectured that they spend the winter at sea. Their natural enemy in the waters round Macquarie Island is the sea-leopard, and the stomachs of all specimens of this animal taken by us during the penguin season contained feathers.



Macquarie Island VICTORIA PENGUINS *Hamilton*

The presence of numerous bones just at the rear of the Shack pointed to the fact that here must have been at one time the site of a King penguin rookery. As many of our potatoes and onions were sprouting in the bags, I determined to dig a portion of this area and plant the most " progressive " of these vegetables. The sandy soil did not appear to contain much nutriment, but I thought that something might be gained by giving it a trial.

On the night of February 2, Sawyer reported that he had heard the Wellington wireless operator calling Suva station, but, as no further signals were heard from anywhere, he was inclined to the idea that it was the experience of a " freak night." In explanation of this term, I may say that it is used in reference to nights on which the atmospheric conditions are abnormally favourable for wireless work.

The news was particularly encouraging, and for the next few days we were on the tip-toe of expectation.

In the early morning of the 5th a howling gale sprang up and, increasing in force as the day wore on, rendered work impossible. A tremendous sea worked up, and the ocean for a distance of a mile from shore was simply a seething boil of foam. Huge waves dashed on shore, running yards beyond the usual marks, and threatening to sweep across the isthmus. Masses of tangled kelp, torn from the outlying rocks, washed backwards and forwards in the surf or were carried high up among the tussocks. The configuration of the shingly beach changed while one looked at it. The tops of the waves could be seen flying over Anchor Rock, seventy feet high, and spray was blowing right across the isthmus.

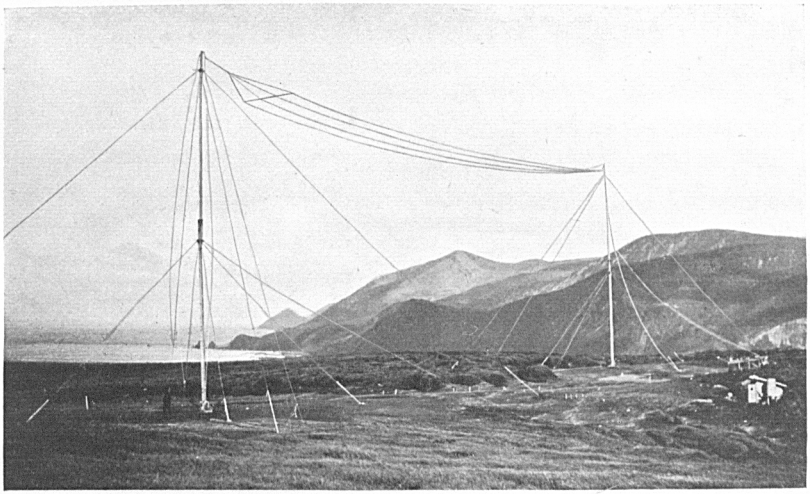
On the advice of the sealers we had shifted our stores farther back from the beach and it was just as well we did so, as the waves reached to within a few feet of the nearest box. Meanwhile I began to wonder how our benzine and lubricating oil were faring. Both had been stacked in cases among the tussock and rocks, well back from the waters of Aerial Cove on the western side of Wireless Hill.

Accordingly, Hamilton, Sandell and I went round in that direction the following morning, while Sawyer made his way up to the wireless station to see if there were any damages there. We worked along round the cliff-front through a cave rejoicing in the name of " Catch Me," from the fact that the waves rushed into it, frequently catching and thoroughly wetting any unfortunate taken off his guard. A massive rock, evidently broken from the roof, lay right across its centre, while on either side of the obstruction were masses of greasy decaying kelp. We were " caught " and floundered about in the kelp while the water surged around us. Arriving at the Cove, we found that several cases were missing. One was discovered buried in kelp, and a little later we came upon a tin battered almost out of recognition. The loss was not serious, but the precaution was taken to shift the oil still farther back.

While we were engaged on this task, Sawyer appeared on the front of the hill above and signalled to us that the aerial had been blown down. The three-inch rope keeping the aerial taut had broken off close to the bridle and torn the halyard with it. It meant that some one would have to climb the mast to pass a rope through the block, and the wind was at this time too strong for anything to be done.

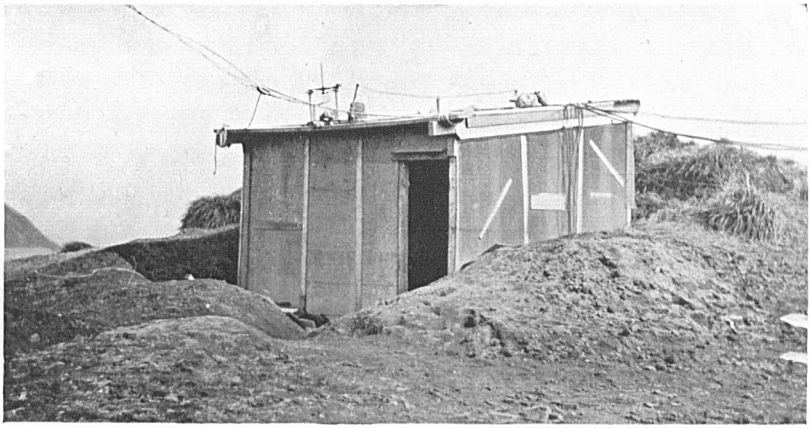
On February 7, Blake and Hamilton, who had been making preparations for several days past, set out for Sandy Bay, intending to do some work in that locality. Their blankets, sleeping-bag, instruments and other gear made rather heavy swags, but they shouldered them in true Murrumbidgee style and tramped away.

Sandell, Sawyer and I went up Wireless Hill to fix the aerial. Sandell, the lightest of the three, was being hoisted up the first section of the mast with some one-and-a-half-inch rope when the hauling-line gave way. Fortunately, he had a strap securing him to the mast, otherwise his fall would have been from twenty feet. This was the only rope we had, so we had to think of some other means of reaching the top. After a short discussion, I suggested that decking-spikes



Macquarie Island *Blake*

VIEW OF THE WIRELESS STATION ON THE SUMMIT OF WIRELESS HILL



Macquarie Island THE WIRELESS OPERATING HUT *Sandell*

Macquarie Island THE WIRELESS ENGINE HUT *Sandell*

should be secured from the wreck of the *Clyde* and driven into the mast at intervals. The idea was followed with great success, and Sandell was able to run the halyard through the block at the top (ninety feet). The aerial was then hauled into position, the stay-wires were tightened, an extra "dead man" was put in and the station was once more ready for work.

Hamilton returned from Sandy Bay on the 11th laden with botanical trophies and four specimens of a small land bird which we had never before seen. He and Blake, who remained behind, had fixed up the hut there so that it afforded decent shelter.

On the night of the 13th what we had long expected happened. Wireless communication was established for the first time, with a ship—s.s. *Ulimaroa*. Sandell and Sawyer were complimented on their success.

On the following night communication was held with Sydney, s.s. *Westralia*, s.s. *Ulimaroa* and H.M.S. *Drake;* the latter very courteously sending us time-signals. We heard that a wireless station had just been established in Melbourne, and that the Hobart station would be working in about one month. It was with the latter station that we expected to do most of our business. There was great joy in the camp now that this stage of practical efficiency was reached and because we were no longer isolated from the world.

Blake came back from Sandy Bay on the 16th with news that he had almost finished the survey of that section. Foggy or misty weather gave him a good deal of trouble in getting sights with the theodolite, and it became part of his future programme to devote the "impossible" days to plotting data, writing up field-notes, and making geological collections.

The afternoon of the 17th was fine, and I went along the beach towards West Point and found it very rough travelling. Hundreds of sea elephants, mostly of the season's young, lay about in the tussock or amongst the rocks. The young,

silver-grey in colour, looked very sleek and fat. The adults consorted in groups of from eight to ten, packed closely and fast asleep. They seemed to fairly luxuriate in a soft, swampy place and were packed like sardines in some of the wallows.

Large numbers of skua gulls, creating a dreadful din, drew my attention to a spot amongst the rocks, and, on nearing it, I found them squabbling around the carcase of a xiphoid whale, about sixteen feet long, which had been cast up apparently only a few hours before.

The skuas, as they are commonly called, are large brown birds which resort to the island in great numbers for the purpose of breeding. They stay longer than any other migrant, being absent only three months during the depth of winter. Returning early in August, they do not start nesting until the beginning of October. The nests, nicely made of grass and plant leaves, are generally built on the terraces and slopes amongst the hills. The ideal site, however, is a pleurophyllum flat adjoining a penguin rookery. Two or three eggs of a brown or greenish-brown colour with darker spots or blotches are laid about the end of October, and, from this time till the chicks are reared, the parent exhibits much annoyance at the presence of any person in the vicinity. They utter shrill cries and swoop down continuously in an attempt to strike the invader with their wings. Several of our party received black eyes as a result of attacks by skuas.

The young grow rather quickly, and not much time elapses before they leave the nest to stagger round and hide amongst the vegetation. The parents fly down and disgorge food, which is immediately devoured by the young ones. The skuas are bare-faced robbers and most rapacious, harassing the penguins in particular. They steal the eggs and young of the latter and devour a great number of prions—small birds which live in holes in the ground. The skuas are web-footed, but are very rarely seen in the water.

Towards the end of the month, Blake spent two days at Sandy Bay and then returned to work up his results.

Hamilton, in order to get into close touch with another species of penguin, stayed several days at "The Nuggets," two and a half miles down the eastern coast. A creek flows into the sea at this point, and many Royal penguin rookeries are established along its course.

Meanwhile, many improvements had been effected in the interior of the Shack. Shelves lined the walls wherever it was convenient to have them, and many perishable food-stuffs had been brought inside. Comfort, after all, is but a relative matter, and, as far as we were concerned, it was sufficient.

Our clothing was all that could be desired, with the exception, perhaps, of the boots. In the equipment were included one pair of sea-boots, one pair of raw hide knee-boots and two pairs of rawhide hunting boots. The latter were not heavy enough, and soon showed the effect of travelling from a water-logged surface to one of rock and vice versa. In fact, our boots were very rarely dry on Macquarie Island.

An event of some moment occurred on the 28th. The fowls, in order to justify our confidence in them and as a return for our constant care, commenced to lay and, strange to say, all began to lay at the same time. Ma, who was greatly concerned during the turn of affairs, suffered from prolonged attacks of cackling.

During the opening days of March, Blake and Hamilton were engaged in field work down the island. They went as far as "The Brothers," a rocky promontory about two miles south of Sandy Bay. Wekas were so plentiful that they lived almost entirely on them. Blake, on returning to the Shack, had a badly blistered heel which kept him indoors for a few days. Hamilton, who had secured a goodly number of specimens, had to attend immediately to their preservation.

There were many rats on the island and we frequently heard them scuttling about on the ceiling of the Shack and slithering down between the lining and the wall. Hitherto they had contented themselves by doing this, but on the

night of the 7th several of them flopped one after another into the hut, awakening the inmates. On getting out to investigate I found a hole through the lining, about seven feet from the floor, and two or three were rustling about on the shelves. After much shifting of boxes and searching behind tins, the intruders were killed.

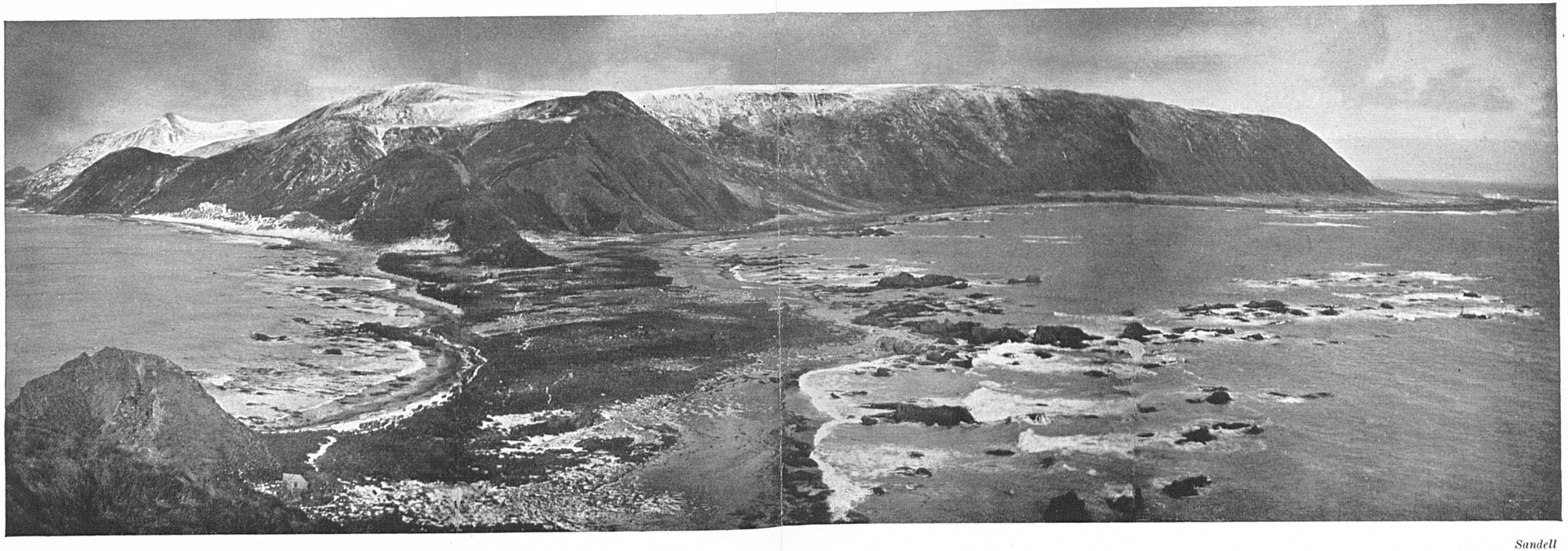
On March 10 our station held communication with Suva at a distance of two thousand four hundred miles; a remarkable performance for a one-and-a-half-kilowatt wireless set.

Hamilton and I set out for West Point and Eagle Cave on the 11th with the object of examining the flora of the locality and, incidentally, to shoot ducks which frequent the pools on the "Feather Bed" terrace. The weather was dull and misty and the walk very uncomfortable. We made our way across this treacherous tract, often sinking knee-deep. As we neared the first pool a duck rose and immediately paid the penalty. Although we saw at least two hundred, only one was shot, owing to the fact that there is no cover about and the ducks are too easily scared.

Close to Eagle Cave Hamilton gathered some plant specimens and, after lunching, we set off home. Light, steady rain set in about 3 P.M. and wet us thoroughly. We travelled back along the coast, finding it fearfully rough but not so tiring as walking on the terrace.

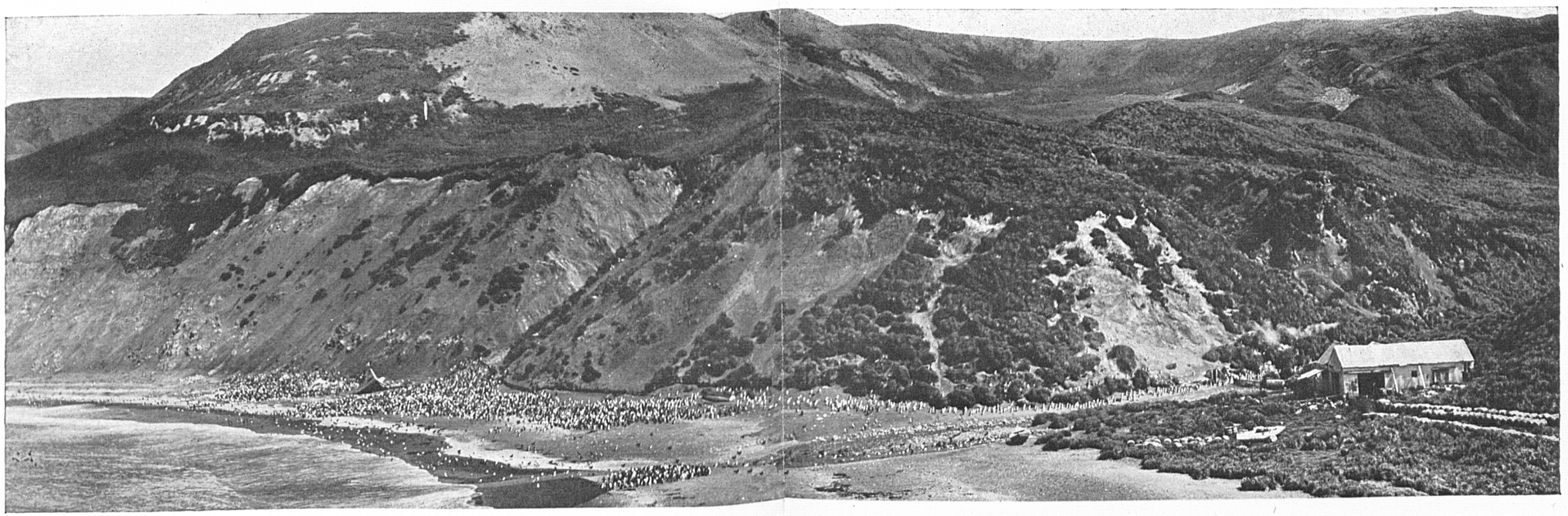
Heavy snow fell during the night of the 11th. Among other things we learnt by wireless that Amundsen had returned to Hobart with the news that he had reached the South Pole.

Blake had just recovered from his blistered heel when he had the misfortune to meet with a slight accident. He and Hamilton were engaged cutting a track through the tussock from the Shack to the beach, when the spade wielded by Hamilton struck Blake's foot, cutting through the boot and inflicting a wound on the great toe. It was treated antiseptically and bound up; Blake being laid up for a few days.



Sandell

Macquarie Island
PANORAMIC VIEW OF MACQUARIE ISLAND, AS SEEN FROM WIRELESS HILL AT THE NORTH EXTREMITY OF THE ISLAND. THE SHACK IS NEAR THE BOTTOM OF THE PICTURE ON THE LEFT-HAND SIDE: THE SEALERS' HUT AT THE FAR END OF THE ISTHMUS: THE DISTANT LEFT-HAND POINT OF THE COAST IS THE NUGGETS: NORTH-EAST BAY ON THE LEFT: HASSELBOROUGH BAY ON THE RIGHT



Hamilton

Macquarie Island
A VIEW OF THE SHORE AT THE NUGGETS: THE SEALERS' SHED ON THE RIGHT. THE BARE PATCHES FAR INLAND HIGH ON THE HILLS ABOVE THE SHED ARE ROYAL PENGUINS' ROOKERIES, FROM WHICH THEY TRAVEL TO THE BEACH IN A LONG PROCESSION

Cooking was still on the up grade. Everybody, as his turn arrived, embarked on something new. Blake turned out a magnificent meat pudding during his week, and Sawyer manufactured a salmon kedgeree. Sandell's treacle pudding and Hamilton's soda rolls and date pudding were all equally good, while I fairly surpassed myself with a roly-poly and some pancakes.

Hitherto, Sawyer and Sandell had been coming down to the Shack each night after finishing the wireless work, but on account of the bad weather they determined to sleep up there and, with that end in view, each built a bunk for himself; Sawyer, in the operating-hut, had ample room for the improvement, but Sandell had more difficulty in the engine-hut, finding it necessary to add a small structure to the original one.

Good wireless work was now being done, and almost every ship trading to eastern Australian ports gave us a "call up." Much difficulty was experienced with the mast's stays, which frequently required tightening on account of the "deadmen" working loose in the yielding peaty soil. There were seven stays required for each mast, and Sandell spent much time in attending to them.

Hamilton had found, some weeks previously, several nests of the sooty albatross along the cliff-front on the eastern side of Wireless Hill, and on the 21st he visited them for the purpose of photographing the young in the nest. They were still in the downy stage, and vomited vigorously on being approached.

These birds build their nests on ledges along the face of a steep cliff and always betray the whereabouts of their nesting-place by wheeling and soaring around the vicinity. When sitting, the bird utters piercing calls for its mate and is thereby easily located. They make a nest of grass, generally at the root of a tussock growing on the cliff-front, and when the building is in progress the two birds sit side by side entwining their necks, rubbing beaks and at intervals uttering their harsh cries. One can approach and catch

them quite easily, either at this time or when sitting. The female lays one large white egg, which has a peculiar and rather disagreeable odour. They have beautiful slaty or bluish-grey plumage with a dark soot-black head, while encircling the eye is a white ring which stands out conspicuously from the dark feathers surrounding it. Like most other sea-birds they have the rather revolting habit of vomiting quantities of partly digested food and fluid when an attempt is made to get close to them. In this respect old and young are alike. Their food is procured at sea, and consists of the small forms of marine life.

Sandell and Hamilton went round to Aerial Cove on the 25th to collect shells and to search for the missing lubricating oil. When coming home, after a successful day, they discovered a cave quite close to Catch Me. A lantern was secured from the Shack and they went back to examine it. It penetrated for a considerable distance and opened out on the hill side about eighty feet above sea-level. Many rocks hung down from overhead, and altogether it appeared a very unsafe place. Blake went along later and collected specimens from its floor.

We built a kind of annex to the Shack out of the cases of provisions; each case being numbered and a list being drawn out setting forth the contents of the case. This list was nailed on to the wall inside, and besides being convenient for procuring the provisions, gave the cook, in a *coup-d'œil*, exact information and afforded him a glorious scope.

With regard to the coal-supply, our allowance at Macquarie Island had been reduced by one-half, on account of the large amount of wreckage lying on the beach. The weekly cook limited himself to three briquettes, and these he supplemented with sea elephant blubber and wood, which he gathered and cut up for use.

Each man commenced his cooking week on Saturday morning, and continued until the following Friday night, when, after having cleared up, washed the towels and cleaned the stove, he retired. The incoming cook, who for

Macquarie Island SOOTY ALBATROSSES NESTING *Hamilton*

half an hour had been prowling about keenly observant of "overlooked" dirty "things" and betraying every sign of impatience to make a start, proceeded at once to set a batch of bread, sufficient for one week, which was baked early on Saturday morning. Five loaves had to be baked, and as only two could be dealt with at a time, the chance of producing at least one doughy loaf was reasonably high until every one became a master baker.

For a time we had been rather hard put to it in the matter of having baths, but the disability had been overcome by means of sawing a cask in two; an expedient which answered very well. The bath was also used as a wash-tub, each man taking charge as his cooking week came round. The clothes were dried inside the Shack along a number of strings arranged at the back of the stove. Darning and mending took a little time, and our experiences in this direction were such as to demonstrate the wisdom of putting in "a stitch in time."

In going over to the meteorological screen one morning I saw a giant petrel flapping about in the tussock, gorged to such an extent that it could not rise. I killed the loathsome bird with the rib-bone of a sea elephant, and Hamilton made a fine specimen of it later on.

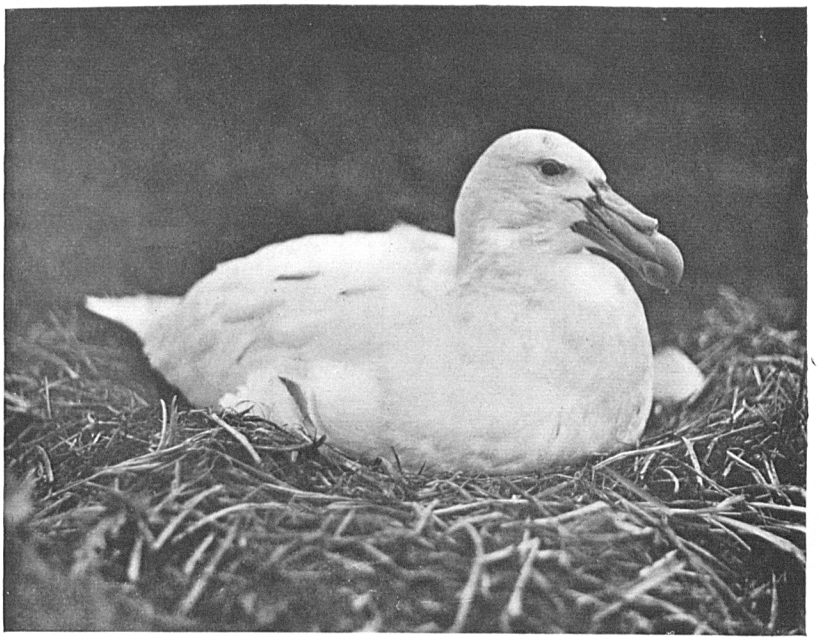
These birds, properly called giant petrels, are usually known as "nellies" or "stinkers"; the latter title being thoroughly justified on account of the disagreeable smell which comes from them. As may be inferred from the name, they are the largest of all the petrels, and measure about seven feet from tip to tip when on the wing. The colour ranges through various shades from almost pure white to a dark greyish-brown; some even appearing almost black. Very large and ungainly when on the ground, they become most graceful when in the air, and soar about without the slightest effort even on the stormiest days. I have seen them flying into a forty-mile wind with absolute ease, never moving a wing, but occasionally adjusting their balance. They are gross scavengers, and eat apparently for the sake of

eating. A carcase on the rocks or beach attracts them in large numbers, and very soon they can be seen pulling and tearing at it until thoroughly gorged, when they waddle away into the water and sit there wholly unable to rise till digestion takes place. If disturbed, they immediately disgorge and fly off. They nest on the ground and lay one large white egg. When sitting, they are reluctant to leave the nest and will squat there, vomiting evil-smelling, partly digested food and fluid at any intruder. The young, even in the downy stage, have the same habit.

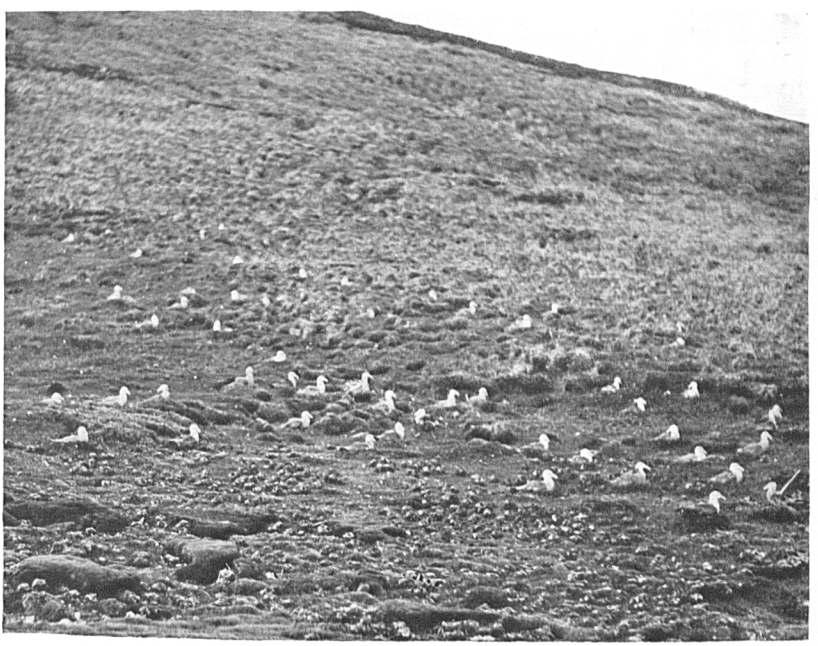
When mating they go on with a queer kind of performance, which consists of running around each other on the shore with wings outspread as if displaying their charms, finally flying off or waddling into the water.

The persistently windy weather during March had an effect on everything exposed to its force. Sandell discovered on the 29th that the rope holding the wireless aerial had cut through, leaving only one strand, which now bore all the strain. It was just a matter of days before it would part, and, with a view to preventing a repetition of February's happening, we went up to lower the aerial, but the frayed portion of the rope would not pass through the block, so we had to leave it as it was and wait for the inevitable.

Exceptionally low tides at the end of the month gave Hamilton a fine opportunity of collecting marine specimens, and he secured amongst many other things some striking anemones. Some difficulty was experienced in preserving them, as they lost colour and shrivelled up. But a special line of treatment was attended by fairly successful results. They were put in shallow dishes into which sea-water was poured. Very soon they attached themselves to the bottom and began to expand, finally opening out to the fullest extent. With a view to narcotizing them while in this condition, menthol was applied to the water but did not seem to have much effect. Chloral hydrate was found to give the best results. It killed them all, but, before dying, they elongated and detached themselves from the bottom



Macquarie Island A WHITE GIANT PETREL ON THE NEST *Blake*



Macquarie Island A GIANT PETREL ROOKERY *Hamilton*

of the dish; after which they were taken out and placed in formalin for preservation.

Blake had very little opportunity of doing much survey work during the month, as he was hampered by a sore foot and the weather was wretched. He therefore spent most of his time plotting data, making geological investigations and collecting and naming specimens.

He and Hamilton had so far confined their attention to the northern half of the island, and had resolved to complete the study of this area before tackling the southern half.

The weather throughout the month was rather severe, and only two days were really appreciated. Precipitation occurred on twenty-five days, but the worst feature was the continuity of strong winds, which however did not reach gale-force on more than three occasions. Much snow and hail fell, the former accompanying winds with a southerly component, while with the north-westers came the depressing mist or misty rain which is such a characteristic of the place. Temperatures, as might have been expected, were beginning to go down, and we experienced several very cold days. The average temperature for March was 41·8°, while the highest was 46·9° and the lowest 35·3° F. on the 24th.

At 10 P.M. on April 1 the rope supporting the aerial parted. Sawyer and Sandell were on duty at the time, but of course suspended operations immediately. As before, the halyard also carried away and Sandell henceforth resolved to shackle one end of the aerial to the mast, using a short length of chain instead of the rope. The wreck of the *Clyde* was once more our standby, providing a suitable length of chain and four shackles. After completing this job, they had very little subsequent trouble with the aerial.

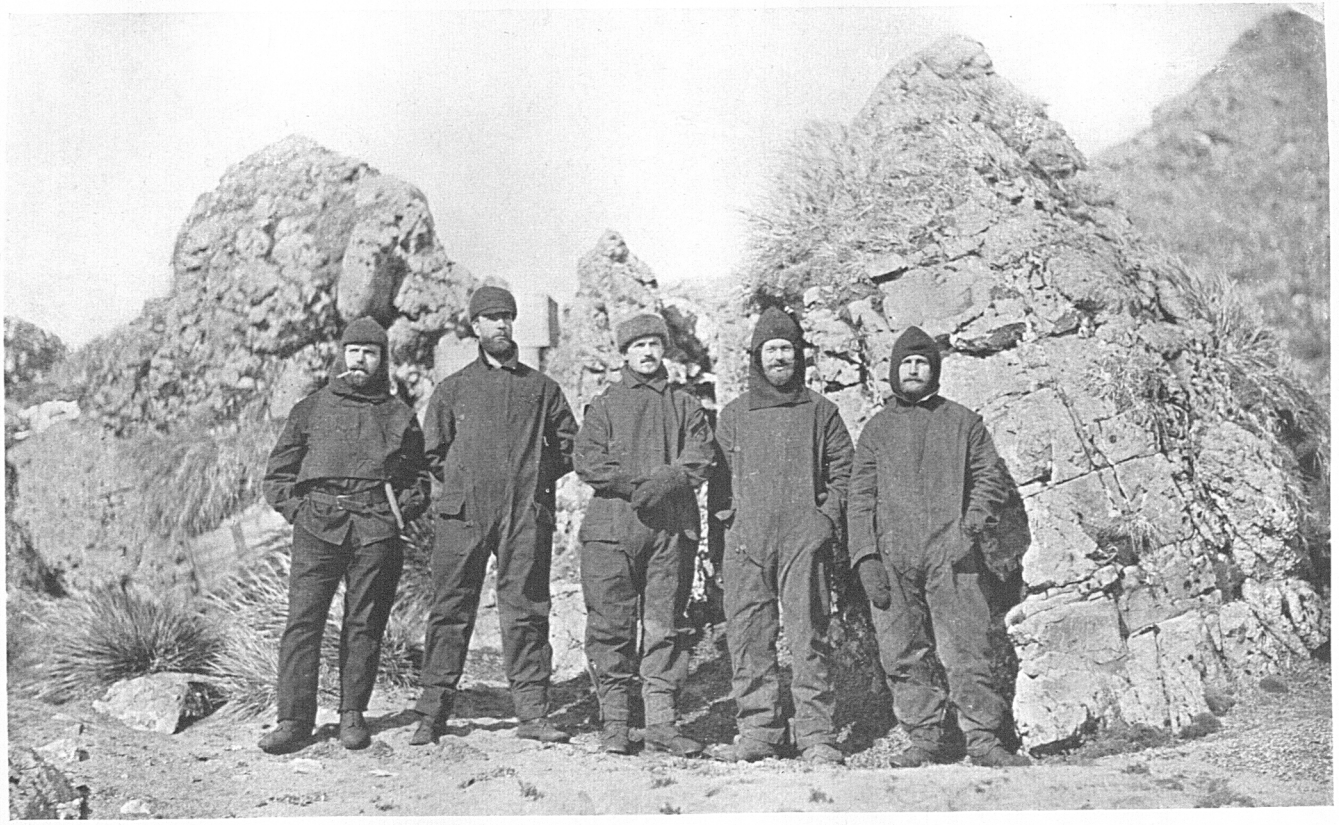
Hamilton and Sawyer caught several three-pound fish on April 2, and Sandell served them in good style. They were good eating, but, unfortunately, were very much worm-infested. These parasitical worms are about an inch and a half long and taper to a point at each end. They penetrate right through the flesh and are plainly noticeable after the

fish is cooked. One has to dodge the worms as the meal proceeds: either that or persuade oneself that they do not matter.

The flowing contours of the land in the vicinity of "The Nuggets" suggested glacial action to Blake, and on the 4th, while making geological investigations in that locality, he lit upon a well-defined basal moraine. Needless to say he was very interested in the discovery, and brought home a number of polished, striated boulders as convincing evidence of his theory.

It was rather disappointing to find that the vegetables we had planted were making little progress. They would shoot up at first very strongly, like the "seed which fell on stony ground," but, as soon as a gale arose, the tops turned black and shortly afterwards withered away. It was apparently an effect of the salt spray which, in rough weather, used to blow across the isthmus. Hamilton planted some willows and other cuttings, which shared the same fate.

The winter had now arrived in real earnest, and the months which followed were punctuated by a succession of gales, while we came to recognize that it was an exceptional day when the hills were not shrouded in mist. The only thing to do was to brace oneself up for the ordeal and to put a good foot forward.



THE MACQUARIE ISLAND PARTY. FROM LEFT TO RIGHT: SANDELL, AINSWORTH, SAWYER, HAMILTON, BLAKE

Hamilton

CHAPTER XXVI

A LAND OF STORM AND MIST

By G. F. AINSWORTH

A HEAVY north-west gale was experienced on April 12, the wind attaining a force of over fifty miles an hour. As usual, a tremendous sea worked up very quickly, and sheets of spray shredded across the isthmus. About 2 P.M. the wind shifted to west and later to south-west; these changes being accompanied by fierce hail and squalls of snow. During the night the wind moderated, heavy snow fell and, when morning dawned, all the pools were frozen over and the island was draped in white. It was the heaviest fall we had so far experienced.

On the 15th Hamilton and I shot several gulls for specimens.

The Dominican or black-backed gulls are very numerous and remain on the island all the year round. They are rather pretty, being snow-white, except on the upper part of the wings and back. Ordinarily their food is obtained from the water, but at Macquarie Island they live almost entirely upon the carcases left by the sealers, and are usually seen defending their rights against skuas and giant petrels. They build nests of tussock on rocks close to the water or maybe on the ground. Three eggs, much like those of the skua in colour, but with a greener tint and smaller, are laid, but generally only two are hatched. The young leave the nest early and hide amongst the rocks, whither the old ones come to feed them.

We now considered it advisable to prepare for the winter,

and with that end in view papered the inside of the Shack in various places. As the cold winds were particularly searching, all faulty joints in the lining were pasted over with any kind of paper we could find. A leak down the outside of the stove-pipe was remedied, after a good deal of trouble, by soldering a collar round the pipe where it passed through the roof. Firing was an important consideration, so each man now brought home several loads of drift-wood every day, until we had enough to keep us going for some months. There was a complete boot-mending outfit which was put to a good deal of use, for the weathered rocks cut the soles of our boots and knocked out the hobnails. Our supply of the last-named did not last long, and several of the party used strips of hoop-iron in their stead.

Blake found it necessary to make a kind of work-desk in his section, and accordingly had a thorough rearrangement. He shifted his bunk up to a height of about five and a half feet, very close to the ceiling ; a fact which necessitated some wriggling and squirming on his part to get into the sleeping-bag. There was a fine open space left underneath, and he managed to fix up his table very neatly.

Although they had intended to leave the work on the southern half of the island until the spring, Hamilton and Blake set out for Lusitania Bay on April 23 to make a short reconnoitring trip. It was thought advisable to spend a few days down there, to improve the hut and generally speaking to have a look-round. Both men had already visited the place and depoted some provisions there. At 8 A.M. they started off, carrying their blankets, sleeping-bags and a few other articles. Their proposal was to go along the coast as far as Sandy Bay and from thence along the hill-tops for the remaining ten miles.

Hail and snow-squalls succeeded each other at frequent intervals, and by the time they reached Sandy Bay, all hope of proceeding along the hill-tops was dissipated. They therefore kept near the coast. The going was frightfully rough and the weather was very bad, so on making

Green Valley they camped in a small cave for the night. The floor was covered with tussock, and, by searching amongst the rocks, enough pieces of wreckage were found to keep the fire going. On the whole they passed a fairly comfortable night. Mac proved a bit troublesome by persisting in her attempts to curl up on or between the sleeping-bags, and by finally eating the jam which had been saved for breakfast. The weather was quite as bad next morning, but, after a meal of dry biscuit and cocoa, they pushed on, taking four and a half hours to do the six miles. The next day was spent making the hut weather-proof and fixing up a couple of bunks. The provisions which had been cached were in good order and abundance of firewood lay around, in the shape of old barrel-staves. Just close to the living-hut was a works-hut containing boilers and digestors which years ago had been used for procuring penguin oil, while there was a rookery a few yards away from which the victims had come.

This rookery was the resort of King penguins, the largest of the four species which are to be found on the island. They are magnificently coloured birds, being bluish-grey on the back while the head is greenish-black and on each side of the neck there is a brilliant yellow band, shading to a greenish-yellow on the upper part of the breast, and gradually merging into the glossy white of the lower part of the body. They attain to a height of about three feet and weigh thirty pounds approximately. The site of their rookery is a stony flat about a hundred yards from the water, and here are collected between five and six thousand—all that remain on the island.

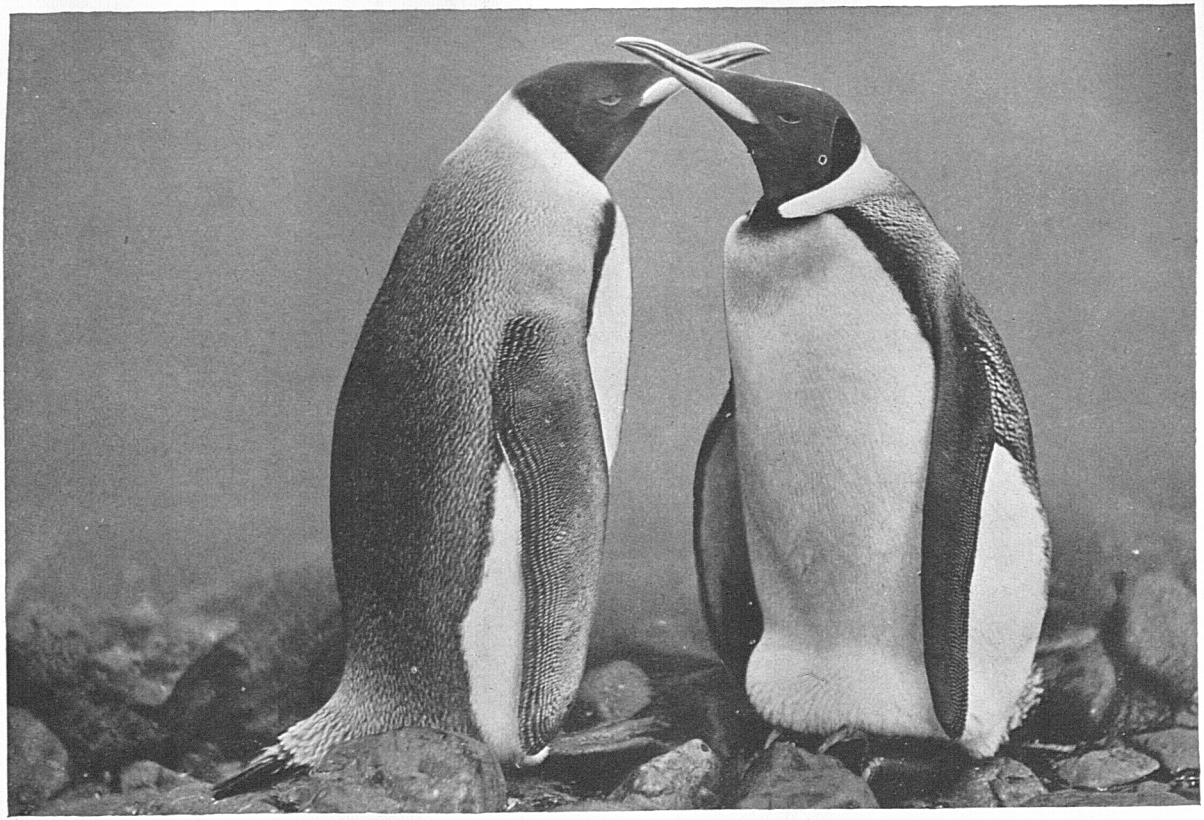
They make no nest, the single egg laid being supported on the feet, and kept in position and incubated in a kind of skin pouch which conceals it from view. One would never guess the egg was there, for, on being disturbed, the bird shuffles along, carrying it in the manner described. The egg is large, tapering very much at one end and resembling a pear in shape. They lay during December and January,

and the young are hatched in about six weeks. A peculiar feature about the young birds is that the parents feed them for two seasons. They are covered with a coarse, greyish-brown furry growth, and a year-old chick looks bigger than the old bird. This furry growth is lost during the second year and the adult plumage replaces it. The young utter a peculiar sound, something between a squeak and a whistle. It is probable that the King penguins were never so numerous as the Royal or Victoria penguins, but the fact remains that they have not yet recovered from the wholesale slaughter to which they must have been subjected over sixteen years ago.

Down on a strip of shingly beach the birds parade, when not in the rookery or at sea getting food. Their proceedings strike one as being extraordinarily human, while the dignity and gravity of the participants are beyond description. On one occasion, a large number marching along the beach were seen to halt suddenly and talk excitedly. Three birds then left the main body, consulted together for a short time, and then separated. The other birds immediately separated into three companies, and each company stood behind one of the three already mentioned, who were now some distance apart. The individuals of each party then talked among themselves for several minutes, after which two parties joined forces and marched off, leaving the third party staring after them.

I have lost myself for the time being amongst the penguins and shall now return to Blake and Hamilton, who climbed on to the hill-tops the following morning to spy out the land. The island is generally speaking higher, and all the more elevated peaks are on the southern half.

They saw numerous rabbits, of which many were black, and Mac had the day of her life amongst them. These animals were introduced to the island about twenty-five years ago, and have gradually withdrawn to the lonelier southern part, though occasionally odd ones are seen about the northern end. They are very tame and live in holes



Macquarie Island KING PENGUINS *Hamilton*

amongst the rocks or make burrows in the gully banks and broken hill sides.

Many lakes, frozen over, were seen, several of which were fairly large. Altogether, the topography is similar to that of the northern end.

In an endeavour to improve the evening fare, a sweet broth consisting of biscuit, milk, jam and sugar was tried but it was not a success; Hamilton remarking that "even Blake had only one helping." On the following morning they started for the Shack and chose the route on the hill-tops, as the ground was frozen hard; and, though there were frequent snow-drifts into which they floundered occasionally, the surface for travelling was much better than along the coast.

Hamilton slipped and hurt his ankle on the trip, and the boots of both were just about worn out. They apprehended no difficulty in completing their prospective work. Blake pointed out that the chart of the island shows Lusitania Bay as being rather a large indentation, whereas in reality it is almost a straight stretch of coast.

An earthquake shock was felt at 9.15 P.M. on the 27th. I was sitting in the Shack writing up records at the time, and it seemed as if somebody had struck the south-west end of the place a severe blow with a bag of sand. Immediately afterwards a crashing sound, apparently some distance away on the eastern side, indicated that some rocks on the cliff-front had been dislodged.

Much rough weather was experienced during the month, and it rained, hailed and snowed on twenty-five days. The wind attained moderate to fresh gale-force on six days, and fog and mist were almost invariable. The lowest temperature recorded was 32·7° F.

The average relative humidity for the four months ending April 30 was 93 per cent., leading to copious condensation on the instruments exposed to the air. It was necessary, therefore, constantly to attend and frequently clean the thermographs, hygrometers and the wireless plant.

In the case of the latter, loss of power occurred in the form of "brush discharge," and Sawyer had to take great care in order to guard against this accident. He shellacked the condensers and other exposed parts and found the proceeding rather effective. I noticed that the drifting snow and misty rain managed to get down the opening leading to the liquid surface of the anemobiagraph, thus altering the zero of the recording apparatus. When this happened the instrument had to be dismantled and set right.

We found it necessary to use sea elephant blubber in the stove in order to warm the Shack, and a very small piece put on the fire at intervals always ensured a good heat. Sea elephants had become scarce, so, in order to lay in a supply of fuel for the next few weeks, we went round to Aerial Cove on the 3rd and killed the largest animal we could find, afterwards carrying the blubber round to the Shack. We came through Catch Me and had the same old experience. Hamilton examined the contents of the stomach of the sea elephant and found gravel, stones, cuttlefish, beaks and "worms" in abundance.

A violent north-west gale during the early morning hours of the 4th reached a maximum velocity of fifty-two miles an hour at 5.20 A.M., but at 8 A.M. it began to weaken rapidly and an hour later had shifted to west-south-west, coming from that point as a moderate gale for the rest of the day. As was usual with winds having any southerly component, snow and squalls of soft hail were experienced. With the exception of the wind-vane, which was blown a few yards into the tussock, nothing was damaged.

In the afternoon Blake and I had a trip down to the moraine which he had found a few days previously. After a heavy one and a half hours' walk, the last half-mile of which was along a creek bed, with water ankle-deep all the way, we reached the spot: the site of one of the large penguin rookeries up on the hills at the back of "The Nuggets." The sun showed between squalls, and Blake took some interesting photographs of rocks showing striæ and other

glacial characteristics. We battled with one enormous boulder for some time before getting it into a suitable position for the camera, and afterwards walked right through the glacial area. The U-shaped character of the valleys was very pronounced, while boulder-clay obtruded itself everywhere on our notice.

Hobart wireless station was by this time in working order, a fact which greatly facilitated wireless business. Sandell took the engine to pieces early in the month and gave it, as well as the fittings, a thorough overhaul and cleaning. We received a message on the 7th, saying that the *Aurora* was leaving Hobart on the 13th for a sub-antarctic cruise and would call at the island. At the same time I was requested to send a list of articles required. I found, after going through the stock and consulting each member, that we needed nothing but strong boots, cartridges, dungaree trousers, coarse salt, cigarettes and fresh vegetables.

A persistent area of high pressure affected the weather conditions of the island to the extent of shrouding us in fog from the 6th to the 10th inclusive, and we did not catch a glimpse of the sun during that period. The average daily temperature-range during this time was only 2·3°. Such conditions have a rather depressing effect on the spirits, but the cheering news we received on the 7th made some amends for the lack of sunshine.

The sun appeared at last on the 11th and shone strongly, so Blake and I went up to Wireless Hill to take some " shots " with the theodolite. I noticed four of our sheep on the front of the hill, and, as there should have been nine, Sandell and I, after finishing with Blake, walked out to North Head to see if the others were all right. We found them on the north-east side of the hill and drove them up to the rest of the flock.

From the hill-top we could see Hamilton engaged in skinning a large sea leopard on the coast, so we climbed down to render any necessary assistance. It was a beauti-

fully marked animal, about eleven feet long, and made a fine specimen.

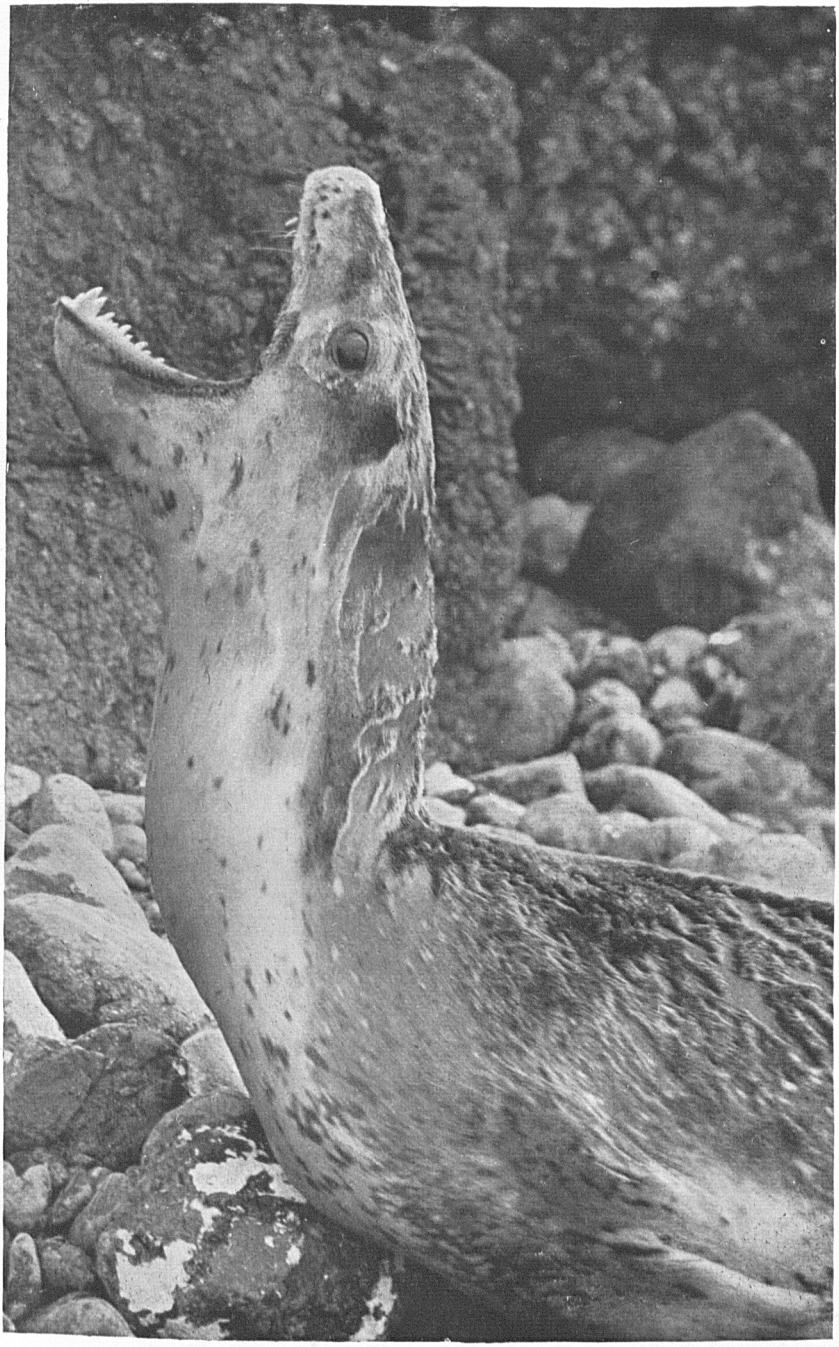
Sea leopards frequent Macquarie Island in great numbers from the late winter to the early summer, and may be seen lying about, sleeping close to the water and apparently always very tired. They do not give birth to the young there, and from observations I concluded that they were born at sea. We had taken female specimens on several occasions, apparently within a few hours of parturition, and as none had been seen with newly born young, and no islands lay within several hundred miles, it was presumed that the birth took place in the water. Until the young one is weaned, its habitat is evidently in the water as we never saw an adult suckling its offspring.

Sea leopards—long, lithe creatures with a reptilian cast of head—are remarkably quick in the water. If one is disturbed on shore it opens its mouth very wide, revealing a wicked-looking row of teeth in each jaw; the canine teeth or tusks being very long and slightly curved.

Unlike sea elephants and seals they are solitary animals, and should several of them be found on a small gravelly patch of beach they are seen to be as far as possible from one another. We have never seen them attempt to fight on the shore, but the gaping wounds and scars with which they are frequently covered indicate that they treat each other very severely in the water. They live on penguins, gulls, shags and fish.

I saw several shags on one occasion very busy fishing, and between diving intervals they would sit on the water. Suddenly one disappeared under the water and the rest flew off; but in a few seconds the one which had disappeared was thrown into the air and caught by a sea leopard, who played in this fashion with the maimed bird for several minutes before devouring it.

A few days previously we had received a request from Mr. D. C. Bates, the New Zealand Meteorologist, for a daily weather report, and from the 12th onwards a message was



Macquarie Island THE HEAD OF A SEA-LEOPARD, SHOWING FIGHT *Hamilton*

sent nightly to Wellington, a distance of about eleven hundred miles. In acknowledging these reports, subsequently, the office referred to their immediate value in the issue of daily forecasts, and expressed indebtedness to the Expedition.

The two species of penguins which leave the island during the winter months had disappeared, and silence now reigned where formerly were busy, noisy colonies. The departure of the migrants made the place seem lonelier and, during the depths of winter when snow covers the ground and the birds and animals are few in number, a more dreary spot would be difficult to find.

The weather conditions were now rather severe, and as Sawyer and Sandell worked from 8 P.M. till 2 or 3 A.M. every night and slept at the wireless station, they were exempted from the necessity of coming down to get breakfast during their cooking weeks. They now rested till about noon, and arrived at the Shack every day in time for lunch. Hamilton, Blake and I, each outside his own cooking week, took it in turns to prepare breakfast.

Blake's fieldwork at the north end, more particularly in the vicinity of West Point and North Head, was just about finished. West Point proved to be an area of gabbro, a coarse-grained eruptive rock representative of basic rocks, while North Head was composed of basic agglomerate, and volcanic bombs were numerous.

Hamilton had got together a good collection of bird specimens, and was now in quest of skeletons.

On the night of the 13th we witnessed a rather pretty auroral manifestation. It assumed the appearance of a Noah's ark cloud, that is, stretching from opposite points on the horizon and appearing to converge at each one of these points. The light was a pale yellow, no other tint being visible. In addition, a nebulous glow appeared at intervals in the south.

We heard on the 16th that the *Aurora* had sailed on that day from Hobart and would arrive at Macquarie Island in

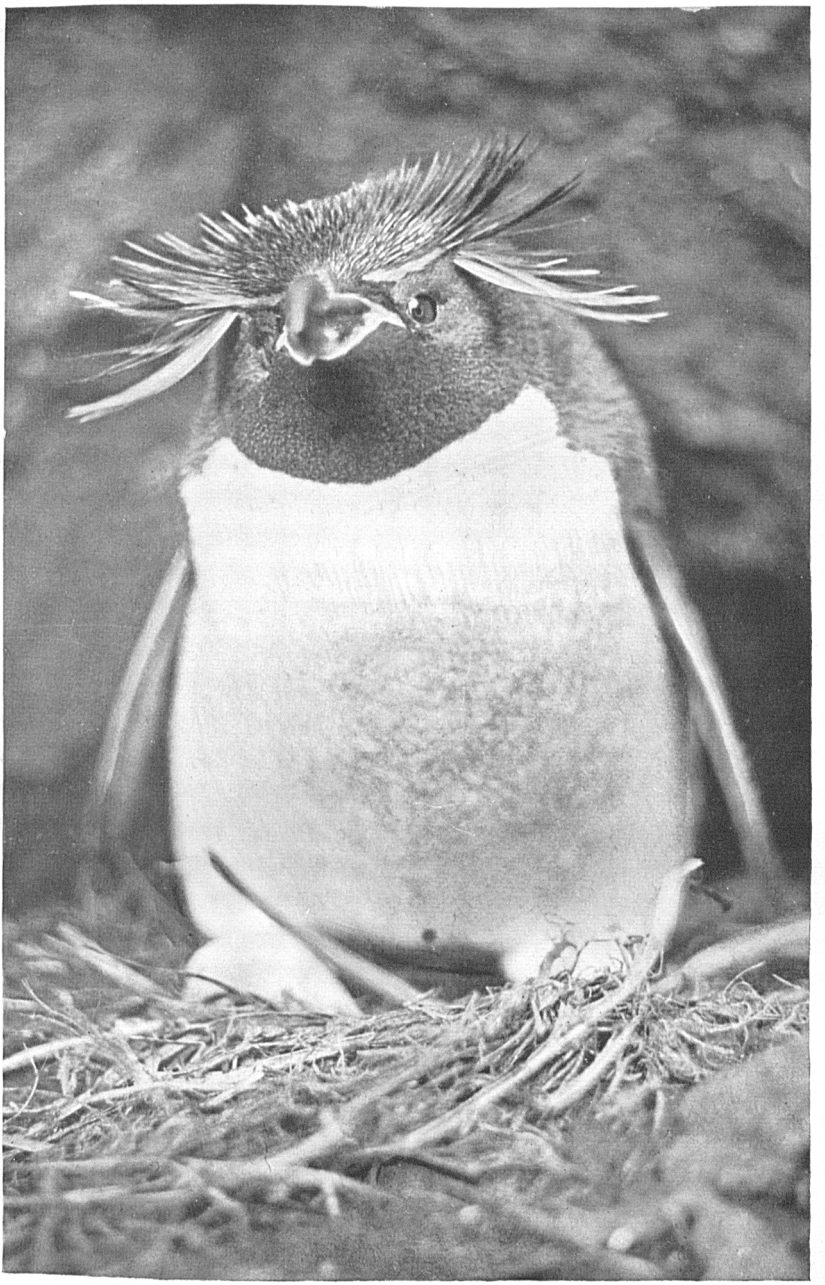
about three weeks; oceanographical work being carried out on the trip down. This was indeed cheerful news, and we began to look forward to her arrival.

A fresh west-south-west gale during the early morning hours of the 17th was accompanied by soft hail and snow-squalls, and the temperature at 9 A.M. was 31·2° F. The ground was covered with snow and all the pools were frozen over, but at 9 P.M. there was a rapid shift of the wind to the north-west and the snow almost disappeared. Soft hail, generally a little larger than tapioca and of the same shape, frequently fell. These little pellets are formed of compressed snow and are commonly supposed to be frozen cloud-particles mixed with raindrops compacted by a high wind.

On the following night, Blake and I went up to Wireless Hill to take star observations. It was very dark and the hill-front was slippery, frequent falls being the rule. Just after setting up the instrument, the wind freshened to such an extent that it was impossible to do anything, so we descended very wet and muddy to the Shack, having had a rough passage. The reason for this was that I fell on the lantern and extinguished the light.

We were supplied with two hurricane lamps which do not by any means deserve their title as they blow out in even a moderately strong wind. Sandell made a lantern for his own use, declaring that it was impossible for any wind to blow it out. I firmly believed him, as it was a little binnacle lamp placed inside a small oatmeal tin into which a cleaned photographic plate had been fixed and with holes punched in the bottom and top of the tin for ventilation. It was thus a lamp with two covers, and frequent demonstrations of its ability to survive heavy blows were made by the inventor.

During the next three days a forty-mile wind accompanied by snow, hail and sleet was experienced and the maximum temperature on the 25th did not reach freezing-point, the ground being firmly frozen and snow-covered. During the evening of the last-named date the wind shifted to



A PRECOCIOUS VICTORIA PENGUIN *Hurley*

north-west, and by noon on the 26th no snow remained, except on the hills.

In anticipation of the *Aurora's* arrival, Blake and Hamilton collected some stores together in the hope that Captain Davis would transport them down to Lusitania Bay, thus obviating the necessity of carrying them down on foot. As Blake reckoned that he would remain there fully three months and Hamilton about two months, it was thought that such another opportunity might not present itself.

Through the courtesy of the naval officials, H.M.S. *Drake* sent us time-signals twice a week, and though we had so far heard no sound from Adelie Land, there was a possibility that they could receive messages from us. Sawyer therefore sent out time-signals as a matter of routine.

Hamilton made a trip to the west coast on the 28th and returned with thirteen wekas. Sawyer did not care for these birds, but each of the others could account for one at a meal. They seem to be better eating if plucked like a fowl and roasted, but the plucking takes too long and we generally skinned and boiled them. It is advisable to hang them for several days before cooking as it certainly makes them tender.

Rough, stormy weather prevailed during the greater part of the month and the wind reached the force of a gale on nine days. Much snow, soft hail and sleet fell and some very cold days were experienced. The average temperature was 40°, the maximum being 44·7° and the minimum 27·8° F.

A heavy snowfall occurred during the early morning hours of June 3, and the temperature was below freezing-point all day. In the afternoon we had rather an enjoyable time tobogganing down a steep talus-slope on the east coast. A considerable struggle was necessary in order to get the sledge to the top, but the lightning slide to the bottom more than compensated for the labour.

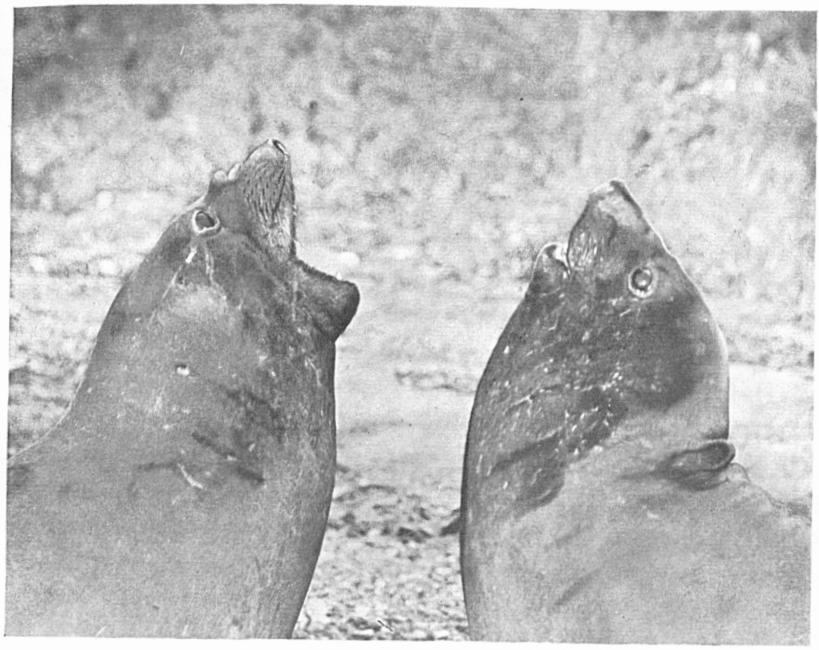
We made wireless inquiries concerning the *Aurora* at

night, and were informed by Hobart that a search for the Royal Company Islands was included in her programme. It was therefore presumed that she was engaged in prosecuting this search and would probably not reach us for some days.

Hamilton killed a very fine sea lepoard on the 5th and the skin, apart from being unscarred, was handsomely marked. It should make a splendid specimen. The stomach contained more than the usual number of worms and one specimen of tape-worm, seven inches long and three-eighths of an inch wide, was preserved.

Everything was going along in the usual placid manner on the 7th, when, as we were just taking our seats for lunch, some one rushed in with the information that the *Aurora* was in sight. There was a scramble to various points of vantage and she was soon observed coming up the east coast very slowly. At 2.30 P.M. she dropped anchor in North-East Bay, but, as it was blowing strongly and a nasty sea was running, no boat was launched, though one may imagine how anxiously we watched for some movement in that direction. As soon as it became dark a message was "Morsed" to us to the effect that a boat would bring mails and goods ashore in the morning if the weather moderated, and with that we had to be content. Needless to say, business ashore was for the time being paralysed, but a message was sent to the Secretary in Hobart advising him of the Ship's arrival.

True to his intimation of the previous night, Captain Davis brought a boat ashore at 9.30 A.M. and with him came several visitors who were to be our guests for some days. They were Mr. E. R. Waite, Curator of the Canterbury Museum and his taxidermist, and Mr. Primmer, a cinematographer. Conspicuous in the boat was a well-laden mail bag and no time was lost in distributing the contents. Letters, papers, and magazines were received by every member of the party, and all the news was "good." Some stores were brought along and, after getting these ashore,



YOUNG MALE SEA ELEPHANTS AT PLAY *Hamilton*

A LARGE SEA-LEOPARD ON THE BEACH *Hamilton*

we took the visitors across to the Shack and invited them to make themselves at home.

Captain Davis also came along to the Shack and afterwards looked over the wireless station. He returned to the ship just after lunch, and Sandell, Sawyer and Blake took the opportunity of going on board. Hamilton, in the meantime, piloted the visitors on a short trip round to Aerial Cove, introducing them to Catch Me, where they were duly baptized. They afterwards climbed up Wireless Hill and had a look at the station, returning to the Shack much impressed with the rough nature of the country.

Blake went off to the ship again, taking the stores which had been got ready for transport to Lusitania Bay, as the captain had agreed to land them when he visited there in a few days' time.

Amongst the cases which were landed was one containing the recording apparatus for the tide-gauge. The other parts of this instrument had been left on the island in December, but for some reason the clock and charts had gone astray and were not found till the vessel was being unloaded in Adelie Land. Some thermometers and a Robinson anemometer had also been overcarried and, when they came to light, the latter was immediately placed in commission.

Captain Davis sent a boat ashore on the morning of the 12th with an invitation to come on board and lunch. I accordingly went out to the vessel and, after lunching, had a thorough look over her, mentally contrasting her spick-and-span appearance at the time with what it had been when I left her in December. I went ashore again in the afternoon and assisted the visitors to get their loads down to the boat, as they were returning to the ship, which was leaving next morning on a sounding trip down the island.

On the 14th we started to carry the stores across to the Shack on our backs. We soon realized that seventy or eighty pounds was not a light load over a half-mile stretch

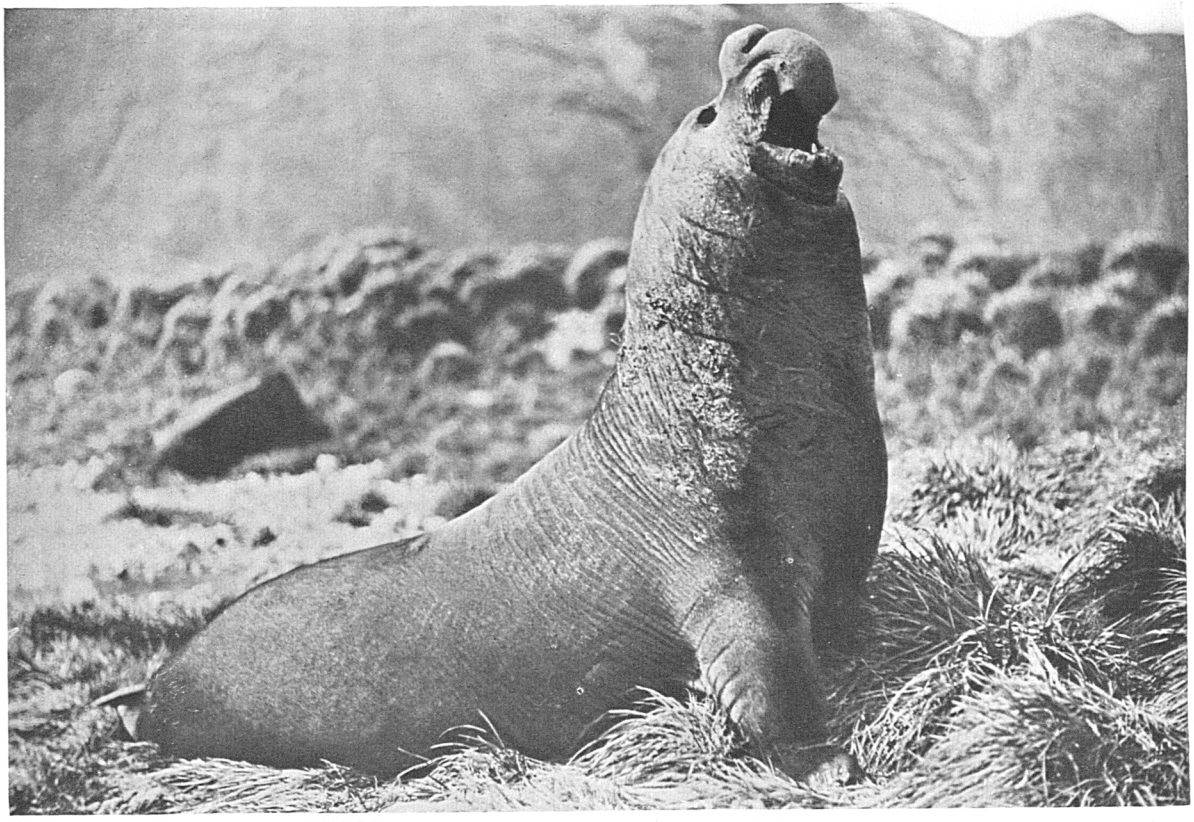
of rough, shingly beach, but succeeded in transporting the onions, apples and potatoes before finishing for the night. The other articles were brought over during the next two afternoons.

The tide-gauge pipe, weighing about six hundredweights, and the box for the housing of the recording gear had been landed in December round in Aerial Cove, where a site had been chosen for the erection of the gauge. Experience showed me that the place was unsuitable, so I took Hamilton, Sandell and Sawyer round to the cove on the 15th and we decided, as we had no boat, that it was impossible to carry the pipe round to the east coast.

I had been making some tidal observations on an upright, fixed in a comparatively quiet spot on the east coast, and it was here that I contemplated erecting the gauge. Two snow-gauges, eight inches each in diameter, were amongst the meteorological equipment and it appeared that if these two were soldered together a suitable pipe could be made. Further, the pipe was to be protected from the violence of the seas by planks fixed round it. Sandell agreed with the idea and forthwith set about soldering the two together and making a suitable float, the one supplied being too wide. All that now remained was to erect the gauge.

The two following afternoons were devoted to stowing the new stores. We carried everything across and stacked them at the south-west end of the Shack. Unfortunately, the boots which we had ordered did not come, but Captain Davis let us have five pairs of light bluchers out of the ship's stores, and we reckoned that these with extra soles and a few hobnails would hold out till August or September, when a sealing vessel was expected.

The *Aurora* returned from the south of the island on the 19th and reported having had a rough experience in the north-east to south gale which blew on the two previous days. The wind came out of the north-east very suddenly on the 17th, and some very strong squalls were experienced. A calm prevailed for several hours in the evening, but a



A SEA ELEPHANT

Hamilton

south-east gale then sprang up and blew all day on the 18th, gradually working into the south and dying away during the night.

Early on the 20th the *Aurora* steamed out of the bay, bound north as we thought, but she returned again in the evening, and we signalled to know if anything were wrong. They replied, "All well, but weather very bad outside." She lay at anchor in the bay all next day as it was snowing and blowing very hard from the south-west, but at 8.45 A.M. on the 22nd she disappeared in the north and we did not see her again for some months. A few hours after her departure the wind increased in force, and a continuous gale raged for the next five days.

Sandell and I now made a start at erecting the tide-gauge, and after the lapse of five days got the instrument into position. We could work on it only at low tide, for much rock had to be chipped away and numerous wire stays fixed. The work was therefore of a disagreeable character. Its appearance when finished did not by any means suggest the amount of trouble we experienced in setting it up, but the fact that it stood the heavy seas for the following eighteen months without suffering material damage was a sufficient guarantee that the work had been well done.

A tremendous sea was running on the 25th as a result of the previous two days' "blow" and a heavy gale still persisting. Spray was scudding across the isthmus, and the sea for a mile from the shore was just a seething cauldron. The wind moderated somewhat on the 26th, but strong squalls were experienced at intervals throughout the day, and on the 27th a strong wind from the south-west brought rather heavy snow.

On the following day a westerly gale sprang up which shifted suddenly to south-south-west and south-west in the evening and was accompanied by fierce hail and snow-squalls throughout the night. Without moderating to any extent the gale continued to blow on the 29th and passed

through west to west-north-west, finally lasting till the end of the month.

Something in the nature of a "tidal" wave occurred during the night of the 28th, for, on rising the following morning, I was considerably astonished to see that the sea-water had been almost across the isthmus. To effect this, a rise of twenty or twenty-five feet above mean sea-level must have taken place and such a rise appeared abnormally high. Our coal heap, which we had hitherto regarded as perfectly safe from the sea, was submerged, as shown by the kelp and sand lying on top of it, and the fact that seven or eight briquettes were found fifteen feet away from the heap.

Nothing at the wireless station was damaged and work went on as usual. The wind used to make a terrific noise in the aerial wires, but this did not affect the transmission of messages. The howling of the wind round the operating-hut interfered with the receiving, at times making it extremely difficult to hear signals; particularly on nights not favourable for wireless work.

Hamilton was at this time concentrating his attention on shags or cormorants. This species of cormorant is peculiar to the island, being found nowhere else. They are blue-black, with a white breast, and on the head they have a small black crest. At the top of the beak are golden lobes, while the skin immediately round the eye is pale blue. They remain on the shores of the island all the year and nest on the rocks in or very close to the water. They form rookeries and build nests of grass, laying three eggs about the end of November. The period of incubation is six weeks. They live entirely on fish, and, on that account, neither the birds nor the eggs are palatable. They are very stupid, staring curiously till one gets almost within reach of them, when they flap heavily into the water. They are easily caught when sitting on the nest, but a shag rookery, like most other rookeries, is by no means a pleasant place in which to linger.

I had the satisfaction of getting the first record from

Macquarie Island A CORMORANT ROOKERY HASSELBOROUGH BAY *Blake*

the tide-gauge on the first day of July, but the clock worked erratically, requiring some attention.

Hamilton had a lobster-pot set some distance from the shore and anchored to a float, but unfortunately the pot was lost in the rough seas at the end of June. He had a couple of fish-traps also, but, in view of this disaster, he decided to set these in Aerial Cove, where the water was quieter. Having a couple of sea leopard heads which required macerating, he baited the trap with them and lowered it into the water, securing it to the rock with a steel wire.

Taking advantage of a bright sun on the following day, Blake and Hamilton went to "The Nuggets" and took some geological and biological photographs, which on being developed turned out well. They had occasion to enter one of the unoccupied huts down there and found a wild cat a little more than half grown, which they caught and carried home with them. He was of the usual tabby colour and by no means fierce, quickly yielding to the coaxing treatment of his captors. He made himself quite at home in the Shack, and we looked forward to a display of his prowess as a rat-catcher.

A bright display of the aurora occurred on the night of July 4, the ribbons and streamers of light being well defined and occasionally slightly coloured. We could establish no connexion between this extraordinary outburst and the fact that it occurred on American Independence night, but it was certainly the most energetic manifestation of the phenomenon we had so far witnessed. Many " glows " had been seen, and also a few displays of the arch-shaped form, but none had shown much activity or rapid movement.

The operator was requested by the Pennant Hills high-power wireless station at Sydney to listen for signals tapped out during the daytime, and Sawyer spent a couple of hours on certain mornings assisting in these tests, which were attended with some success. We occasionally received

press news from land stations or from ships passing across the Tasman Sea, but it was only a brief summary of the cable news: enough to whet one's curiosity, rarely ever satisfying it.

Very cold, rough weather was experienced on the 6th and 7th and a temperature of 26° F. occurred on the latter date, while the maximum did not reach freezing-point. Much snow and soft hail fell, and the ground set hard. The weather interfered to some extent with the tide-gauge clock, and it became so unsatisfactory that I took it to pieces on the 9th and gave it a thorough cleaning, after which it had a new lease of life.

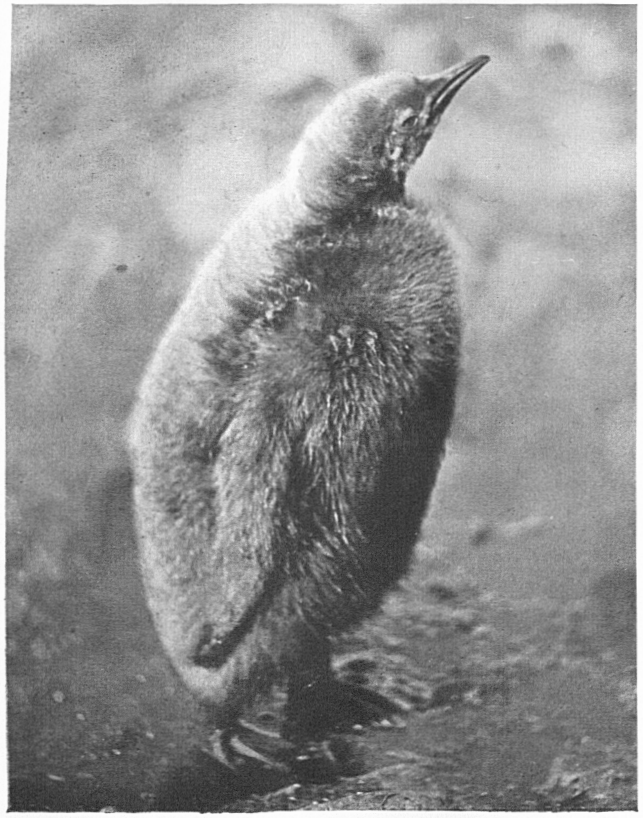
We received a message on the 11th saying that the *Aurora* had arrived in Dunedin, "all well," but had experienced a very rough voyage which greatly interfered with the dredging and sounding programme.

Our tank water gave out for the first time on the 12th. The precipitation for a fortnight had been in the form of dry powdery snow and soft hail; the wind blowing it off the roof before it had a chance to thaw, thus robbing us of our usual water-supply. For a while we had to use swamp water, which contained a good many insects of various kinds and had a distinctly peaty flavour. Finding good water running from the hill-tops down a deep gully on the east coast, three-quarters of a mile away, we carried drinking water from there, using the other for washing up.

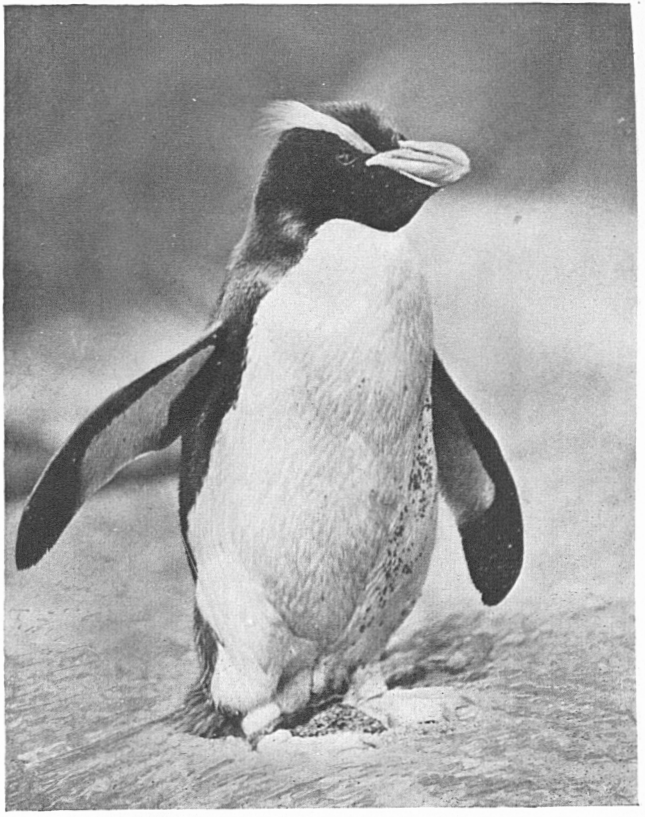
The 13th was a most delightful day—bright sun, very little wind and fresh exhilarating air. Blake and Hamilton went out early on a photographing excursion, and, later on, the latter shot and skinned a white giant petrel.

During the third week of July a very low tide exposed rocks, ordinarily submerged, and Hamilton was occupied all the week in collecting marine organisms, worms and plants and then preserving, bottling and labelling them.

A most peculiar sight was witnessed on the 17th. Aerial Cove is a favourite nesting-place for shags, and they may be seen in twos and threes flying round in that direction



Macquarie Island A YOUNG KING PENGUIN *Hamilton*



Macquarie Island A SCLATER PENGUIN *Hamilton*

almost any time during the day; but on this particular day a kind of wholesale exodus from the cove took place, and large flocks of them followed each other for a couple of hours. They congregated on the rocks along the east coast, or settled in the water in scores; the latter fact suggesting that the probable reason for this extraordinary behaviour was the presence of unusual shoals of fish.

We used to relax and have a game of cards occasionally, while our small organ became a medium of much enjoyment. All the members except one played well enough to enjoy themselves and to give pleasure to the others. There was a distinct predilection in favour of "ragtime" and I must say I liked to hear that music at frequent intervals. Any one who plays a musical instrument knows that the mood of the player is generally reflected in the character of the music, particularly when he sits down and plays in a casual way.

The pursuit and killing of a sheep had now become something in the nature of an experience, and when Sandell and I went hunting for one on the 20th, we realized it before we reached home. The flock was very timid, and when disturbed on North Head invariably came past the wireless station close to the engine-hut. Sandell concealed himself there with a gun, while I went out to startle the animals. They did not fail to do their part, but Sandell missed and the shot frightened them. He then rushed out and fired another shot as they were running, managing to hit one, which immediately dropped behind and ran to the edge of the cliff. We did not want to shoot the sheep at this moment, as it would have fallen about two hundred feet, so we cautiously approached to drive it away. The poor creature simply took a leap out into space and landed on the talus below, down which it rolled to the water's edge. We scrambled down and skinned it, having to carry the carcase along the rocks at the base of the cliffs, and getting many duckings on the way.

On July 26 I went round to Aerial Cove with Hamilton

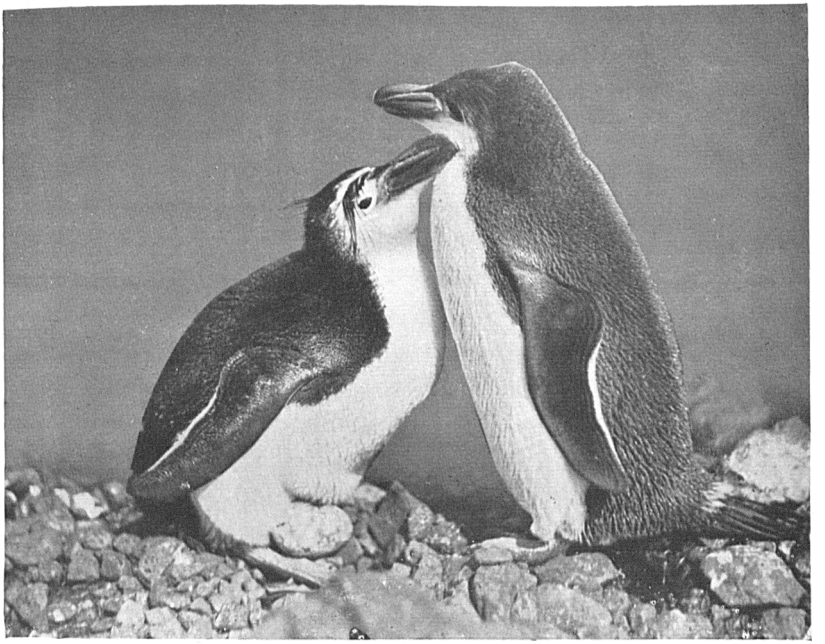
to have a look at the fish-trap, but it had disappeared, the wire having broken, apparently through the continual friction against rock. He had previously caught some fish in it, and it was rather a misfortune to lose it so soon.

During the last week of the month we all had our hair cut. On arrival at the island, several of us had it shorn very closely with the clippers and had not trimmed it since then, growth being very slow. We had a proper hair-cutting outfit and either Blake, Hamilton or Sandell acted as barber.

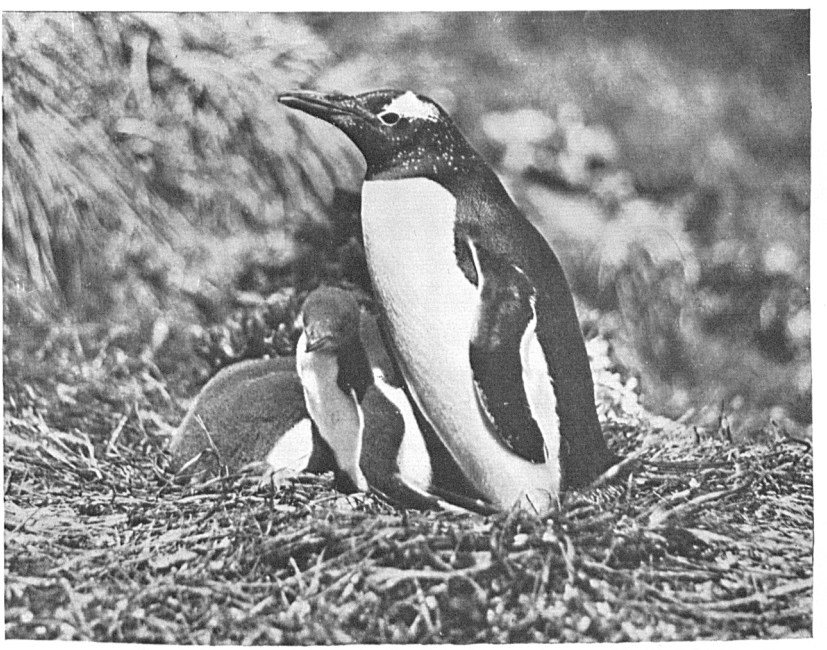
Blake was an expert with the needle and did some really neat mending, while with the aid of some woollen thread and a mug he darned holes in his socks most artistically. He was the authority on how, when and where to place a patch or on the only method of washing clothes. The appearance of his articles when washed, compared with mine, made me wonder.

Hamilton was busy, about this time, dredging in swamp pools and securing specimens of the rockhopper or gentoo penguin.

The small gentoo penguins, like the King penguins, do not migrate and are few in numbers. They form diminutive colonies, which are always established on mounds amongst the tussock, or on the hill sides not far from the water. Their eggs, which are globular in shape, are about the best of the penguin eggs for eating, and if their nests are robbed the birds will generally lay again, although I think they could not lay more than four eggs. They build their nests of grass and plant leaves, and occasionally have been known to establish a fresh rookery after their first one has been robbed. They are more timid than any other species of penguin, and leave the nests in a body when one ventures into the rookery. The skuas take advantage of this peculiarity to the length of waiting about till a chance presents itself, when they swoop down, pick up an egg with their beak and fly off. The penguin makes a great fuss on returning to find that the eggs are gone, but generally finishes up by



Macquarie Island ROYAL PENGUINS ON THE NEST *Hamilton*



Macquarie Island GENTOO PENGUIN AND YOUNG *Hamilton*

sitting on the empty nest. We have frequently put ten or a dozen eggs into one nest and watched the proprietress on her return look about very doubtfully and then squat down and try to tuck the whole lot under herself with her beak.

Weather conditions were rough enough during July, but occasionally a fairly quiet day would occur. High winds were experienced on ten days, the greatest hourly average for any twenty-four hours being thirty-two miles, but no day averaged less than ten miles. Precipitation occurred on twenty-one days, mostly in the form of snow and soft hail. The mean temperature was 37·7°, with extremes of 43·3° and 26° F. The average percentage of cloud was 78; somewhat less than usual and due to the greater frequency of south-west winds, which almost always bring a broken sky.

Now that our life was one of smooth routine I devoted a good deal of time to reducing the meteorological observations. Hourly pressure and temperature readings as well as descriptive remarks, averages and other details required to be summarized, and this occupied a considerable amount of time, so I made a practice of spending a couple of hours each day on the work, whenever possible, hoping thereby to pick up the "leeway." I did not take too kindly to inactive writing in the Shack, but the weather conditions were such that I was glad to stay indoors, though that meant enduring the inevitable cold feet. The floor of the Shack was never warm, and of course there were no carpets.

Mac developed a great animosity against the rats and thoroughly enjoyed rooting them out on all occasions. The only explanation of their presence on the island is that they had arrived in the ships which were wrecked along the coasts. They got into the Shack several times, and we simply brought in Mac and shifted things about till she caught them.

Rough weather occurred during the first week of August, and with occasional temporary weakenings a gale blew throughout, reaching fifty miles an hour at different times.

Snow, hail and sleet fell every day, and on the 3rd the temperature was below freezing-point all day. The Shack, which always shook a little in exceptionally heavy gales, now vibrated a good deal in a forty-mile wind, no doubt feeling the effects of the beating it had undergone.

Blake found a cave running through North Head and went round, on the 5th, to examine it. He proved it to be about sixty yards from opening to opening, and to widen out very much inside; the roof being about fifteen feet above the floor.

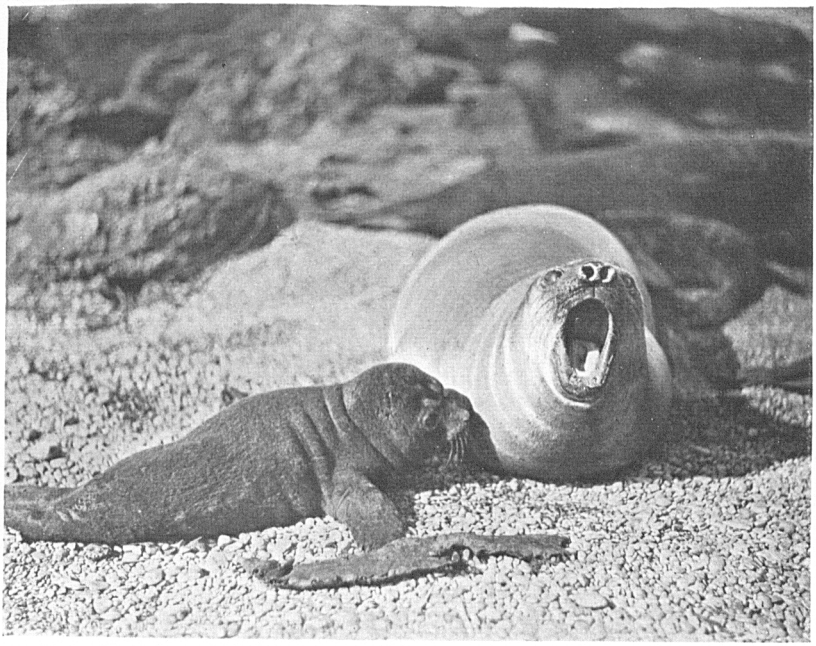
Hamilton and Sandell went along the coast on the 6th and brought home a dozen Maori hens for the pot. Hamilton secured some spiders, parasites on birds and many beetles under the moss and stones on the site of a penguin rookery, besides shooting a few terns.

The tern is a very pretty bird with light grey plumage, a black head and red beak and feet. We found no nests on the island, though the fact that the birds remain throughout the year implies that they breed there. They fly very fast while not appearing to do so, but their movements are by no means graceful. They flit about over the water close to the shore, every now and then dipping down picking up morsels and keeping up a constant, shrill squeaking.

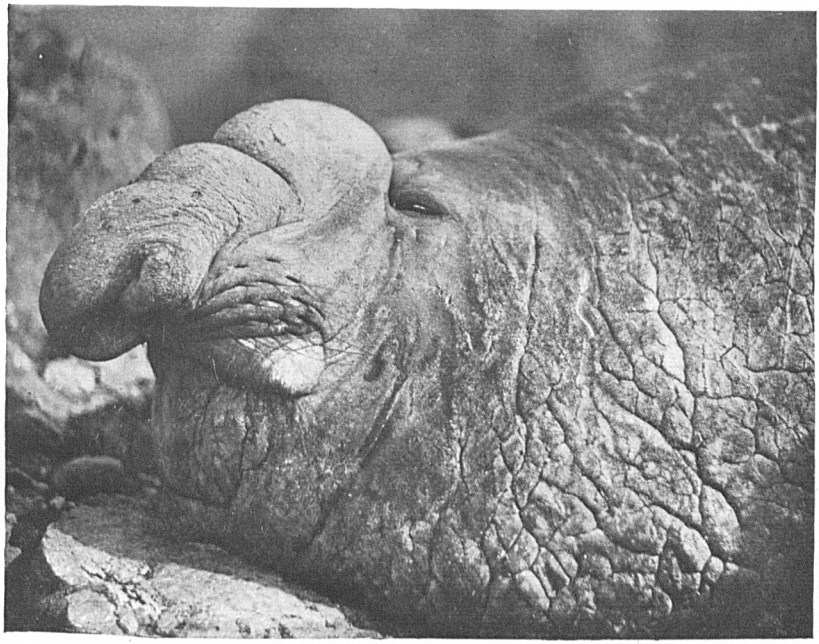
The sea was so high on the 7th that it reached the weight of the tide-guage and, lifting it up, unshipped the recording gear, as the steel wire flew off the wheel before the latter could take up the slack. I deemed it advisable to use stout cord instead of wire in the future and made a protective slot for the weight. I had blocked up the seaward side of the pipe with rocks, but found that these caused a deposit of silt so I had to get into the water at low tide and shift them all out again to clean away the accumulation of sand.

Very heavy snow fell during the afternoon, the flakes being the size of half a crown. A fresh north-north-west wind dropped to a calm at 4 P.M. and almost immediately it began to snow, the island being quite white by 5.30 P.M.

Bright sunny intervals alternated with light snow-squalls



Macquarie Island A COW SEA ELEPHANT AND PUP *Blake*



Macquarie Island THE HEAD OF A BULL SEA ELEPHANT *Hamilton*

on the 10th, and the temperature was below freezing-point all day. It was pleasant to be out of doors, and I walked along to the west coast to see if there were any signs of activity amongst the sea elephants.

An unmistakable sign of the near approach of the breeding season was the presence of an enormous old bull, almost too fat to move, lying on the beach. Very few small ones were seen, as, on the arrival of the adult males and females for the breeding season, the young ones leave for a while, presumably in order to get fat for the moulting period, or because they are afraid of the bulls, who are particularly savage at this time. The full-grown bulls attain to a length of twenty feet, and have a fleshy proboscis about eight or ten inches in length hanging over the mouth, suggesting the trunk of an elephant. It is from this fact that they derive the name of sea elephant.

There is a considerable disparity in size between the adult male and female, the latter very rarely exceeding eleven feet, though we have seen a few twelve and thirteen feet long. The females have no snout development and some of them facially very much resemble a bull terrier. The adults are called bulls and cows, while, curiously enough, in the sealers' phrase, the offspring are referred to as pups. The places where large numbers of them gather together during the breeding season are known as rookeries! "Rookery" appears to me to be inapplicable to a herd of sea elephants, though "pup" supplies a more apt description of the young.

The pups, born during September or early October, are covered with a long, black, wavy fur, which they lose when about two months old, and in its place comes a growth of silver-grey hair, which changes later into the ordinary brown colour of the full-grown animal.

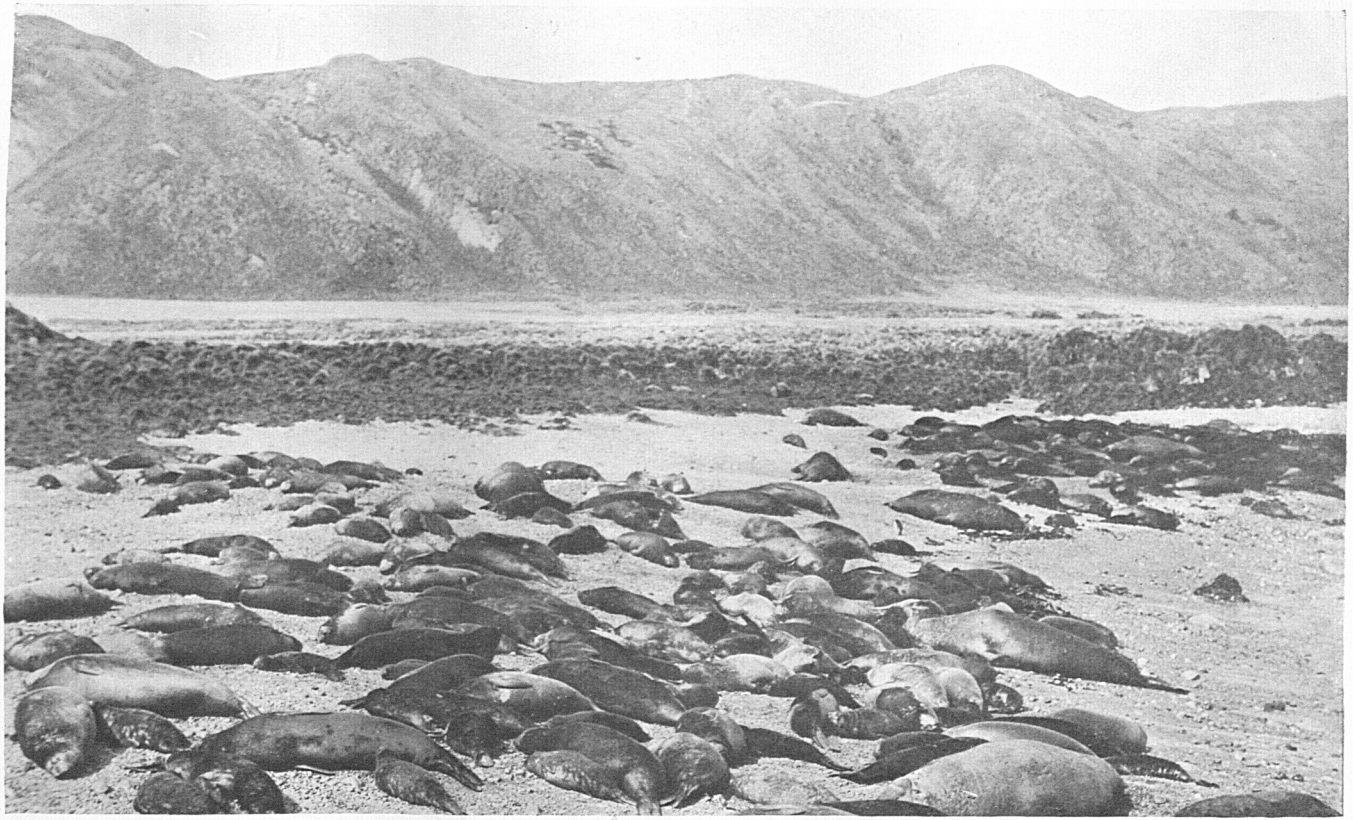
The old males and females leave the island about the end of January, and are not seen again (except a few stray ones) till August in the case of the males, and until September in the case of the females.

The fact that the bulls arrive first leads one to the conclusion that their feeding-grounds must lie at a considerable distance and, in the journey therefrom, the males, being the stronger, should arrive before the females, who are heavy with young and probably make a somewhat leisurely progress, feeding by the way.

The rookeries vary in size, containing from half a dozen to four or five hundred cows; in the last case, of course, being an aggregation of smaller rookeries, each with its proprietor, in the shape of an old bull, lying in or somewhere near the centre. The normal rookery, as far as I could judge, seemed to be one that contained about forty cows, but once the nucleus was formed, it was hard to say how many cows would be there before the season ended, as females keep arriving for a period of about three weeks.

The young vary in length from three and a half to four and a half feet, are born within a few days of arrival and suckled for about a month, becoming enormously fat. The cow, who has not eaten during the whole of this time and has become very thin, then leaves the pup, but remains in the rookery for about two days, after which she escapes to sea, remaining there till the beginning of January, when she returns to the island to moult. The pups when weaned get such rough usage in the rookery that they soon make off into the tussock and sleep for about a month, living on their fat and acquiring a new coat. The noise in one of the large rookeries is something to remember—the barking of the pups, the whimpering and yelping of the mothers and the roaring of the bulls.

Another feature in connexion with the rookery is the presence of what may be called unattached bulls, which lie around at a little distance from the cows, and well apart, forming a regular ring through which any cow wishing to desert her pup or leave the rookery before the proper time has very little chance of passing, as one of these grips her firmly with his powerful flipper and stays her progress. The lord of the harem, in the meantime, hastens to



Macquarie Island *Sandell*

A ROOKERY OF SEA ELEPHANTS NEAR THE SHORE AT THE NELSON REEF, CHIEFLY COWS AND PUPS

the scene of the disturbance, whereupon the other bull decamps.

The sea immediately in the vicinity of a large rookery is generally swarming with unattached bulls, who may be seen with their heads out of the water eyeing each other and keeping a bright look out for escaping cows. Now and again one may see a bull in the water gripping a cow with his flipper, despite her struggles, and roaring at a couple of others who show up menacingly quite close to him.

It may be remarked that towards the end of the season changes in the proprietorship of a rookery are rather rapid, as continuous raids are made by individuals from the outside. The need of continuous vigilance and the results of many encounters eventually lead to the defeat and discomfiture of the once proud proprietor.

I have never seen two bulls fight without first indulging in the usual preliminaries, that is, roaring and advancing a few yards and repeating the performance till within striking distance. Then both animals rear high up, supporting themselves on the lower part of the body, and lunge savagely with their whole weight each at his opponent's head or neck, tearing the thick skin with their teeth and causing the blood to flow copiously. Several lunges of this kind generally finish the battle, whereupon the beaten one drops to his flippers and makes all haste towards the water, glancing fearfully behind him on the way. We have seen bulls with their snouts partly torn off and otherwise injured, but worse injuries must occur in the rare, desperate battles which sometimes take place between two very much enraged animals.

When a bull in the centre of a rookery has occasion to rush at an interloper, he does so without regard to anything in his way, going over cows and pups alike and very often crushing some of the latter to death. Again, it seems as if all the outlying bulls recognize the noise of the rookery bull, because each time he roars they all lift up their heads and take notice, whereas others who have just been roaring

have not the slightest regard paid to them, except perhaps by one immediately concerned.

The bull, during the breeding season, will on provocation attack a man, and it is surprising how quickly the former covers the ground. But on the whole he is an inoffensive animal. It is, of course, impossible to venture into a rookery, as the cows are very savage when they have the pups with them, but one can approach within a few yards of its outskirts without danger. Their food consists of cuttlefish, crabs and fish, and it is probable that they frequent the ocean where this food is plentiful, when they are absent from the island.

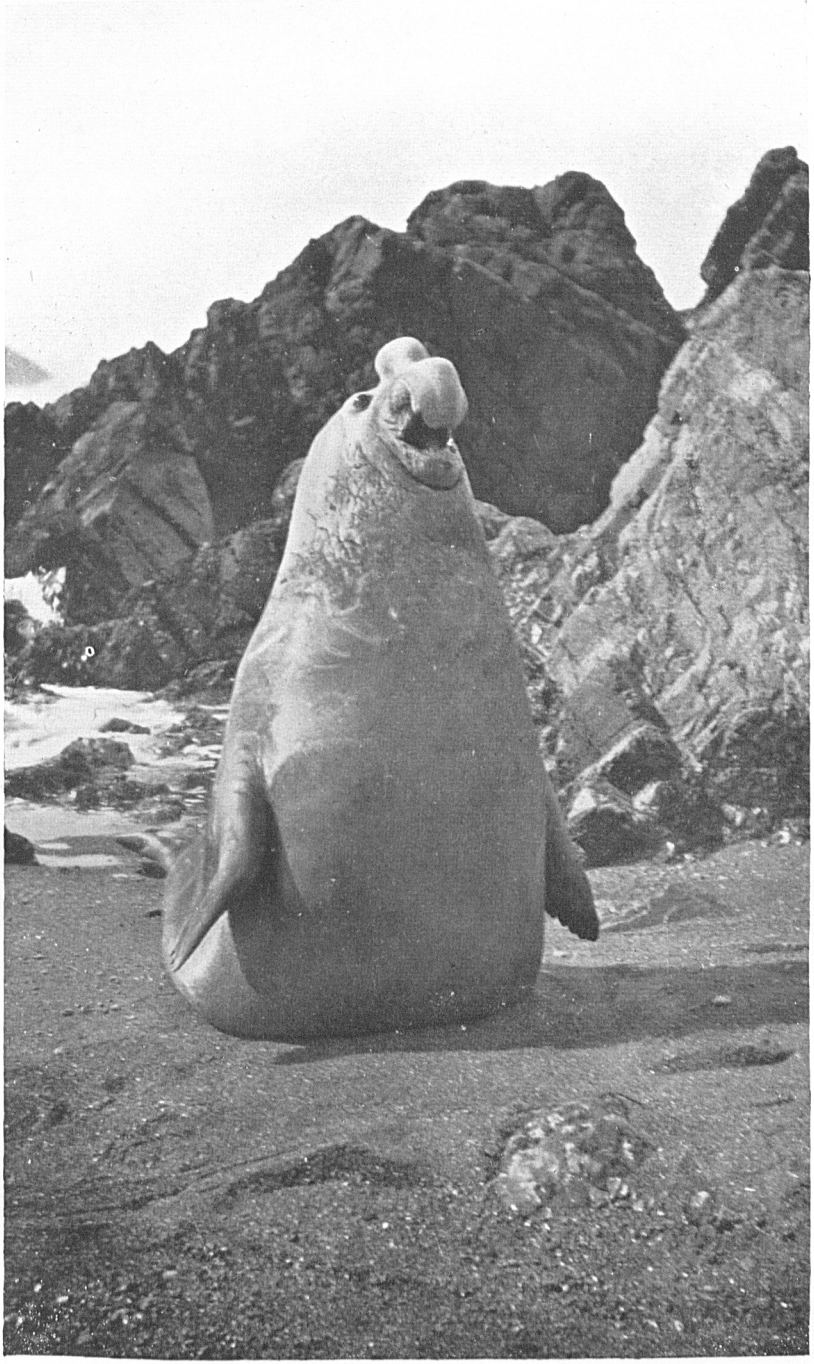
It has been stated that these animals are nearly extinct, but a visit to Macquarie Island during the breeding season would be enough to convince anybody to the contrary. There are thousands of them, and though about seven hundred are killed during a season, the increase in numbers each year, on Macquarie Island alone, must be very great.

The skuas were now returning to the island and their numbers and corresponding clamour were daily increasing. They were the noisiest and most quarrelsome birds we had, but their advent, we hoped, marked the return of less rigorous weather.

Blake left for Lusitania Bay on the 17th, intending to spend several months there in order to survey and geologically examine the southern end, so we gave him a send-off dinner. He had a very rough trip to the place, having to spend two nights in a cave about six miles from his destination, as a result of getting lost in a dense fog.

Hamilton made a wire fish-trap to replace the one which he had lost, and succeeded in getting a few fish on lowering it for the first time. He discovered parasitical mites all over them on the outside, and the flesh contained many worms.

A heavy north-north-west gale was experienced on the 26th, but the weather during the last three days of August was very quiet, either calms or light winds prevailing, and



Macquarie Island *Sandell*

A BULL SEA ELEPHANT IN A FIGHTING ATTITUDE

we took the opportunity to do some work on Wireless Hill. All the wire stays were tightened, and various ropes which appeared to require attention were renewed, while, as a final improvement, the aerial was hauled as tight as we could make it.

We heard on July 31 that the *Rachel Cohen*, a sealing-vessel, had sailed for Macquarie Island and was bringing a few articles for us, so there was something to which we could look forward in the immediate future.

The most remarkable feature of the month's weather was the wind, as gales blew on eleven days, and on seven other days the velocity reached twenty-five miles per hour. Precipitation occurred on twenty-seven days, and the average percentage of cloud was eighty-four. The mean temperature was 38·1° with extremes of 45·3° and 26° F. A prolonged display of auroral light occurred on the night of the 17th, though no colours other than the light lemon-yellow of the arch and streamers could be seen.

Bull elephants were now arriving in great numbers, and these monsters could be seen lying everywhere on the isthmus, both up in the tussock, on the beaches, and among the heaps of kelp. Now and again one would lazily lift a flipper to scratch itself or heave its great bulk into a more comfortable position.

The island is the habitat of two kinds of night-birds, one kind—a species of petrel (Lesson's)—being much larger than the other, both living in holes in the ground. They fly about in the darkness, their cries resembling those made by a beaten puppy. The smaller bird (apparently indigenous and a new species) was occasionally seen flying over the water during the day, but the larger ones come out almost exclusively at night. A light attracts them and Hamilton, with the aid of a lantern and a butterfly-net, tried to catch some. Others swooped about, well out of range, shrieking the while in an uncanny way. Numbers of them were secured afterwards by being dug out of their holes, Mac being just as keen to locate them as Hamilton was to secure

them. They cannot see well during the day, and seem to have almost lost the use of their feet. They lay two small, white, thin-shelled eggs at the end of their burrow; and in certain parts of the island, where the burrows are numerous, the sound made by hundreds of them at once, during the nesting season, somewhat resembles that made by a high-power Marconi wireless set at close range.

Before Blake left Lusitania Bay, I promised to see that the hut on Sandy Bay was re-stocked with provisions by the middle of the month, so, on the 8th, Hamilton, Sandell and I carried a supply of stores down there, leaving a note which informed him that we expected the *Rachel Cohen* to arrive any day, and asking him to return to the Shack. On the way down we came upon a vast quantity of wreckage piled up on the beach, midway between "The Nuggets" and Sandy Bay. This was all that remained of the sealing schooner, *Jessie Nichol*, which had been wrecked on December 21, 1910. Three men were drowned, their bodies being interred among the tussock, each marked by a life belt and a small board on which the name was roughly carved.

On our homeward trip we caught some wekas for the pot and duly arrived at the Shack, tired, wet and hungry.

Next day, while sitting in the Shack reducing records, I heard a yell from Hamilton to the effect that the *Rachel Cohen* was in sight, and about an hour later she dropped anchor in North-East Bay.

The sea was fairly smooth and no time was lost in bringing a boat ashore with the mails, of which each man received a share. A gang of sealers was landed with a view to obtaining sea elephant and penguin oil. I had wirelessed asking for a dinghy to be sent down, which would enable Hamilton to do more marine work; and it now came to hand. Further, we received an additional supply of photographic material and some rubber tubing for the anemometer, but the much-needed boots did not arrive.

On the 18th a strong southerly gale sprang up and

compelled the *Rachel Cohen* to seek safety in flight; so she slipped her cable and put to sea. She had not yet landed all the sealers' stores and was forced to hang about the island till the weather moderated sufficiently for her to return to an anchorage.

The gentoo penguins, which had been observed at the beginning of the month building their nests, commenced to lay, and the first ten eggs were collected by us on September 18. Many sea elephant rookeries were now well-formed as the cows began to arrive about the 11th and were soon landing in large numbers. The first pups were heard on the 20th, and Bauer and I walked along to the rookery from which the barking came and had a look at the new-comers. There were only four, none of which was more than a few hours old, but they yapped their displeasure, and the mothers made frantic lunges at us when we approached to get a close view of them.

The sealers always gave the animals time to form their rookeries and then killed the bulls for oil. A well-conditioned full-grown animal yields about half a tun of oil, and as the commodity when refined has a market value of from £20 to £25 per tun, it will be seen that the industry is a profitable one. The cows being small never have a very thick coating of blubber, but I have seen bulls with blubber to a depth of eight inches, and some of them yield nearly two thousand pounds, though I should estimate the average yield at about one thousand one hundred pounds. The sealers in the early days used to obtain the oil by cutting the blubber up into very small pieces and melting it down in "try" pots. These pots, many of which may be still seen about the island, were made of very thick iron and the fuel used was the refuse taken from the pot itself. In the present method steam digestors are used, and the oil from the melted blubber is drawn off, after steam has been passing for twelve hours. Coal is brought down by the sealing-vessel to be used as fuel. The "elephant season" lasts only about three months, and within about four weeks of its conclusion,

the "penguin season" begins; the same gang of men being employed as a rule. The most difficult operation in connexion with both of these industries is undoubtedly the loading and unloading of the vessel. If auxiliary power were used, the ship could then steam to within half a mile of the shore, but as it is, a sailing-vessel has to anchor about two miles off and the oil is towed in rafts over that distance.

We heard sounds from Adelie Land wireless station for the first time on September 25, 1912, but the signals were very faint and all that we could receive was: "Please inform Pennant Hills." Sawyer called them repeatedly for several hours, but heard no acknowledgment. Every effort was made to get in touch with them from this time forward, Sawyer remaining at the instrument until daylight every morning.

The Royal penguins returned to the island on the 27th and immediately commenced to make their way to the rookeries. They had been absent since April and were very fat after their long migration.

On the 28th Blake and Hamilton started out in the dinghy for Lusitania Bay. They had already made a step and sprit, and, with a calico sail hoisted, the frail craft ran before a light breeze. Having a fair wind they made good headway along the coast, dropping in at a gentoo penguin rookery *en route*, and collecting about two hundred and twenty eggs. Mac was a passenger and was a very sick dog all the trip.

Shortly after their departure, the *Rachel Cohen*, which had been blown away on the 18th, reappeared and again anchored. The captain reported having seen numerous icebergs, some of which were very large, about thirty miles to the eastward of the island. The sealers immediately commenced to get away the rest of their stores and coal and also to put some oil aboard the vessel, but on the following day the wind increased to such an extent that, in attempting

Macquarie Island A CORMORANT AND YOUNG ON NEST *Hamilton*

to reach the ship with a raft of oil, they were blown down the coast and had to beach the boat several miles away.

On the night of the 29th Adelie Land wireless station was again heard tapping out a message apparently with the hope that some station would receive it. All we got was: "Having a hell of a time waiting for calm weather to put up more masts." Sawyer again repeatedly called, but they evidently could not hear him as no reply was received, and the above message was repeated time after time.

The weather during September was not quite so rough as that of the previous two or three months, but misty days were very frequent. Gales were experienced on six days and strong winds on nine days, but several quiet periods occurred. The average temperature was 38·6°, with extremes of 44·7° and 26° F.

October was ushered in by a strong gale and rather heavy rain-squalls. The *Rachel Cohen* had a severe buffeting, though she was lying on the lee side of the island.

Just about three-quarters of a mile to the west of the Shack were two large sea elephant rookeries, very close to each other, and on the 3rd Sandell and I went along to see what was happening there. We found about two hundred and fifty cows in the nearer one, and, as closely as we could count, about five hundred in the adjacent colony. The babel of sounds made one feel thankful that these noisy creatures were some distance from the Shack. Nearly all the cows had pups, some of which had reached a fair size, while others were only a few hours old. We saw several dead ones, crushed out almost flat, and some skuas were busily engaged gorging themselves on the carcases. These birds are indeed professional plunderers, and will venture almost anywhere in pursuit of food.

During the evening we again heard Adelie Land station working, and the burden of their message to an apparently chance audience was: "We do not seem able to get

Macquarie Island; all is well, though bad weather has so far prevented any attempt at sledging."

Sawyer again called them at regular intervals for the rest of the night, but, as before, got no response.

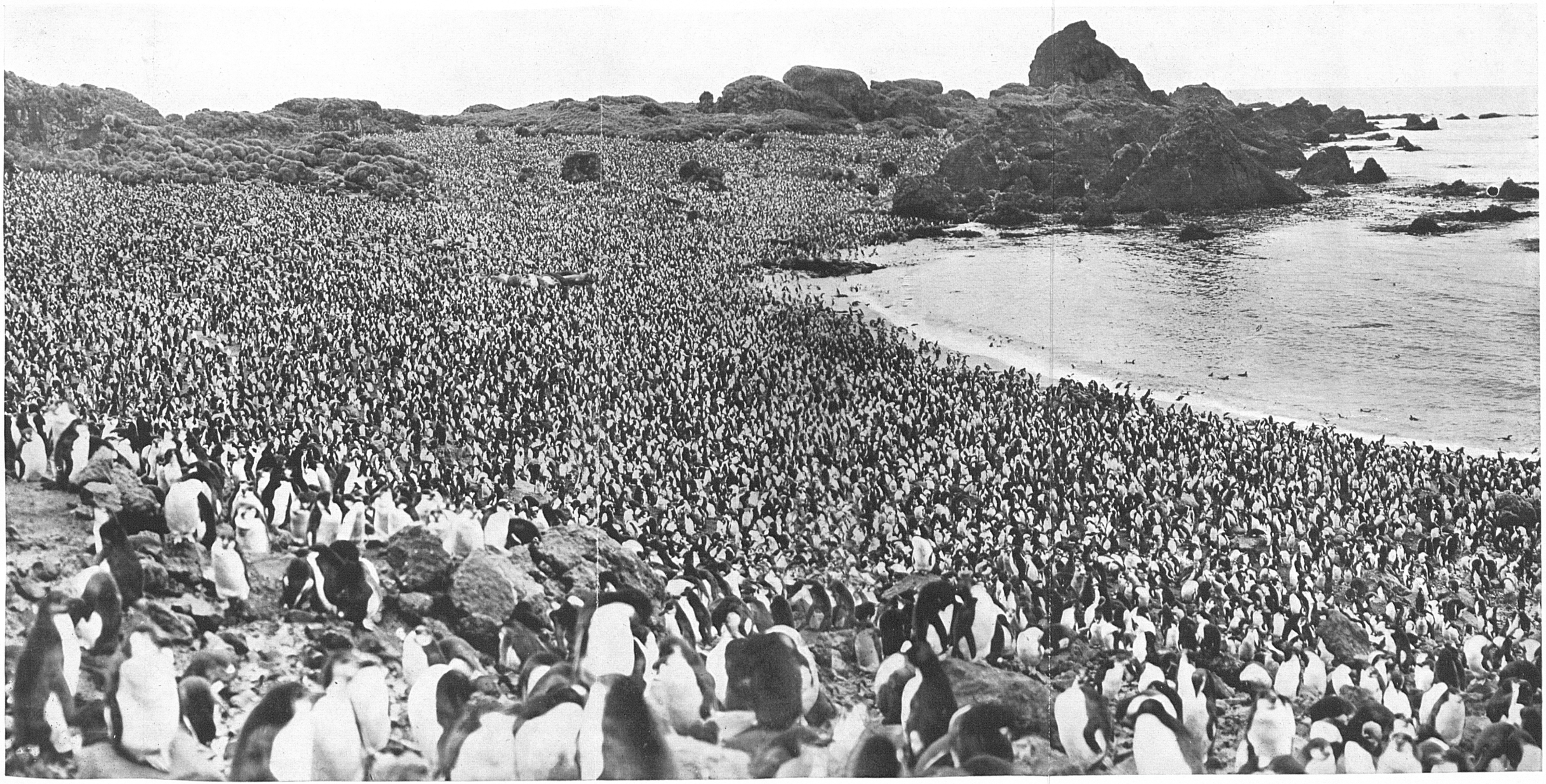
Hamilton and Blake were busy at Lusitania Bay during the first two weeks of October securing sea elephant specimens and collecting eggs. They visited Caroline Cove where is established a giant petrel rookery containing about four hundred birds, and gathered a large number of eggs—purely specimens—as they are no use otherwise.

The *Rachel Cohen* finally left us on the 8th, expecting to pay another visit in December for the purpose of taking off the sea elephant oil procured by the sealers. Sandell and I visited the gentoo penguin colony in Aerial Cove during the afternoon, for the purpose of getting a few eggs. We found plenty there and collected as many as we required. On returning to the empty nests, the birds would first of all peer round to assure themselves that the eggs were really missing, and then throw their heads back, swaying them from side to side to the accompaniment of loud, discordant cries.

Several of us started out on the 10th to visit the west coast for the purpose of getting some wekas and, incidentally, to make any observations possible. We saw thousands of sea elephants along the coast and passed many rookeries of various sizes. There were a large number of wekas about, but after shooting fourteen we were satisfied with our bag.

A westerly gale during the night proved too much for the aerial, and down it came. Blake and Hamilton were away, so Sawyer, Sandell and I went up, and after much battling and frequent use of the " handy billy " succeeded in fixing things. We also re-tightened the wire stays and thoroughly overhauled the ropes. Snow and sleet fell all the time, making the task most diasgreeable.

About the middle of the month the Royal penguins commenced to lay, and on the 17th Sandell and I went to their rookeries at "The Nuggets" and collected about fifteen



Macquarie Island

A ROYAL PENGUINS' ROOKERY

Hurley

dozen eggs, which we buried in a hole in the bank of the creek for preservation. This species of penguin is the one which is killed for oil, not because it is any fatter than the others, but because it lives in such large colonies. There is one rookery of these birds on the south end of the island which covers an area of sixteen and a half acres, whilst at "The Nuggets" there are numbers of them scattered along the banks of a creek which reaches the sea, aggregating ten acres. At the latter place are situated the oil works belonging to the sealers.

From careful observation I should say that the number of birds killed during the season would not total one hundred and fifty thousand. The method of killing—by blows from a heavy club—is about as humane as any that could be adopted, and the yearly increase in numbers in the only rookeries that are being worked is certainly greater than the decrease due to the depredations of the sealers. Apart from this, there are acres of rookeries on the island from which not a single bird is taken, and they go on year after year adding thousands upon thousands to their already vast numbers.

This species resembles the others in habits, and I shall not describe them at any length. They are of the same colour as the Victoria penguins, but have a more orderly crest. Their rookeries are always on or very close to a running stream which forms the highway along which they travel to and fro. There is no policeman on duty, but a well-ordered procession is somehow arranged whereby those going up keep to one side and those coming down keep to the other. Once they are in the rookery, however, different conditions obtain. Here are fights, squabbles and riots, arising from various causes, the chief of which appears to be a disposition on the part of some birds to loiter about. During the nesting time much disorder prevails, and fights, in which beaks and flippers are energetically used, may be seen in progress at various places throughout the rookery. The nests are made of small stones, and occasionally, a bone or

two from the skeleton of some long-dead relative forms part of the bulwarks. The attempt on the part of some birds to steal stones from surrounding nests is about the most fruitful cause of a riot, and the thief generally gets soundly thrashed, besides which all have a peck at him as he makes his way with as much haste as possible from the danger-zone. As the season advances, these rookeries become covered with filthy slush, but it seems to make no difference to the eggs, as the chicks appear in due course. When the moulting process is in full swing the rookeries are very crowded, and feathers and slush then become mixed together, making the place anything but fragrant.

A fifty-four mile gale from the west-north-west blew down on us on the 20th, but shortly after noon it weakened, and, towards evening, with the shifting of the wind to south-west, came squalls of sleet and snow and a drop in temperature. Hamilton returned from Lusitania Bay in the dinghy on the 21st, but Blake stopped there as he had not yet finished his work in that locality. The dinghy was well laden with specimens of various kinds and, on the way up, some wood and pickets were left at Green Valley for future requirements.

On the 25th Sandell and I visited the west coast, but, instead of going the usual way, we walked down the east coast and went up the creek at "The Nuggets" with a view to having a look at the penguin colonies along its course, finally crossing over the hills and getting into another creek, which we followed all the way down to the west coast. Along this creek were numerous waterfalls, one of which was quite sixty feet in height with wind-blown spray frozen white on the rocks on either side. We came across several giant petrel rookeries, and were treated to a display of the "stinker's" ability to make himself objectionable. A pair of sooty albatrosses were seen nesting on the front of a rocky steep, but on climbing up we found that they had not yet laid. After catching some wekas and taking a few photographs we returned to the Shack.

THE WILD WEST COAST OF MACQUARIE ISLAND *Blake*

On the last day of the month several of us crossed the hills to the west coast in search of plants and birds' eggs. We secured a number of plant specimens—a further sign of the arrival of spring—including two which bore a very small flower, and were most successful in obtaining skuas', giant petrels' and sooty albatrosses' eggs.

During the evening I received a message from Captain Davis stating that the *Aurora* would visit us in about three weeks' time and inquiring if we needed any supplies. This was entirely unexpected, as we thought that no more would be seen of the Ship until she came to take us home at the end of March 1913.

Earthquake shocks were felt at 1.55 A.M. and 9.35 A.M. on October 28, but did no damage other than to bring down some loose rock. Auroral displays were rather frequent but not very pronounced, and in most cases could only be classed as " glows."

A bright sunny morning on the 3rd induced Hamilton and me to make a photographic excursion along the coast. Hitherto only still-life photos had been taken, but with the sunlight we were then having, any work was possible, so we determined to have some " shots " at the sea elephants. They were rather difficult subjects, strange to say, but we spent some time amongst them and did famously, till a snow-squall made us suspend operations.

We heard the discordant but mournful cry of a sooty albatross coming from the cliff-front, so Hamilton climbed up and, after scrambling about for a while, succeeded in finding a nest, which contained one egg. This led him to look along the cliffs fronting the east coast, and on the following morning he found several nests and caught two birds, both of which were taken by hand while on the nest. They had beautiful plumage and made very fine specimens.

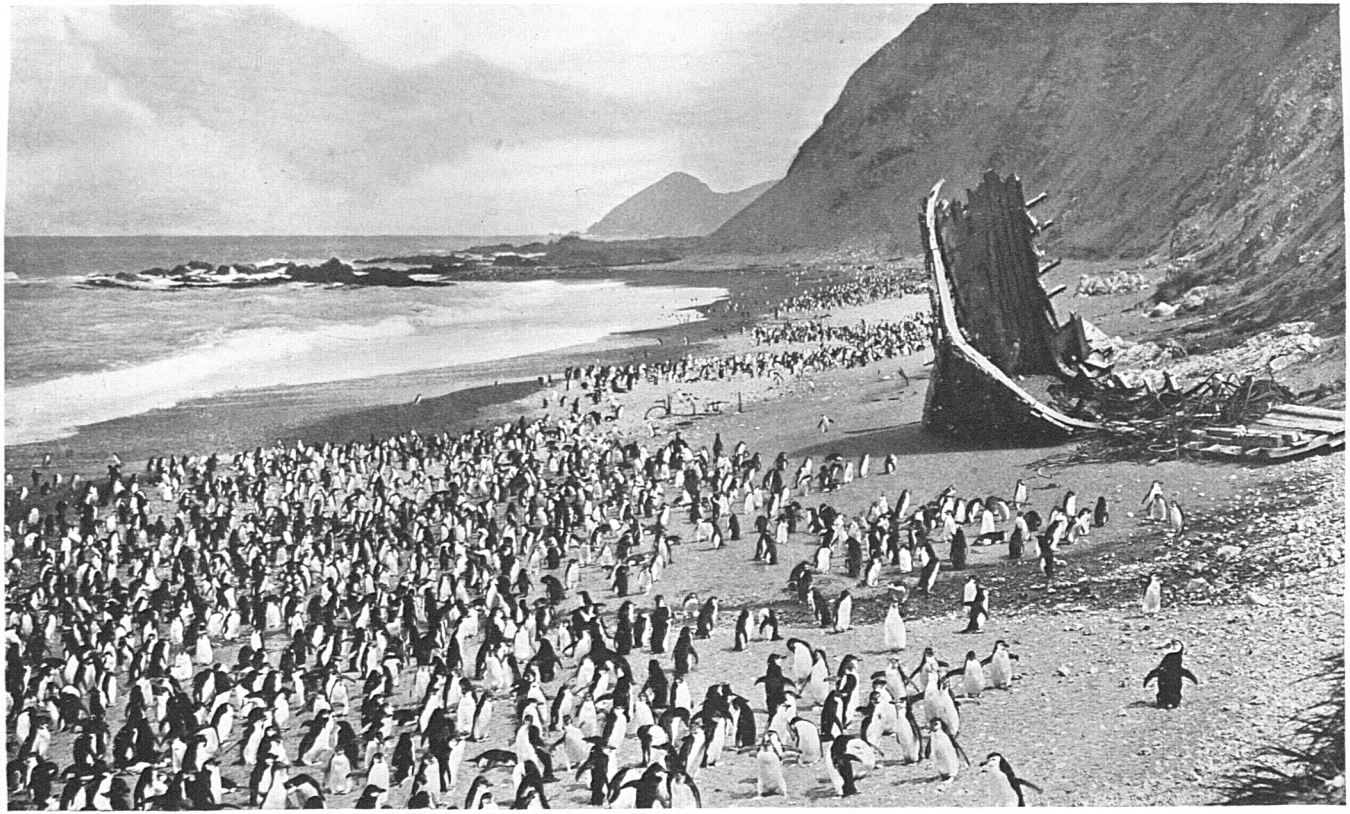
Blake returned from Lusitania Bay during the afternoon of the 4th and reported that he required only four or five days to complete the survey. The configuration of the island at the southern end is vastly different to that shown

in the published charts, and this became more apparent as Blake's figures were plotted.

The news that Piastre had won the Melbourne Cup was flashed about all over the southern ocean during the evening, and we picked it up; but as this was the first we had heard of the animal, nobody seemed much interested. It certainly gave a turn to the conversation, and quite a sporting tone permeated the discussions of the ensuing two or three days.

The subjects of discussion were usually those of environment, and most of our talk centred round sea elephants, sea-leopards, penguins, temperatures, wind, wireless telegraphy, fish, auroræ, exploration, ships, Queensland and New Zealand. Sea elephants and penguins do offer scope for a considerable amount of conversation, as one observes them under such different circumstances, and they are so odd that something remarkable is always associated with the sight of them. The weather, being practically the *bête noire* of our existence, came in for a good deal of abuse. Wireless telegraphy is a mighty interesting subject at all times, and we passed many hours of our stay in discussing its future. All the members were, allegedly, fishermen of some calibre, and when I have said that, anybody with a knowledge of the man who claims ability as an angler will know what all the others, in turn, had to receive with restrained and respectful admiration. The advantages of settlement in Queensland were so apparent to at least one member of the party that he simply could not understand why thousands were not annually killed in the rush to get to this, "the greatest of all the Australian States." Good old silky oak!

The scenery of New Zealand was almost as well known to us as to anybody who has lived in the country all his life, and three of us had never been there. We have sat round the Shack sometimes and only the roar of a sea elephant outside reminded us that we were not, as we imagined, at a Maori "tangi." The wages to be earned there, the delights of travelling, the legislators, Rotorua, kauri pine, and the



Macquarie Island THE WRECK OF THE *GRATITUDE* ON THE NUGGETS BEACH *Hurley*

moon they've got in Auckland—we've heard of all these and marvelled at them. "Kapai te Maori!"

Blake and Hamilton went to Sandy Bay in the dinghy on the 6th in order to complete some work. They improved the hut there, to the extent of making a fire-place and laying barrel-staves on the floor, afterwards bringing a boat-load of timber from the *Jessie Nichol* wreck and rigging up a board bunk sufficiently large to accommodate both of them.

While walking down to the *Clyde* wreck for some wood on the 7th I saw a strange bird on the beach, and, returning to the Shack for the gun, I got him at the second shot. He was a land bird and had evidently been blown out of his course, as none of his kind had been seen before on the island.

On getting up on the following morning I found poor old Ma lying dead, and the feathers which lay about indicated that she had been the victim of a savage assault, but whether at the teeth of a dog or the beak of a skua I was unable to determine. This was most unfortunate, as the hens had all started to lay again two days previously; but apart from this she was a funny old creature and one could almost hold a conversation with her, so we regretted her loss. However, to make amends for this disaster the Victoria penguins started to lay on the same day, and as several of their rookeries were only a few minutes' walk from the Shack, the position was much the same as if we owned a poultry farm.

Hamilton returned from Sandy Bay on the 17th and immediately set about collecting shags' eggs. He visited Aerial Cove for the purpose but did not get enough, and was compelled to go to West Point, where he gathered twenty-four dozen for specimens. He now had a collection of eggs of all birds which nest on the island, with the exception of the weka and the tern.

At 6.30 P.M. on November 22 the *Aurora* steamed into North-East Bay and dropped anchor. Hamilton, Blake and Sawyer launched the dinghy and pulled out to receive the

mails, which they brought ashore for distribution. All on board were well and Captain Davis sent word to say he would land in the morning, bringing our goods and some visitors —Professor Flynn of Hobart and Mr. Denny.

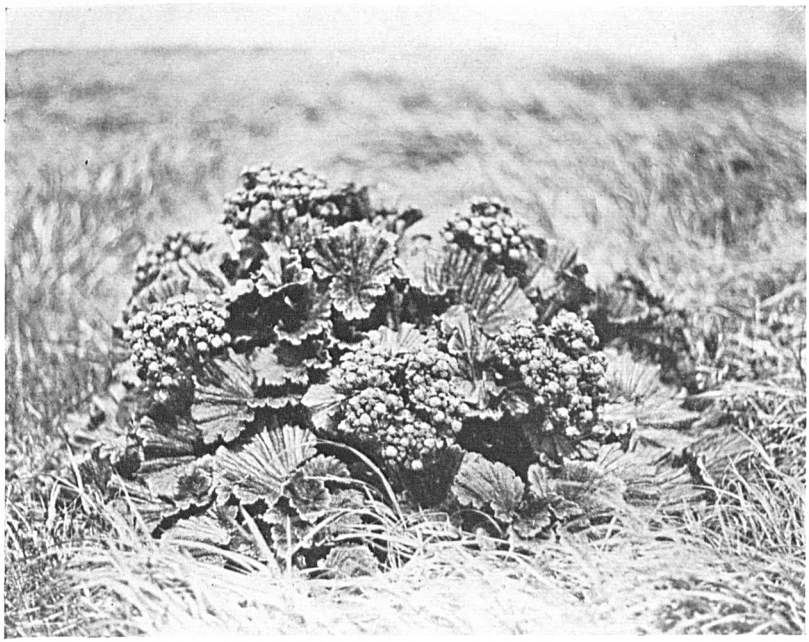
The *Aurora* next day steamed round North Head and took a series of soundings between the main island and the Judge and Clerk. These latter islets lie about eight miles to the north of North Head, and are merely rocks about eighty feet high upon which thousands of shags and other birds have established rookeries. On the following morning we said good-bye to the Ship, which weighed anchor and steamed away, leaving us once more to our own devices.

All the flowering plants were now showing their extremely modest blooms, and the tussock looked like a field of wheat, each stem having a decided ear. The gentoo penguins, as well as the giant petrels, had hatched their eggs, and the parent birds were shouldering full responsibilities.

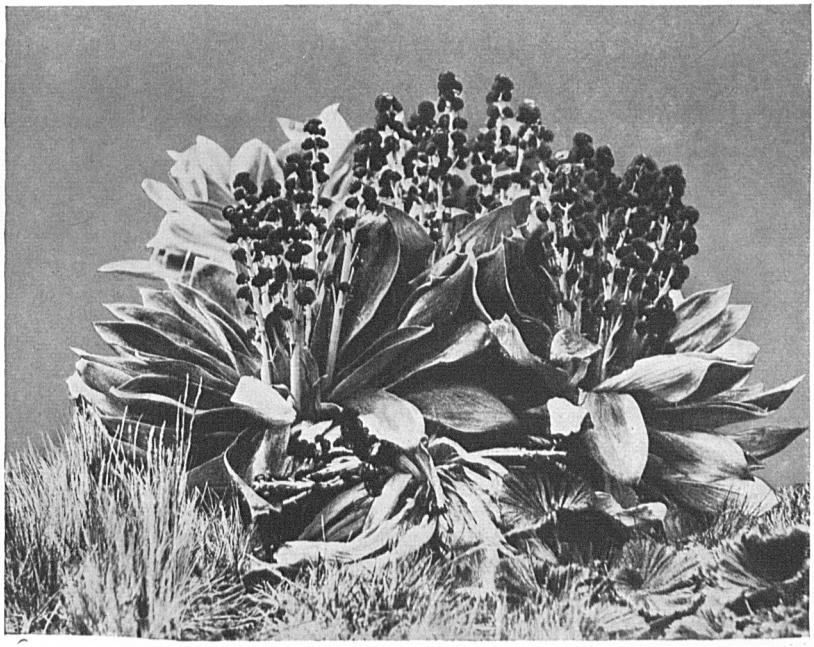
Blake and Hamilton were now prepared for another visit to the southern end. Blake had almost completed the chart of the island, and the difference between it and the published chart was very striking. In the latter case the south end was shown as being six miles wide, whereas it is in reality only a little more than two miles across, and the width of the island is nowhere more than three and a half miles. About twenty miles from the southern end lie two islets known as the Bishop and Clerk. The former, which is the larger, is covered with a growth of tussock, while the latter is mainly bare rock.

A distinct rise in temperature was noticeable during November and the mean worked out at 41·6°, while the extremes were 49° and 32° F. Strong winds were recorded on thirteen days and six short-lived gales occurred. We had less precipitation than during any previous month, as thirteen dry days were experienced. The average cloudiness was 93 per cent.; largely due to the frequent foggy or misty weather.

On December 2, at 10 A.M., Blake and I packed our



Macquarie Island KERGUELEN CABBAGE *Hamilton*



Macquarie Island FLOWERING PLANT *Hamilton*

sleeping-bags and blankets and started for Sandy Bay. The swags weighed only thirty-five pounds each and we made a rather quick trip.

After repairing the dilapidated shack, we sallied out for the purpose of catching our evening meal, and with the aid of Mac soon succeeded in getting eight wekas. A sea elephant was then killed, and the blubber, heart and tongue taken ; the first-named for use as fuel and the others for food. We cleaned the wekas and put them in the pot, cooking the whole lot together, a proceeding which enabled us to forgo cooking a breakfast in the morning. The beach was swarming with young sea elephants and many could be seen playing about in a small, shallow lagoon.

Just south of the hut there is a sandy spit and one of the only stretches of beach on the island, where thousands of penguins from the adjacent rookeries were congregated, amongst them being three King penguins, which were easily distinguishable on account of their great size.

Feeling a little weary, I sought the hut about 9 P.M. and turned into the sleeping-bag, which was placed on a board bottom covered with tussock, which was by no means uncomfortable. The old place smoked so much that we decided to let the fire die down, and as soon as the smoke had cleared away, the imperfections of the hut became apparent; rays of moonlight streaming through countless openings in the walls and roof.

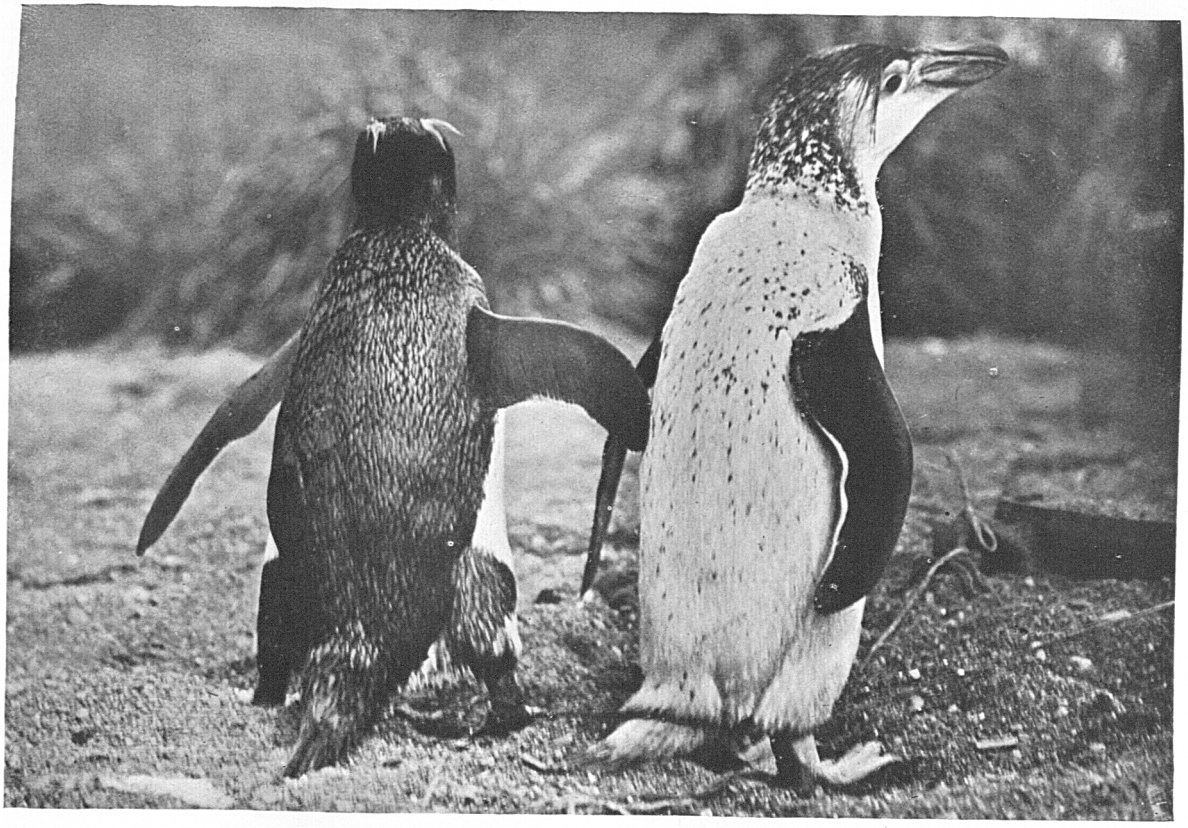
We rose at 6.30 A.M. While Blake lit the fire, I went out to fill the billy at a small stream running out of the hills about sixty yards away. After breakfast we set out for Green Valley, but had not gone very far when it began to blow very hard from the south, straight in our faces, and we scrambled on towards our destination amidst squalls of snow, hail and sleet. Eventually we reached the valley and had a somewhat meagre lunch in a small cave. The title " cave " rather dignifies this hole in the rock, but it was the only friendly spot in a most inhospitable locality, and we were inclined to be generous.

On the whole, the length of coast we had traversed was found to be as rough as any on the island. There is not a stretch of one hundred yards anywhere that can be termed "good going." In many places we found that the steep cliffs approached very close to the water, and the mournful cry of the sooty albatross could be heard coming from points high on the face of the cliffs, while the wekas were so tame that one could almost walk up and catch them.

A large creek whose banks are overhung with a coarse growth of fern makes its way out of the hills and runs into Sandy Bay. Just a little to the south of this creek Blake discovered a terminal moraine about two hundred yards in length and fifty feet wide. It rests on sandstone about fifteen feet above the present sea-level and the boulders consist of polished and sub-angular blocks of sandstone and porphyry of various sizes. It evidently belongs to the valley or to a later stage of glaciation. The rocks along the coast are all a volcanic series, and basic dykes are visible in many places.

We arose at 7 A.M. next day and breakfasted on porridge, weka, fried heart, "hard-tack" and cocoa. Leaving the hut shortly afterwards we climbed on to the hills and travelled south for several miles in order to fix the position of some lakes and creeks. There was one lake in the vicinity about half a mile long and to all appearances very deep. It lay between two steep hills, and the grassy bank at one end and the small sloping approach at the other gave it an artificial appearance, while the water was beautifully clear and perfectly fresh. At the sloping end, dozens of skuas were busily engaged washing themselves and the flapping of their wings in the water made a remarkable noise, audible at a considerable distance on the hill-tops. On returning to the hut at Sandy Bay several rabbits secured by Mac were cleaned and put on to boil.

Next morning a dense mist shrouded the island till about 11 A.M., but the weather becoming fine and bright, we started for the west coast about noon. During our progress along the bed of a creek, Blake discovered what



DARBY AND JOAN. TWO RARE EXAMPLES OF PENGUINS WHICH VISITED THE SHACK, MACQUARIE ISLAND. ON THE LEFT A SCLATER PENGUIN, ON THE RIGHT AN ALBINO ROYAL PENGUIN *Hamilton*

was believed to be a glacial deposit containing fossil bones, and considerable time was spent in examining this and attempting to extract whole specimens, thereby making it too late to proceed to the west. On returning to the hut we decided to pack the swags. We reached home just in time for tea, finding that nothing unusual had occurred during our four days' absence.

Hamilton and Blake went out fishing in the dinghy on the 9th and made a remarkable haul of fish, sixty in number, ranging in size from a few ounces to twelve and a half pounds. They were all of the same species, somewhat resembling rock cod, but as usual they were covered with external parasites, and their flesh was full of worm-cysts. Hamilton preserved a number of them and the rest were cooked, but we did not relish them very much and the one meal was enough.

On December 11 we had a hard gale all day, the anemometer recording " bursts " of over fifty miles an hour frequently, while the average exceeded forty miles an hour throughout. Twelve months ago on that day we had made our first landing on the island from the *Aurora,* but vastly different weather conditions prevailed at the time.

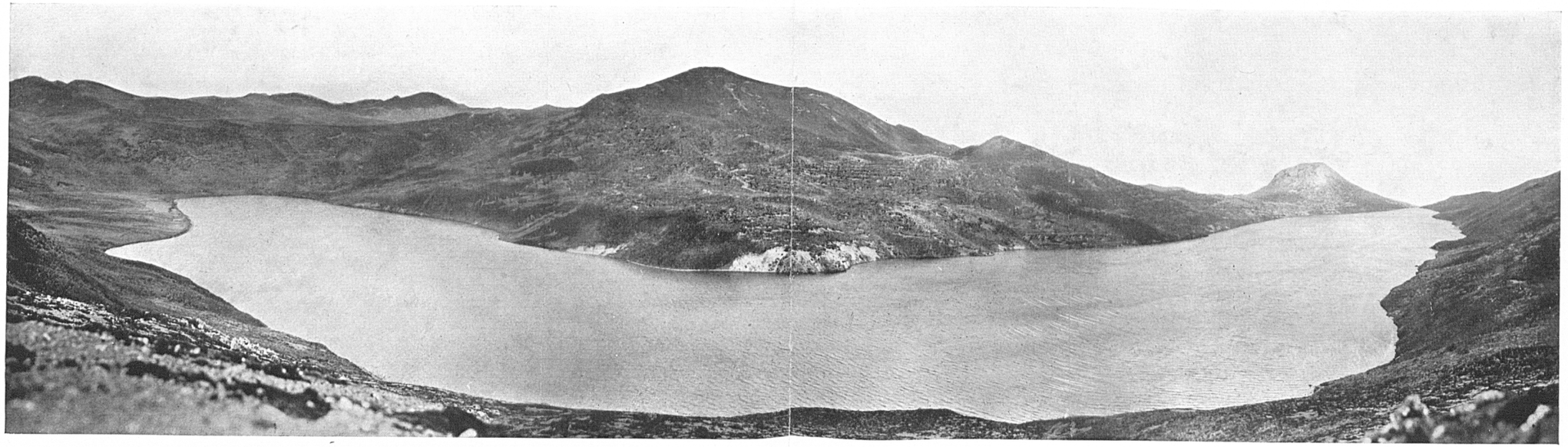
Christmas Day was now very close at hand, and as Blake and Hamilton were going to celebrate at the other end of the island, whence they had gone on the 10th, Sawyer, Sandell and I arranged a little " spread " for ourselves. Sawyer produced a cake which he had received in the recent mail, and some friend had forwarded a plum pudding to Sandell, so on Christmas Day these, with a boiled ham, some walnuts, mince rolls and a bottle of stout were spread on the table, which had been decorated with tussock stuck in sea elephants' tusks. The highest temperature registered on the island during our stay—51·8° F.—was recorded on Christmas Day, and the sun seemed so warm that Sandell and I ventured into the sea for a dip, but the temperature of the water was not high enough to make it an agreeable experience.

During the evening of the 26th we received a message saying that the *Aurora* had left Hobart on her trip south to bring back the two parties from Antarctica, but no mention of picking us up on the return journey was made.

The King penguins and " night birds " had laid by this time, and Hamilton added more eggs to his collection. He found for the first time a colony of mutton birds near the south end. He also came upon a mollymawk rookery on the south-western point of the island, and managed to take one of the birds by hand.

Blake and he had an accident in the dinghy on the 29th, fortunately attended by no serious results. They had gone from Lusitania Bay to the south end, and, while attempting to land through the surf, the boat struck a rock and capsized, throwing them into the water. They had many things in the boat but lost only two billies, two pannikins, a sounding line and Hamilton's hat, knife and pipe. Their blankets floated ashore in a few minutes, and the oars came floating in later in the day. After the capsize Hamilton managed to reach the boat and turn her over, and Blake made for a kelp-hung rock, but, after pulling himself up on to it, was immediately washed off and had to swim ashore. The boat was afterwards found to be stove-in in two places, though the breaks were easily patched up subsequently.

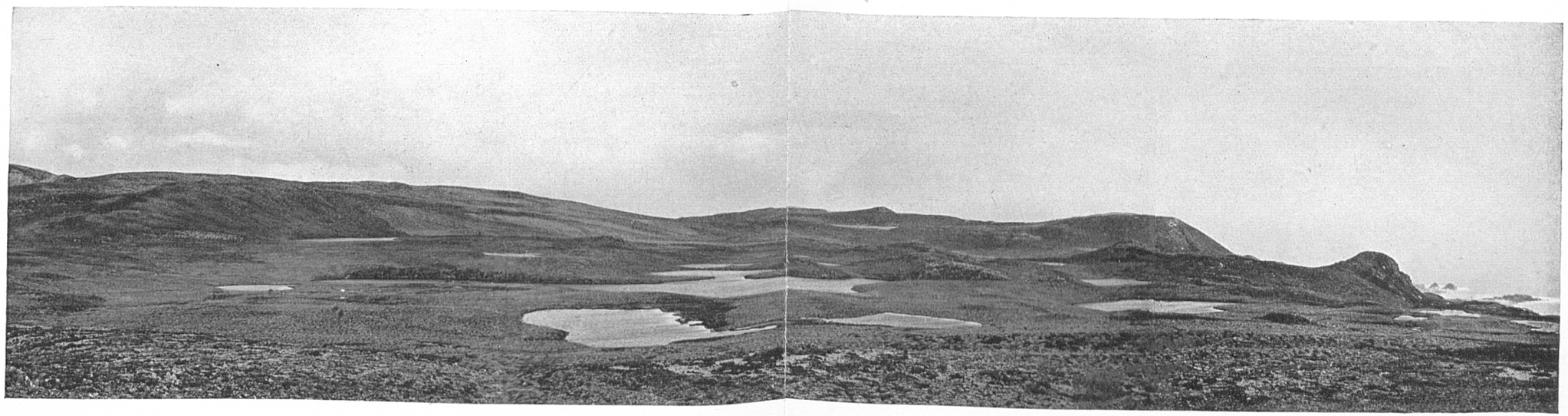
New Year's Eve came and with keen anticipations we welcomed the advent of 1913.



Macquarie Island

WATERFALL LAKE, OF GLACIAL ORIGIN

Blake



Macquarie Island

ON THE PLATEAU-LIKE SUMMIT OF MACQUARIE ISLAND A PANORAMA NEAR THE NORTH END. GLACIAL LAKES AND TARNS IN THE FOREGROUND

Blake

CHAPTER XXVII

THROUGH ANOTHER YEAR

By G. F. AINSWORTH

WE had now thrown a year behind and the work we set out to accomplish was almost finished; so it was with pleasurable feelings that we took up the burden of completion, looking forward to the arrival of April 1913 which should bring us final relief and the prospects of civilisation. I shall deal with the first three months of the year as one period, since almost all the field-work, except photography, had been done, and, after the return of Blake and Hamilton from Lusitania Bay on January 8, our life was one of routine; much time being devoted to packing and labelling specimens in anticipation of departure.

The first business of the year was to overhaul the wireless station, and on the 6th, Sawyer, Sandell and I spent the day laying in a supply of benzine from Aerial Cove, changing worn ropes, tightening stay-wires, straightening the southern masts and finally hauling the aerial taut. These duties necessitated much use of the "handy billy," and one has but to form an acquaintance with this desirable "person" to thoroughly appreciate his value.

Blake and Hamilton returned on January 8 and reported that their work was finished at the southern end. Thenceforth they intended to devote their time to finishing what remained to be done at the northern end and in adding to their collections. Blake, for instance, resolved to finish his chart of the island, and, if time permitted, to make a

topographical survey of the locality, as it was of great geological interest. Hamilton made the discovery that a number of bird specimens he had packed away were mildewed, and as a result he was compelled to overhaul the whole lot and attend to them. He found another colony of mutton birds on North Head, the existence of which was quite unexpected till he dug one out of a burrow thought to contain " night-birds."

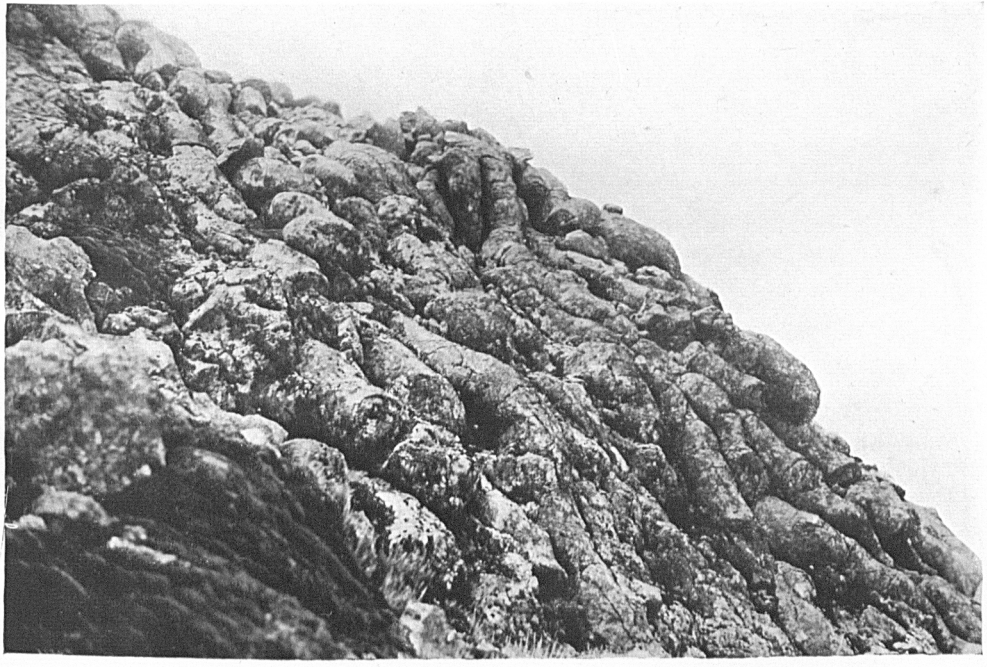
About the middle of January I endeavoured to do a little meteorological work with the aid of some box-kites manufactured by Sandell. But though a number of them were induced to fly, we had no success in getting them up with the instruments attached. They all had a habit of suddenly losing equilibrium and then indulging in a series of rapid dives and plunges which usually ended in total wreckage.

The *Rachel Cohen* again visited the island on January 26, but this time she anchored off "The Nuggets," whither the sealers had gone to live during the penguin season. We could see the ship lying about a mile offshore, and walked down to get our mails and anything else she had brought along for us. I received a letter from the Secretary of the Expedition saying that he had made arrangements for us to return by the *Rachel Cohen* early in April, and the news caused a little excitement, being the only definite information we had had concerning relief.

The end of the first month found Blake and Hamilton both very busy in making suitable boxes for specimens. Many of the larger birds could not be packed in ordinary cases, so Hamilton had to make specially large ones to accommodate them, and Blake's rock specimens being very heavy, extra strong boxes had to be made, always keeping in view the fact that each was to weigh not more than eighty pounds, so as to ensure convenient handling.

After a silence of about four months, we again heard Adelie Land on February 3, but the same old trouble existed, that is, they could not hear us. Sawyer called them

LARGE ERRATICS AND OTHER GLACIAL DEBRIS ON THE SUMMIT OF MACQUARIE ISLAND *Blake*



PILLOW-FORM LAVA ON THE HIGHLANDS OF MACQUARIE ISLAND *Blake*

again and again, getting no reply, but we reckoned that conditions would improve in a few weeks, as the hours of darkness increased.

Hamilton and I made a trip to the hill-tops on the 4th for the purpose of taking a series of plant and earth temperatures which were of interest biologically, and while there I took the opportunity of obtaining temperatures in all the lakes we saw. Hamilton also took some panoramic photographs from the various eminences and all of them turned out well.

During the evening Adelie Land sent out a message saying that Dr. Mawson had not yet returned to the Base from his sledging trip and Sawyer received it without difficulty, but though he " pounded away " in return for a considerable time, he was not heard, as no reply or acknowledgment was made.

The *Rachel Cohen* remained till the 5th, when a northerly gale arose and drove her away. As she had a good cargo of oil on board no one expected her to return. We had sent our mail on board several days previously as experience had shown us that the sailing date of ships visiting the island was very uncertain.

Sandell met with a slight though painful accident on the 7th. He was starting the engine, when it " backfired " and the handle flying off with great force struck him on the face, inflicting a couple of nasty cuts, loosening several teeth, and lacerating the inside of his cheek. A black eye appeared in a day or two and his face swelled considerably, but nothing serious supervened. In a few days the swelling had subsided and any anxiety we felt was at an end.

We now had only two sheep left, and on the 8th Blake and I went to kill one. Mac accompanied us. Seeing the sheep running away, she immediately set off after them, notwithstanding our threats, yells and curses. They disappeared over a spur, but shortly afterwards Mac returned, and, being severely thrashed, immediately left for home. We looked for the sheep during the

rest of the day but could find no trace of them, and though we searched for many days it was not till five weeks had elapsed that we discovered them on a small "landing" about half-way down the face of the cliff. They had apparently rushed over the edge and, rolling down, had finally come to a stop on the ledge where they were found later, alive and well.

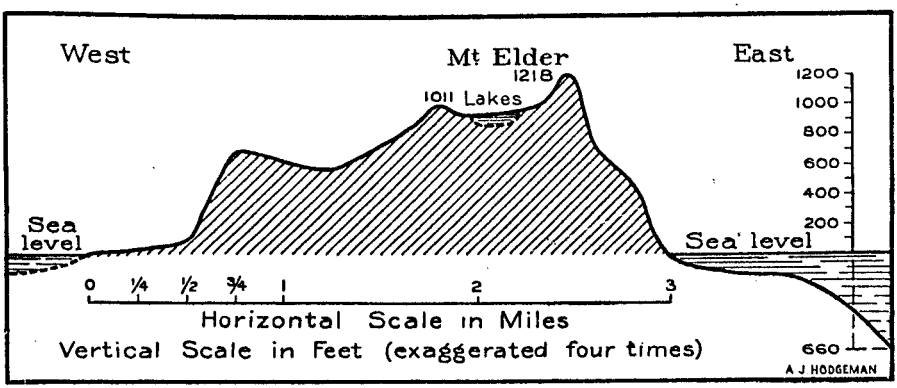
On the 8th Adelie Land was heard by us calling the *Aurora* to return at once and pick up the rest of the party, stating also that Lieutenant Ninnis and Dr. Mertz were dead. All of us were shocked at the grievous intelligence and every effort was made by Sawyer to call up Adelie Land, but without success.

On the following day we received news from Australia of the disaster to Captain Scott's party.

Blake, who was now geologizing and doing topographical work, discovered several lignite seams in the hills on the east coast; he had finished his chart of the island. The mainland is simply a range of mountains which have been at some remote period partly submerged. The land meets the sea in steep cliffs and bold headlands, whose general height is from five hundred to seven hundred feet, with many peaks ranging from nine hundred and fifty to one thousand four hundred and twenty feet, the latter being the height of Mount Hamilton, which rears up just at the back of Lusitania Bay. Evidence of extreme glaciation is everywhere apparent, and numerous tarns and lakes are scattered amongst the hills, the tops of which are barren, wind-swept and weather-worn. The hill sides are deeply scored by ravines, down which tumble small streams, forming cascades at intervals on their hurried journey towards the ocean. Some of these streams do not reach the sea immediately, but disappear in the loose shingly beaches of peaty swamps. The west coast is particularly rugged, and throughout its length is strewn wreckage of various kinds, some of which is now one hundred yards from the water's edge. Very few stretches of what may be

called "beach" occur on the island; the foreshores consisting for the most part of huge water-worn boulders or loose gravel and shingle, across which progress is slow and difficult.

Apparently the ground shelves very rapidly under the water, as a sounding of over two thousand fathoms was



A SECTION ACROSS MACQUARIE ISLAND THROUGH MT. ELDER

obtained by the *Aurora* at a distance of eight miles from the east coast. The trend of the island is about eleven degrees from true north; the axis lying north by east to south by west. At either end are the island-groups already referred to, and their connexion with the mainland may be traced by the sunken rocks indicated by the breaking seas on the line of reef.

A very severe storm about the middle of the month worked up a tremendous sea, which was responsible for piling hundreds of tons of kelp on the shore, and for several days tangled masses could be seen drifting about like small floating islands.

On the 20th an event occurred to which we had long looked forward, and which was now eagerly welcomed. Communication was established with the Main Base in Adelie Land by wireless! A message was received from Dr. Mawson confirming the deaths of Ninnis and Mertz, and stating that the *Aurora* had not picked up the whole

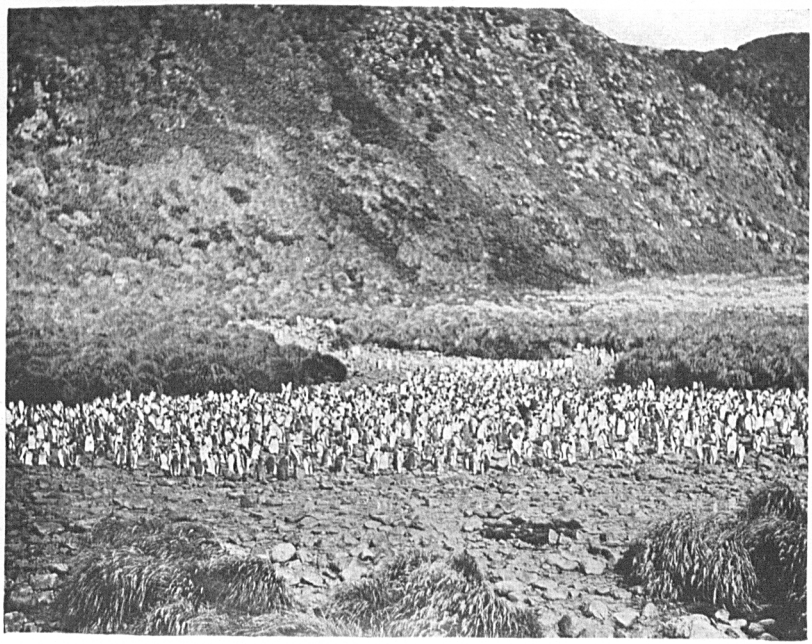
party. Sawyer had a short talk with Jeffryes, the Adelie Land operator, and among other scraps of news told him we were all well.

Hamilton killed a sea elephant on the 22nd. The animal was a little over seventeen feet long and thirteen and a half feet in girth just at the back of the flippers, while the total weight was more than four tons. It took Hamilton about a day to complete the skinning, and, during the process, the huge brute had to be twice turned over, but such is the value of the nautical handy-billy that two men managed it rather easily. When the skin had been removed, five of us dragged it to the sealers' blubber-shed, where it was salted, spread out, and left to cure.

We had communication with Adelie Land again on the 26th, and messages were sent and received by both stations. Dr. Mawson wirelessed to the effect that the *Aurora* would, after picking up Wild's party, make an attempt to return to Adelie Land if conditions were at all favourable.

Finding that provisions were running rather short on the last day of February, we reduced ourselves to an allowance of one pound of sugar per week each, which was weighed out every Thursday. Altogether there were only forty-five pounds remaining. Thenceforth it was the custom for each to bring his sugar-tin to the table every meal. The arrangement had its drawbacks, inasmuch as no sugar was available for cooking unless a levy were made. Thus puddings became rareties, because most of us preferred to use the sugar in tea or coffee.

March came blustering in, accompanied by a sixty-four-mile gale which did damage to the extent of blowing down our annexe, tearing the tarpaulin off the stores at the back and ripping the spouting off the Shack. A high sea arose and the conformation of the beach on the north-western side of the isthmus was completely changed. Numbers of sea elephants' tusks and bones were revealed, which had remained buried in the shingle probably for many years, and heaps of kelp were piled up where before there had been



Macquarie Island THE KING PENGUINS' ROOKERY, LUSITANIA BAY *Hamilton*

Macquarie Island *Blake*

THE HEAD OF A BULL SEA ELEPHANT PHOTOGRAPHED
IN THE ACT OF ROARING

clean, stony beach. Kelp is a very tough weed, but after being washed up and exposed to the air for a few days, begins to decay, giving forth a most disagreeable smell.

At this time we caught numerous small fish amongst the rocks at the water's edge with a hand line about four feet long. It was simply a matter of dropping in the line, watching the victim trifle with destiny and hauling him in at the precise moment.

Wireless business was now being done nightly with Adelie Land, and on the 7th I received a message from Dr. Mawson saying that the party would in all probability be down there for another season, and stating the necessity for keeping Macquarie Island station going till the end of the year. This message I read out to the men, and gave them a week in which to view the matter. The alternatives were to return in April or to remain till the end of the year.

I went through the whole of the stores on the 10th, and found that the only commodities upon which we would have to draw sparingly were milk, sugar, kerosene, meats and coal. The flour would last till May, but the butter allowance would have to be reduced to three pounds per week.

It was on the 12th that we found the lost sheep, but as we had some wekas, sufficient to last us for several days, I did not kill one till the 15th. On that day four of us went down towards the ledge where they were standing, and shot one, which immediately toppled off and rolled down some distance into the tussock, the other one leaping after it without hesitation. While Blake and Hamilton skinned the dead sheep, Sandell and I caught the other and tethered it at the bottom of the hill amongst a patch of Maori cabbage, as we thought it would probably get lost if left to roam loose. However, on going to the spot next day, the sheep was nearly dead, having got tangled up in the rope. So we let it go free, only to lose the animal a day or two later, for it fell into a bog and perished.

On March 22 a lunar eclipse occurred, contact lasting a little over three hours from 9.45 P.M. till within a few minutes of 1 A.M. on the 23rd. The period of total eclipse was quite a lengthy one, and during the time it lasted the darkness was intense. Cloud interfered for a while with our observations in the total stage. No coronal effect was noted, though a pulsating nebulous area appeared in front of the moon just before contact.

A message came on the 27th saying that the *Rachel Cohen* was sailing for Macquarie Island on May 2, and would bring supplies as well as take back the men who wished to be relieved, and this was forwarded in turn to Dr. Mawson.

He replied, saying that the *Aurora* would pick us up about the middle of November and convey us to Antarctica, thence returning to Australia; but if any member wished to return by the *Rachel Cohen* he could do so, though notification would have to be given, in order to allow of substitutes being appointed. All the members of the party elected to stay, and I asked each man to give an outline of the work he intended to pursue during the extended period.

During March strong winds were recorded on fourteen days, reaching gale-force on six occasions. The gale at the beginning of the month was the strongest we had experienced, the velocity at 5.40 A.M. on the 1st reaching sixty-four miles per hour. Precipitation occurred on twenty-six days and the average amount of cloud was 85 per cent. A bright auroral display took place on the 6th, lasting from 11.20 till 11.45 P.M. It assumed the usual arch-form stretching from the south-east to south-west, and streamers and shafts of light could be observed pulsating upwards towards the zenith.

We now started on what might be called the second stage of our existence on the island. In the preceding pages I have endeavoured to give some idea of what happened during what was to have been our full period; but unforeseen circumstances compelled us to extend our stay for eight

Macquarie Island *Hurley*

THE ROOKERY OF ROYAL PENGUINS AT THE SOUTH END VIEWED FROM A CLIFF SEVERAL HUNDRED FEET ABOVE IT

months more, until the *Aurora* came to relieve us in November. As the routine was similar in a good many respects to that which we had just gone through, I shall now refer to only the more salient features of our life.

The loyalty of my fellows was undoubted, and though any of them could have returned if he had felt so inclined, I am proud to say that they all decided to see it through. When one has looked forward hopefully to better social conditions, more comfortable surroundings and reunion with friends, it gives him a slight shock to find that the door has been slammed, so to speak, for another twelve months. Nevertheless, we all found that a strain of philosophy smoothed out the rough realities, and in a short time were facing the situation with composure, if not actual contentment.

We decided now to effect a few improvements round about our abode, and all set to work carrying gravel from the beach to put down in front of the Shack, installing a sink-system to carry any waste water, fixing the leaking roof and finally closing up the space between the lining and the wall to keep out the rats.

We expected the *Rachel Cohen* to leave Hobart with our stores on May 2, and reckoned that the voyage would occupy two weeks. Thus, it would be six weeks before she arrived. I was therefore compelled on the 10th to reduce the sugar allowance to half a pound per week. We were now taking it in turns to go once a week and get some wekas, and it was always possible to secure about a dozen, which provided sufficient meat for three dinners. Breakfast consisted generally of fish, which we caught, or sea elephant in some form, whilst we had tinned fish for lunch.

Sandell installed a telephone service between the Shack and the wireless station about the middle of April, the parts all being made by himself; and it was certainly an ingenious and valuable contrivance. I, in particular, learned to appreciate the convenience of it as time went on. The buzzer was fixed on the wall close to the head of my bunk and

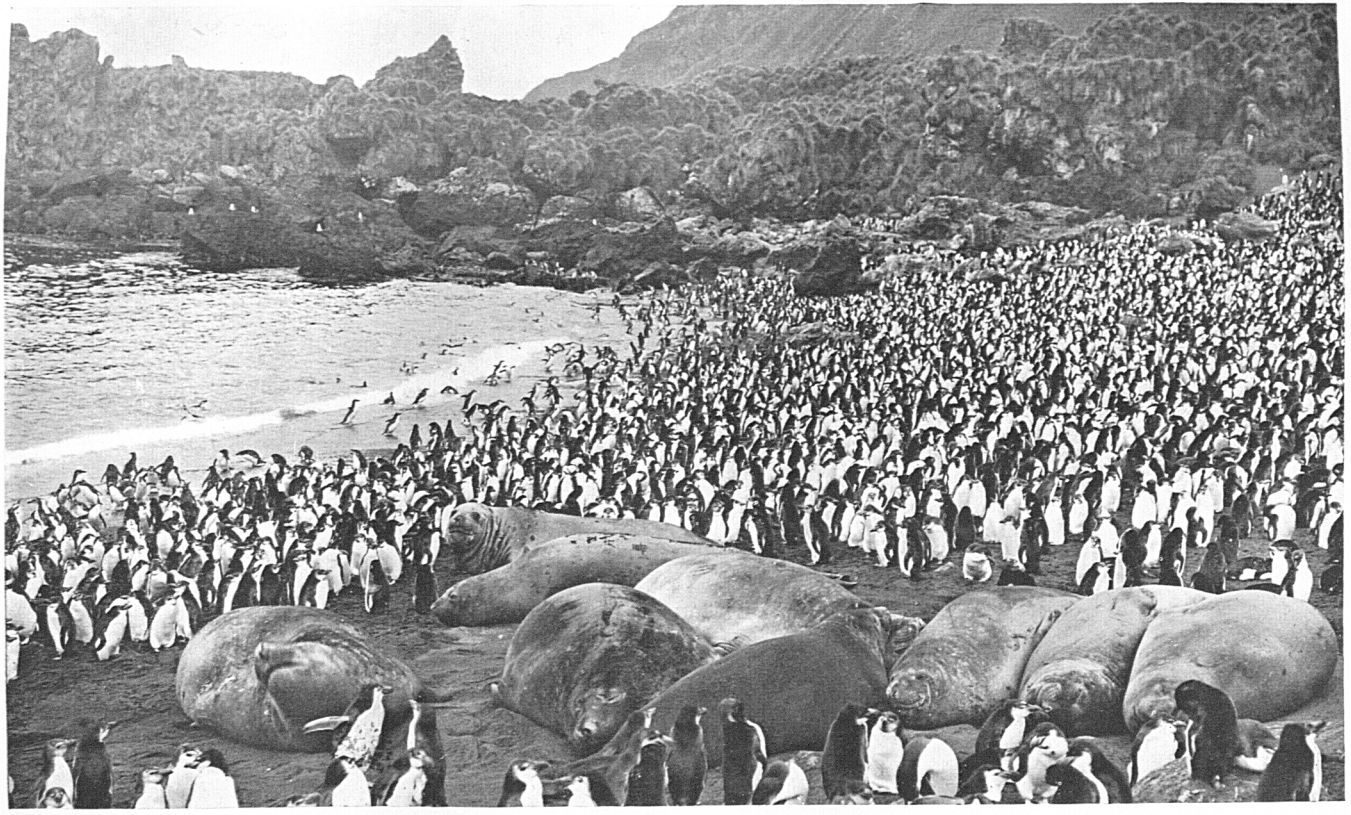
I could be called any time during the night from the wireless station, thus rendering it possible to reply to communications without loss of time. Further, during the winter nights, when auroral observations had to be made, I could retire if nothing showed during the early part of the night, leaving it to Sandell, who worked till 2 or 3 A.M. to call me if any manifestation occurred.

We had heavy gales from the 12th to the 17th inclusive, the force of the wind during the period frequently exceeding fifty miles per hour, and, on the first-mentioned date, the barometer fell to 27·8 inches. The usual terrific seas accompanied the outburst.

Finding that there were only eight blocks of coal left, I reduced the weekly allowance to one. We had a good supply of tapioca, but neither rice nor sago, and as the sealers had some of the latter two, but none of the former, we made an exchange to the extent of twelve pounds of tapioca for eight pounds of rice and some sago. Only fifteen pounds of butter remained on the 20th, and I divided this equally, as it was now one of the luxuries, and each man could use his own discretion in eating it. As it was nearing the end of April, and no further word concerning the movements of the *Rachel Cohen* had been received, I wirelessed asking to be immediately advised of the exact date of the vessel's departure. A reply came that the ship would definitely reach us within two months. I answered, saying we could wait two months, but certainly no longer.

With a view to varying the menu a little, Blake and I took Mac up on the hills on April 26 to get some rabbits and, after tramping for about six hours, we returned with seven. In our wanderings we visited the penguin rookeries at "The Nuggets," and one solitary bird sat in the centre of the vast area which had so lately been a scene of much noise and contention.

On May 1 I took an inventory of the stores and found that they would last for two months if economically used.



Macquarie Island YOUNG SEA ELEPHANTS ASLEEP AMONGST ROYAL PENGUINS, SOUTH END ROOKERY *Hurley*

Of course, I placed confidence in the statement that the *Rachel Cohen* would reach the island within that time.

With the coming of May wintry conditions set in, and at the end of the first week the migrants had deserted our uninviting island. Life with us went on much the same as usual, but the weather was rather more severe than that during the previous year, and we were confined to the Shack a good deal.

The sealers who were still on the island had shifted back to the Hut at the north end so that they were very close to us and frequently came over with their dog in the evenings to have a yarn. The majority of them were men who had "knocked about" the world and had known many rough, adventurous years. One of them in particular was rather fluent, and we were often entertained from his endless repertoire of stories.

On the 23rd, finding that there were seventy-seven and a half pounds of flour remaining, and ascertaining that the sealers could let us have twenty-five pounds, if we ran short, I increased the allowance for bread to twelve and a half pounds per week, and this, when made up, gave each man two and three-quarter pounds of bread. Our supply of oatmeal was very low, but in order to make it last we now started using a mixture of oatmeal and sago for breakfast; of course, without any milk or sugar.

Just about this time Mac gave birth to six pups and could not help us in obtaining food. She had done valuable service in this connexion, and the loss in the foraging strength of the party was severely felt for several weeks. She was particularly deadly in hunting rabbits and wekas, and though the first-named were very scarce within a few miles of the Shack, she always managed to unearth one or two somewhere. Hut-slippers were made out of the rabbit skins and they were found to be a great boon, one being able to sit down for a while without his feet "going."

June arrived and with it much rough, cold weather. A boat was expected to come to our relief, at the very latest,

by the 30th. We had a very chilly period during the middle of the month, and it was only by hand-feeding the " jacket " of the wireless motor that any work could be done by the station, as the tank outside was almost frozen solid.

The tide-gauge clock broke down towards the end of the month, and though I tried for days to get it going I was not successful. One of the springs had rusted very badly as a result of the frequent " duckings " the clock had experienced, and had become practically useless.

We had ascertained that the *Rachel Cohen* was still in Hobart, so on the 23rd I wirelessed asking when the boat was to sail. The reply came that the *Rachel Cohen* was leaving Hobart on Thursday, June 26.

Our supply of kerosene oil was exhausted by the end of the month, despite the fact that the rule of " lights out at 10 P.M." had been observed for some time. Thus we were obliged to use sea elephant oil in slush lamps. At first we simply filled a tin with the oil and passed a rag through a cork floating on the top, but a little ingenuity soon resulted in the production of a lamp with three burners and a handle. This was made by Sandell out of an old tea-pot and one, two or three burners could be lit as occasion demanded. During meal times the whole three burners were used, but, as the oil smoked and smelt somewhat, we generally blew out two as soon as the meal was finished. This was the " general " lamp, but each man had, as well, one of his own invention. Mine was scornfully referred to as the " house-boat," since it consisted of a jam tin, which held the oil, standing in a herring tin which caught the overflow.

At the end of June, Blake and I surveyed all the penguin rookeries round about " The Nuggets " and, allowing a bird to the square foot, found that there must have been about half a million birds in the area. The sealers kill birds from these rookeries to the number of about one hundred and thirty thousand yearly, so that it would seem reasonable to suppose that, despite this fact, there must be an annual increase of about one hundred thousand birds.

The end of the month arrived and, on making inquiries, we found that there was no news of the *Rachel Cohen* having left Hobart. We had enough flour to last a fortnight, and could not get any from the sealers as they possessed only three weeks' supply themselves. However, on July 8, Bauer came across and offered to let us have some wheatmeal biscuits as they had a couple of hundredweights, so I readily accepted twenty pounds of them. We now had soup twice a day, and managed to make it fairly thick by adding sago and a few lentils. Cornflour and hot water flavoured with cocoa made a makeshift blanc-mange, and this, with sago and tapioca, constituted our efforts towards dessert.

On the 12th I received a message stating that the *Rachel Cohen* had sailed on July 7; news which was joyfully received. We expected her to appear in ten or twelve days.

On the 18th we used the last ounce of flour in a small batch of bread, having fully expected the ship to arrive before we had finished it. Next day Bauer lent us ten pounds of oatmeal and showed us how to make oatmeal cakes. We tried some and they were a complete success, though they consisted largely of tapioca, and, according to the respective amounts used, should rather have been called tapioca cakes.

When the 22nd arrived and no ship showed up, I went across to see what the sealers thought of the matter, and found that they all were of opinion that she had been blown away to the eastward of the island, and might take a considerable time to " make " back.

On this date we came to the end of our meats, which I had been dealing out in a very sparing manner, just to provide a change from sea elephant and weka. We had now to subsist upon what we managed to catch. There were still thirty-five tins of soup, of which only two tins a day were used, so that there was sufficient for a few weeks. But we found ourselves running short of some commodity each day, and after the 23rd reckoned to be without bread and biscuit.

At this juncture many heavy blows were experienced,

and on the 24th a fifty-mile gale accompanied by a tremendous sea beat down on us, giving the *Rachel Cohen* a very poor chance of "making" the island. Our last tin of fruit was eaten; twelve tins having lasted us since March 31, and I also shared the remaining ten biscuits amongst the men on the 24th. We were short of bread, flour, biscuits, meats, fish, jam, sugar and milk, but had twenty tins of French beans, thirty tins of cornflour, some tapioca, and thirty tins of soup, as well as tea, coffee and cocoa in abundance. We had not been able to catch any fish for some days as the weather had been too rough, and, further, they appeared to leave the coasts during the very cold weather.

Sea elephants were very scarce, and we invariably had to walk some distance in order to get one; each man taking it in turn to go out with a companion and carry home enough meat for our requirements. We were now eating sea elephant meat three times a day (all the penguins having migrated) and our appetites were very keen. The routine work was carried on, though a great deal of time was occupied in getting food.

Bauer very generously offered to share his biscuits with us, but we fellows, while appreciating the spirit which prompted the offer, unanimously declined to accept them. We now concluded that something had happened to the ship, as at the end of July she had been twenty-four days out.

On August 3 we had a sixty-three-mile gale and between 1 and 2 A.M. the velocity of the wind frequently exceeded fifty miles per hour. Needless to say there was a mountainous sea running, and the *Rachel Cohen*, if she had been anywhere in the vicinity, would have had a perilous time.

A message came to me on August 6 from the Secretary of the Expedition, saying that the *Rachel Cohen* had returned to New Zealand badly damaged, and that he was endeavouring to send us relief as soon as possible. I replied, telling him that our food-supply was done, but that otherwise we were all right and no uneasiness need be felt, though we wished to be relieved as soon as possible.

Splendid news came along on the 9th to the effect that the New Zealand Government's steamer *Tutanekai* would tranship our stores from the *Rachel Cohen* on the 15th and sail direct for the island.

Sawyer now became ill and desired me to make arrangements for his return. I accordingly wired to the Secretary, who replied asking if we could manage without an operator. After consulting Sandell, I answered that Sandell and I together could manage to run the wireless station.

Everybody now looked forward eagerly to the arrival of the *Tutanekai*, but things went on as before. We found ourselves with nothing but sea elephant meat and sago, with a pound-tin of French beans once a week and two ounces of oatmeal every morning.

We heard that the *Tutanekai* did not leave as expected on the 15th, but sailed on the afternoon of the 17th, and was coming straight to Macquarie Island. She was equipped with a wireless telegraphy outfit, which enabled us on the 18th to get in touch with her; the operator on board stating that they would reach us early on the morning of the 20th.

On the evening of the 19th we gave Sawyer a send-off dinner; surely the poorest thing of its kind, as far as eatables were concerned, that has ever been tendered to any one. The fare consisted of sea elephant's tongue "straight," after which a bottle of claret was cracked and we drank heartily to his future prosperity.

At 7.30 A.M. on the 20th the *Tutanekai* was observed coming up the east coast, and as we had "elephanted" at 6 A.M. we were ready to face the day. I went across to the sealers' hut and accompanied Bauer in the launch to the ship, which lay at anchor about a mile from the shore. We scrambled on board, where I met Captain Bollons. He received me most courteously, and, after discussing several matters, suggested landing the stores straight away. I got into the launch to return to the shore, but the wind had freshened and was soon blowing a fresh gale. Still, Bauer

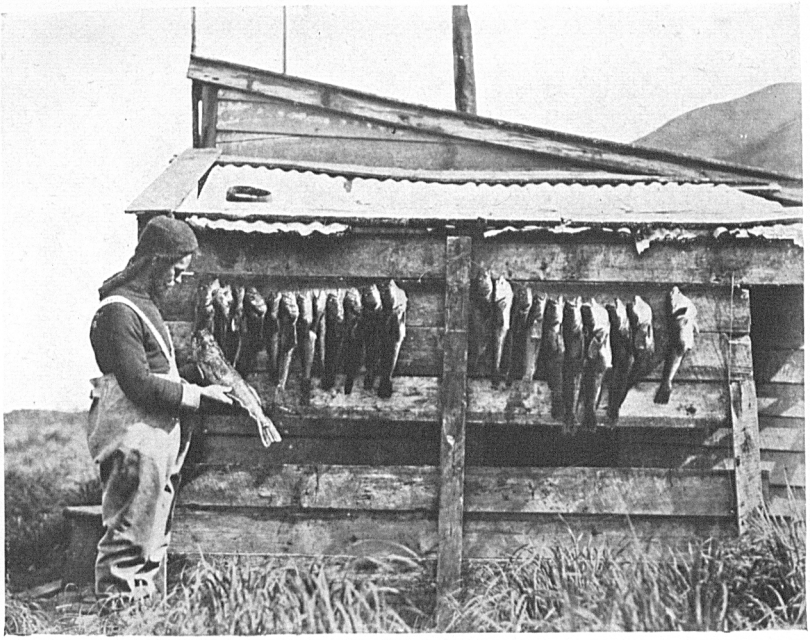
thought we should have no difficulty and we pushed off from the ship. The engine of the launch failed after we had gone a few yards, the boat was blown rapidly down the coast, and we were eventually thrown out into the surf at "The Nuggets." The Captain, who witnessed our plight, sent his launch in pursuit of us, but its engines also failed. It now became necessary for the crew of the whale-boat to go to the assistance of the launch. However, they could do nothing against the wind, and, in the end, the ship herself got up anchor, gave the two boats a line and towed them back to the former anchorage. The work of unloading now commenced, though a fairly heavy surf was running. But the whaleboat of the *Tutanekai* was so dexterously handled by the boatswain that most of our stores were landed during the day.

Sawyer went on board the *Tutanekai* in the afternoon, thus severing his connexion with the Expedition, after having been with us on the island since December 1911. On the following morning, some sheep, coal and flour were landed, and, with a whistled good-bye, the *Tutanekai* started north on her visit to other islands.

Our short period of stress was over and we all felt glad. From that time onwards we ate no more elephant meat "straight." A sheep was killed just as the *Tutanekai* left, and we had roast mutton, scones, butter, jam, fruit and rice for tea. It was a rare treat.

All the stores were now brought up from the landing-place, and as I had put up several extra shelves some weeks previously, plenty of room was found for all the perishable commodities inside the Shack.

The beginning of September found me fairly busy. In addition to the meteorological work, the results of which were always kept reduced and entered up, I had to work on Wireless Hill during the evening and make auroral observations on any night during which there was a display, attending to the stores and taking the week of cooking as it came along.



Macquarie Island *Blake*

HAMILTON INSPECTING A GOOD CATCH OF FISH AT LUSITANIA BAY

Macquarie Island *Blake*

HAMILTON OBTAINING THE BLUBBER OF A SEA ELEPHANT FOR FUEL

Blake and Hamilton went down the island for several days on September 3, since they had some special observations to make in the vicinity of Sandy Bay.

The sea elephant season was now in progress, and many rookeries were well formed by the middle of the month. The skuas had returned, and on the 19th the advance-guard of the Royal penguins arrived. The gentoos had established themselves in their old " claims," and since the 12th we had been using their eggs for cooking.

Early in September time-signals were received from Melbourne, and these were transmitted through to Adelie Land. This practice was kept up throughout the month and in many cases the signals were acknowledged.

Blake and Hamilton returned to the Shack on the 24th, but left again on the 30th, as they had some more photographic work to do in the vicinity of Green Valley and Sandy Bay.

Blake made a special trip to Sandy Bay on October 30 to bring back some geological specimens and other things he had left there, but on reaching the spot found that the old hut had been burned to the ground, apparently only a few hours before, since it was still smouldering. Many articles were destroyed, among which were two sleeping-bags, a sextant, gun, blankets, photographic plates, bird specimens and articles of clothing. It was presumed that rats had originated the fire from wax matches which had been left lying on a small shelf.

On November 9 we heard that the *Aurora* would leave Hobart on the 19th for Antarctica, picking us up on the way and landing three men on the island to continue the wireless and meteorological work.

We sighted the *Rachel Cohen* bearing down on the island on November 18, and at 5.15 P.M. she came to an anchorage in North-East Bay. She brought down the remainder of our coal and some salt for Hamilton for the preservation of specimens.

On the next night it was learned that the *Aurora* had left

Hobart on her way South, expecting to reach us about the 28th, as some sounding and dredging were being done *en route*.

Everybody now became very busy making preparations for departure. Time passed very quickly, and November 28 dawned fine and bright. The *Rachel Cohen*, which had been lying in the bay loading oil, had her full complement on board by 10 A.M., and shortly afterwards we trooped across to say good-bye to Bauer and the other sealers, who were all returning to Hobart. It was something of a coincidence that they took their departure on the very day our ship was to arrive. Their many acts of kindness towards us will ever be recalled by the members of the party, and we look upon our harmonious neighbourly association together with feelings of great pleasure.

A keen look-out was then kept for signs of our own ship, but it was not until 8 P.M. that Blake, who was up on the hill side, called out, "Here she comes," and we climbed up to take in the goodly sight. Just visible, away in the north-west, there was a line of thin smoke, and in about half an hour the *Aurora* dropped anchor in Hasselborough Bay.

A VICTORIA PENGUIN ON THE NEST

Macquarie Island

A GROWTH OF LICHEN ON RED SANDSTONE

(AN EXAMPLE OF THE MOST CONSPICUOUS VEGETATION OF ADELIE LAND)

Adelie Land *Paget colour photo by Correll*

CHAPTER XXVIII

THE HOMEWARD CRUISE

We bring no store of ingots,
Of spice or precious stones;
But what we have we gathered
With sweat and aching bones.
KIPLING.

AS we sat in the wardroom of the *Aurora* exchanging the news of months long gone by, we heard from Captain Davis the story of his fair-weather trip from Hobart. The ship had left Australian waters on November 19, and, from the outset, the weather was quite ideal. Nothing of note occurred on the run to Macquarie Island, where a party of three men were landed and Ainsworth and his loyal comrades picked up. The former party, sent by the Australian Government, were to maintain wireless communication with Hobart and to send meteorological reports to the Commonwealth Weather Bureau. A week was spent at the island and all the collections were embarked, while Correll was enabled to secure some good colour photographs and Hurley to make valuable additions to his cinematograph film.

The *Aurora* had passed through the "fifties" without meeting the usual gales, sighting the first ice in latitude 63° 33′ S., longitude 150° 29′ E. She stopped to take a sounding every twenty-four hours, adding to the large number already accumulated during her cruises over the vast basin of the Southern Ocean.

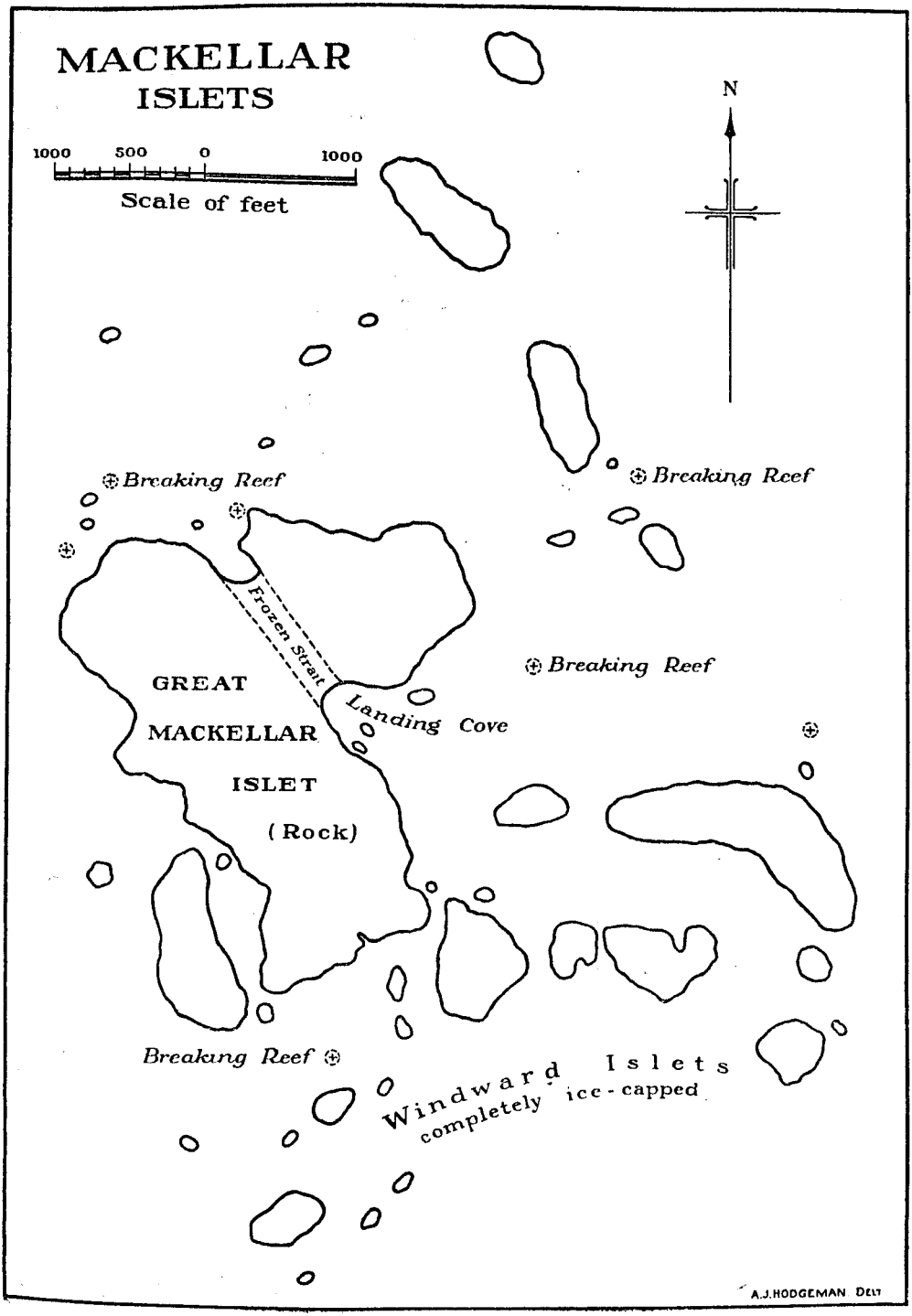
All spoke of the clear and beautiful days amid the floating ice and of the wonderful coloured sunsets; especially the

photographers. The pack was so loosely disposed, that the ship made a straight course for Commonwealth Bay, steaming up to Cape Denison on the morning of December 14 to find us all eager to renew our claim on the big world up North.

There was a twenty-five-knot wind and a small sea when we pulled off in the whale-boat to the ship, but, as if conspiring to give us for once a gala-day, the wind fell off, the bay became blue and placid and the sun beat down in full thawing strength on the boundless ice and snow. The Adelians, if that may be used as a distinctive title, sat on the warm deck and read letters and papers in voracious haste, with snatches of the latest intelligence from the Macquarie Islanders and the ship's officers. No one could erase that day from the tablets of his memory.

Late in the afternoon the motor-launch went ashore, and the first of the cargo was sent off. The weather remained serene and calm, and for the next six days, with the exception of a "sixty-miler" for a few hours and a land breeze overnight, there was nothing to disturb the embarkation of our bulky impedimenta which almost filled the outer Hut. Other work went on apace. The skua gulls, snow and Wilson petrels were laying their eggs, and Hamilton went ashore to secure specimens and to add to our already considerable collection of bird skins. Hunter had a fish-trap lowered from the forecastle, used a hand dredge from the ship, and did tow-netting occasionally from the launch in its journeys to and from the land. Hurley and Correll had bright sunshine to ensure good photographic results. Bage and Hodgeman looked after the transport of stores from the Hut, and Gillies, Bickerton and Madigan ran the motor-launch. McLean, who was now in possession of an incubator and culture tubes, grew bacteria from various sources—seals and birds, soils, ice and snow. Ainsworth, Blake and Sandell, making their first acquaintance with Adelie Land, were most often to be seen quarrying ice on the glacier or pulling loaded sledges down to the harbour.

Adelie Land AN ILLUSTRATION OF THE LIFE ON THE MACKELLAR ISLETS *Hurley*


MACKELLAR
ISLETS
1000 500 0 1000
Scale of feet
N
Breaking Reef
Breaking Reef
Frozen Strait
Breaking Reef
GREAT
MACKELLAR
ISLET
(Rock)
Landing Cove
Breaking Reef
Windward Islets
completely ice-capped
A.J.HODGEMAN DELT

On the 18th a party of us went off to the Mackellar Islets in the motor-launch, taking a tent and provisions, intending to spend two days there surveying and making scientific observations.

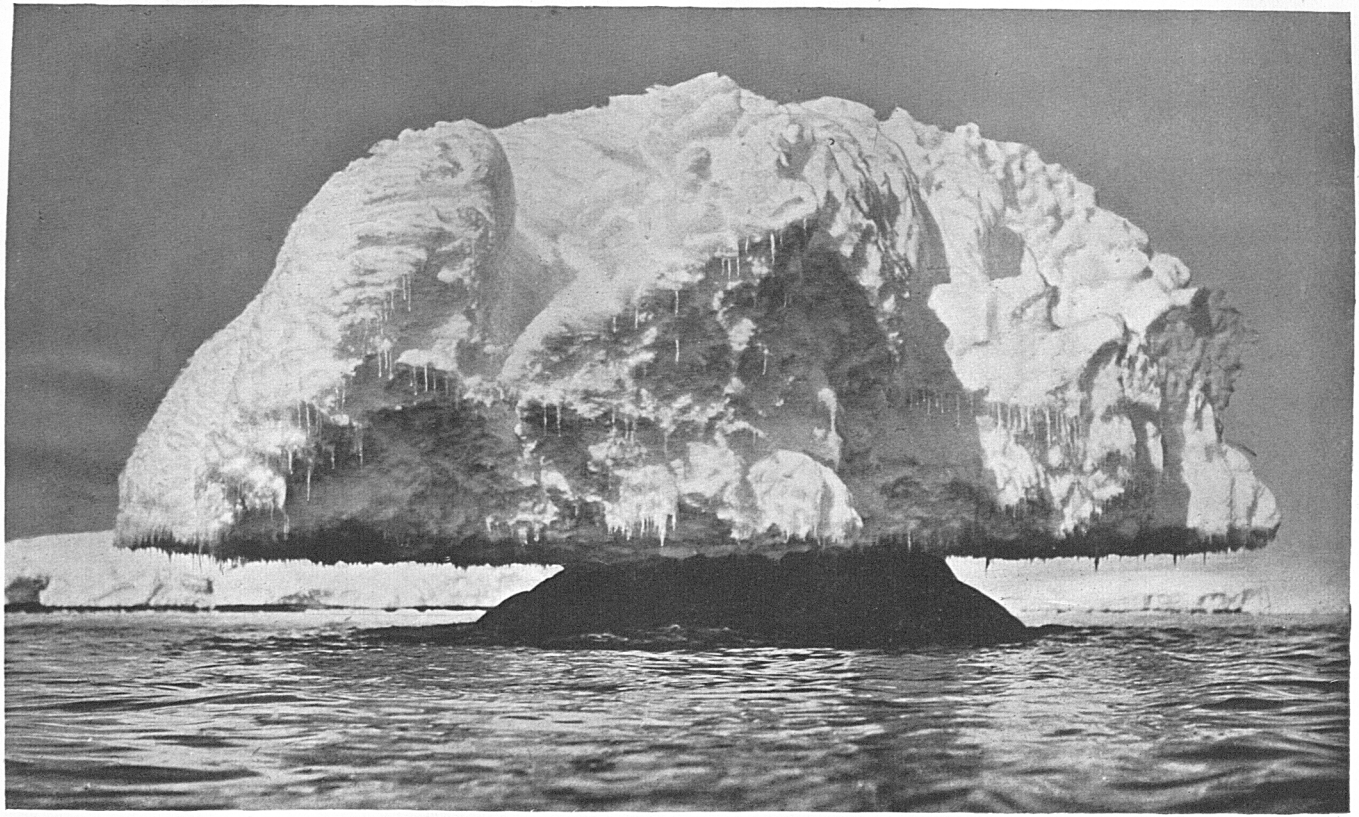
These islets, over thirty in number, are clustered mainly in a group about two miles off shore. The group is encircled by rocky " outposts," and there are several " links " to the southern mainland. Under a brilliant sun, across the pale blue water, heaving in a slow northerly swell, the motor-launch threaded her way between the granite knobs, capped with solid spray. The waves had undermined the white canopies so that they stood immobile, perched on the dark, kelp-fringed rocks, casting their pallid reflections in the turquoise sea. Steaming into a natural harbour, bordered by a low ice-foot on which scores of Weddell seals lay in listless slumber, we landed on the largest islet—a succession of salt-encrusted ridges covered by straggling penguin rookeries. The place just teemed with the sporadic life of an Antarctic summer.

It was calculated that the Adelie penguins exceeded one hundred and fifty thousand in number over an area of approximately one hundred acres. Near the landing-place there were at least sixty seals and snow petrels; skua gulls and Wilson petrels soon betrayed their nests to the biologists.

The islets are flat, and afford evidence that at one time the continental ice-cap has ridden over them. The rock is a hard grey gneiss. A rough plane-table map of the group was made by Hodgeman and myself.

Our scheme of local exploration was now continued to the west. For two years we had looked curiously at a patch of rocks protruding beneath the ice-cap eight miles away, within Commonwealth Bay. It had been inaccessible to sledging parties, and so we reserved Cape Hunter, as it was ultimately called, for the coming of the Ship.

The anchor was raised on the forenoon of the 22nd, and by midday the *Aurora* steamed at half-speed along the ramparts of the glacier, stopping about four miles from



Adelie Land AN ICE MUSHROOM AMONGST THE MACKELLAR ISLETS *Hurley*

the Cape, after sounding in four hundred and twenty-four fathoms. Through field-glasses much had already been seen; enough to arouse an intense interest.

One could not but respond to the idea that here was a new world, flawless and unblemished, into which no human being had ever pried. Here were open secrets to be read for the first time. It was not with the cold eye of science alone that we gazed at these rocks—a tiny spur of the great unseen continent; but it was with an indefinable wonder.

In perfect weather a small party set off in the launch towards a large grounded berg which appeared to lie under the ice-cliffs. Approaching it closely, after covering two miles, we could see that it was still more than a mile to the rocks.

Penguins soon began to splash around; Wilson petrels came glancing overhead and we could descry great flocks of Antarctic petrels wheeling over cliff and sea. Reefs buried in frothing surge showed their glistening mantles, and the boat swerved to avoid floating streamers of brash-ice.

The rocky cliffs, about eighty feet in height at the highest point, were formed of vertically lying slate rocks—a very uniform series of phyllite and sericite-schist. At their base lay great clinging blocks of ice deeply excavated by the restless swell. One island was separated from the parent mass by a channel cut sheer to the deep blue water. Behind the main rocks and indenting the ice-cliff was a curving bay into which we steered, finding at its head a beautiful cove fringed with a heavy undermined ice-foot and swarming with Adelie penguins. Overhanging the water was a cavern hollowed out of a bridge of ice thrown from the glacier to the western limit of the rock outcrop.

Hurley had before him a picture in perfect proportion. The steel-blue water, paled by an icy reflection, a margin of brown rocks on which the penguins leapt through the splashing surf, a curving canopy of ice-foot and, filling the background, the cavern with pendent icicles along its cornice.

The swell was so great that an anchor had to be thrown

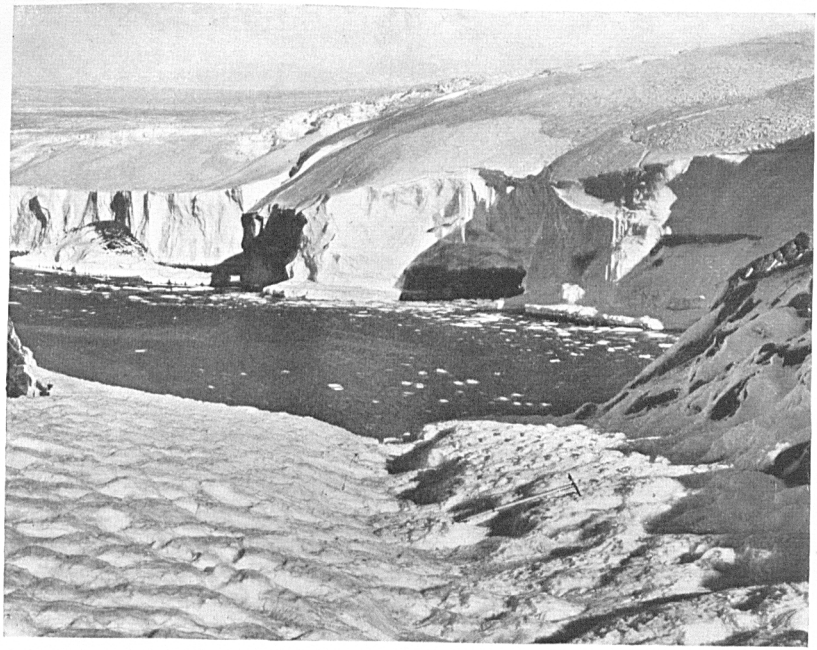
from the stern to keep the launch off shore, and two men remained on board to see that no damage was done.

At last we were free to roam and explore. Over the first ridge of rocks we walked suddenly into the home of the Antarctic petrels! There had always been much speculation as to where these birds nested. Jones' party at our western base had the previous summer at Haswell Island happened upon the first rookery of Antarctic petrels ever discovered. Here was another spot in the great wilderness peopled by their thousands. Every available nook and crevice was occupied along a wide slope which shelved away until it met the vertical cliffs falling to the ocean. One could sit down among the soft, mild birds who were fearless at the approach of man. They rested in pairs close to their eggs laid on the bare rock or among fragments of slate loosely arranged to resemble a rest. Many eggs were collected, and the birds, losing confidence in us, rose into the air in flocks, gaining in feathered volume as they circled in fear above this domain of rock and snow which had been theirs for generations.

In adjoining rookeries the Adelie penguins, with their fat, downy cheeks, were very plentiful and fiercer than usual. Skuas, snow and Wilson petrels were all in their accustomed haunts. Down on the low ice-foot at the mouth of a rocky ravine, a few seals had effected a landing. Algæ, mosses and lichens made quite a display in moist localities.

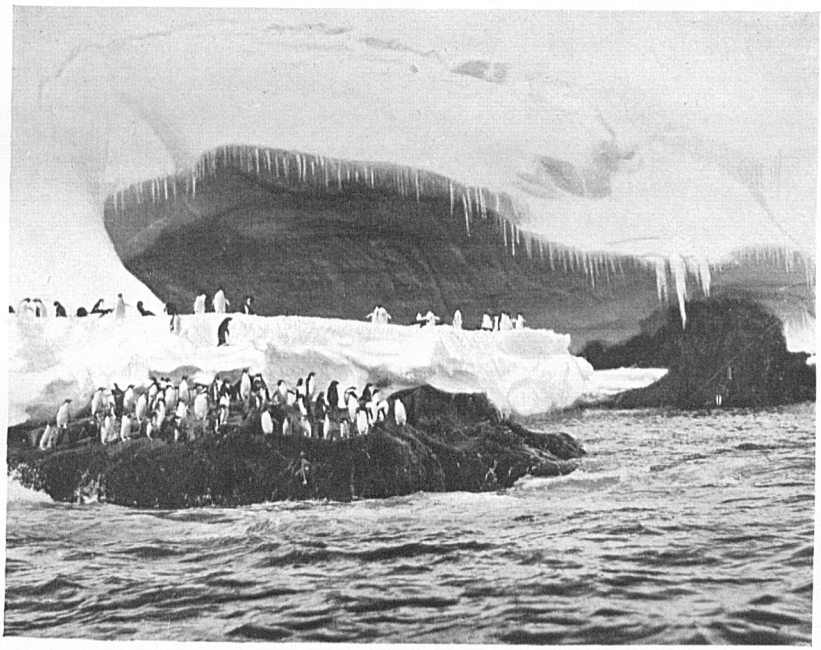
Before leaving for the ship, we "boiled the billy" on a platform of slate near the cove where the launch was anchored and had a small picnic, entertained by the penguins playing about in the surf or scaling the ice-foot to join the birds which were laboriously climbing to the rookeries on the ridge. The afternoon was so peaceful and the calm hot weather such a novelty to us that we pushed off reluctantly to the *Aurora* after an eventful day.

Those on board had had a busy time dredging, and their results were just as successful as ours. A haul was made in two hundred and fifty fathoms of ascidians, sponges,



Hurley

VIEW LOOKING OUT OF A SHALLOW RAVINE AT THE EASTERN EXTREMITY OF THE ROCKS AT CAPE DENISON



Hurley

"HURLEY HAD BEFORE HIM A PICTURE IN PERFECT PROPORTION . . . . "

crinoids, holothurians, fish and other forms of life in such quantity that Hunter and Hamilton were occupied in sorting the specimens until five o'clock next morning. Meanwhile the *Aurora* had returned to her old anchorage close to Cape Denison.

The sky banked up from the south with nimbus, and early on the 23rd a strong breeze ruffled the water. There were a few things to be brought off from the shore, while Ainsworth, Sandell and Correll were still at the Hut, so that, as the weather conditions pointed to a coming blizzard, I decided to " cut the painter " with the land.

An hour later the motor-launch, with Madigan and Bickerton, sped away for the last load through falling snow and a rising sea. Hodgeman had battened down the windows of the Hut, the chimney was stuffed with bagging, the veranda-entrance closed with boards, and, inside, an invitation was left for future visitors to occupy and make themselves at home. After the remainder of the dogs and some miscellaneous gear had been shipped, the launch put off and came alongside in a squally wind through thick showers of snow. Willing hands soon unloaded the boat and slung it in the davits. Every one was at last safe on board, and in future all our operations were to be conducted from the ship.

During the night the wind rose and the barometer fell, while the air was filled with drifting snow. On the 24th—Christmas Eve—the velocity of the wind gradually increased to the seventies until at noon it blew with the strength of a hurricane. Chief Officer Blair, stationed with a few men under the fo'c'sle-head, kept an anxious eye on the anchor chain and windlass.

About lunch time the anchor was found to be dragging and we commenced to drift before the hurricane. All view of the land and lurking dangers in the form of reefs and islets were cut off by driving snow.

The wind twanged the rigging to a burring drone that rose to a shriek in the shuddering gusts. The crests of

the waves were cut off and sprayed in fine spindrift. With full steam on we felt our way out, we hoped to the open sea; meanwhile the chain cable and damaged anchor were slowly being hauled in. The ship's chances looked very small indeed, but, owing to the good seamanship of Captain Davis and a certain amount of luck, disaster was averted. Soon we were in a bounding sea. Each time we were lifted on a huge roller the motor-launch, swinging in the davits, would rise and then descend with a crash on the water, to be violently bumped against the bulwarks. Everything possible was done to save the launch, but our efforts proved fruitless. As it was being converted into a battering ram against the ship itself it had to be cut away, and was soon swept astern and we saw no more of it.

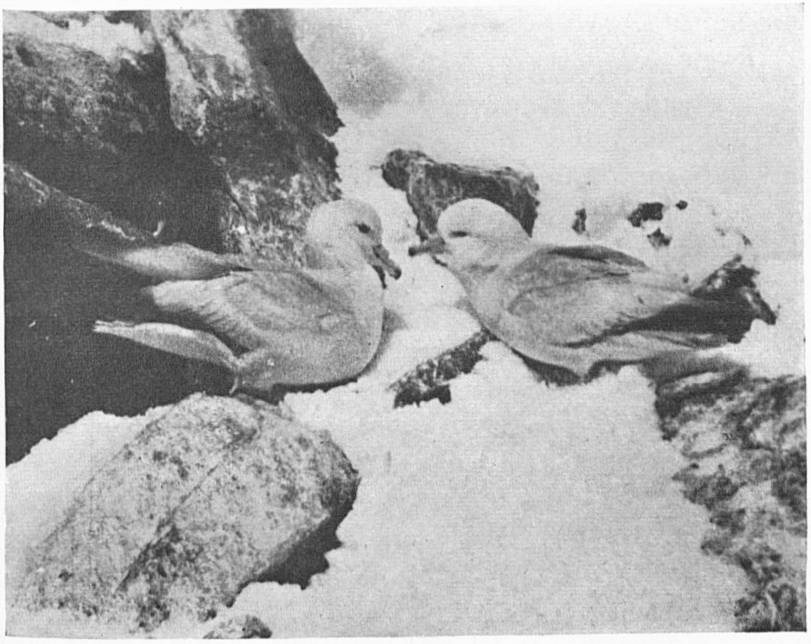
Most unexpectedly there came a lull in the wind, so that it was almost calm, though the ship still laboured in the seas. A clearance in the atmosphere was also noticeable for Cape Hunter became discernible to the west, towards which we were rapidly drifting. This sight of the coast was a great satisfaction to us, for we then knew our approximate position * and the direction of the wind, which had veered considerably.

The lull lasted scarcely five minutes when the wind came back from a somewhat different quarter, north of east, as violent as ever. The "eye" of the storm had passed over us, and the gale continued steady for several days. That night the struggle with the elements was kept up by officers and crew, assisted by members of the shore party who took the lee-wheel or stood by in case of emergency.

"December 25. Christmas Day on the high seas off Adelie Land, everything wet and fairly miserable; incipient *mal de mer*, wind 55–60; snowing! When Davis came down to breakfast and wished us a Merry Christmas, with a smile at the irony of it, the ward-room was swaying about in a most bewildering fashion."

* It should be borne in mind that compasses are unreliable in the vicinity of the magnetic pole.

ANTARCTIC PETRELS RESTING ON THE SNOW *Hurley*



Stillwell Island SILVER-GREY PETRELS MAKING LOVE *Hurley*

Towards evening, after the *Aurora* had battled for hours slowly to the east, the sea went down somewhat and some drifting ice was sighted. We continued under full steam, pushing forward to gain the shelter of the Mertz glacier-tongue. It was now discovered that the fluke of the anchor had broken off short, so great had been the strain imposed upon it during the height of the hurricane.

On Boxing Day the ship was in calmer water heading in a more southerly direction so as to come up with the land. Fog, fine snow and an overcast sky made a gloomy combination, but during the afternoon the fog lightened sufficiently for us to perceive the mainland—a ghostly cliff shrouded in diaphanous blink. By 10 P.M. the Mertz glacier was visible on the port bow, and to starboard there was an enormous tilted berg which appeared to be magnified in the dim light.

Allowing a day for the weather to become clearer and more settled, we got out the trawl on the 28th and did a dredging in three hundred fathoms close to the glacier-tongue. Besides rocks and mud there were abundant crinoids, holothurians, corals, crustaceans and "shells." In addition, several pieces of fossilized wood and coaly matter were discovered scattered through the "catch."

Bage, under Davis's direction, took temperatures and collected water samples at fifty, seventy-five, one hundred, two hundred and three hundred fathoms, using the Lucas sounding-machine on the fo'c'sle. The temperature gradient from the surface downwards appeared to give some indication of the depth of ice submerged in the glacier-tongue alongside which we were lying.

On the 29th a cold south-easter blew off the ice-cliffs and the sun was trying to pierce a gauzy alto-stratus. The *Aurora* steamed north-east, it being our intention to round the northern limit of the Mertz Glacier. Gradually a distant line of pack, which had been visible for some time, closed in and the ship ran into a *cul-de-sac*. Gray, who was up

in the crow's-nest, reported that the ice was very heavy, so we put about.

Proceeding southward once more, we glided along within a stone's throw of the great wall of ice whose chiselled headlands stood in profile for miles. There was leisure to observe various features of this great formation, and to make some valuable photographic records when the low south-western sun emerged into a wide rift. Hunter trailed the tow-net for surface plankton while the ship was going at half-speed.

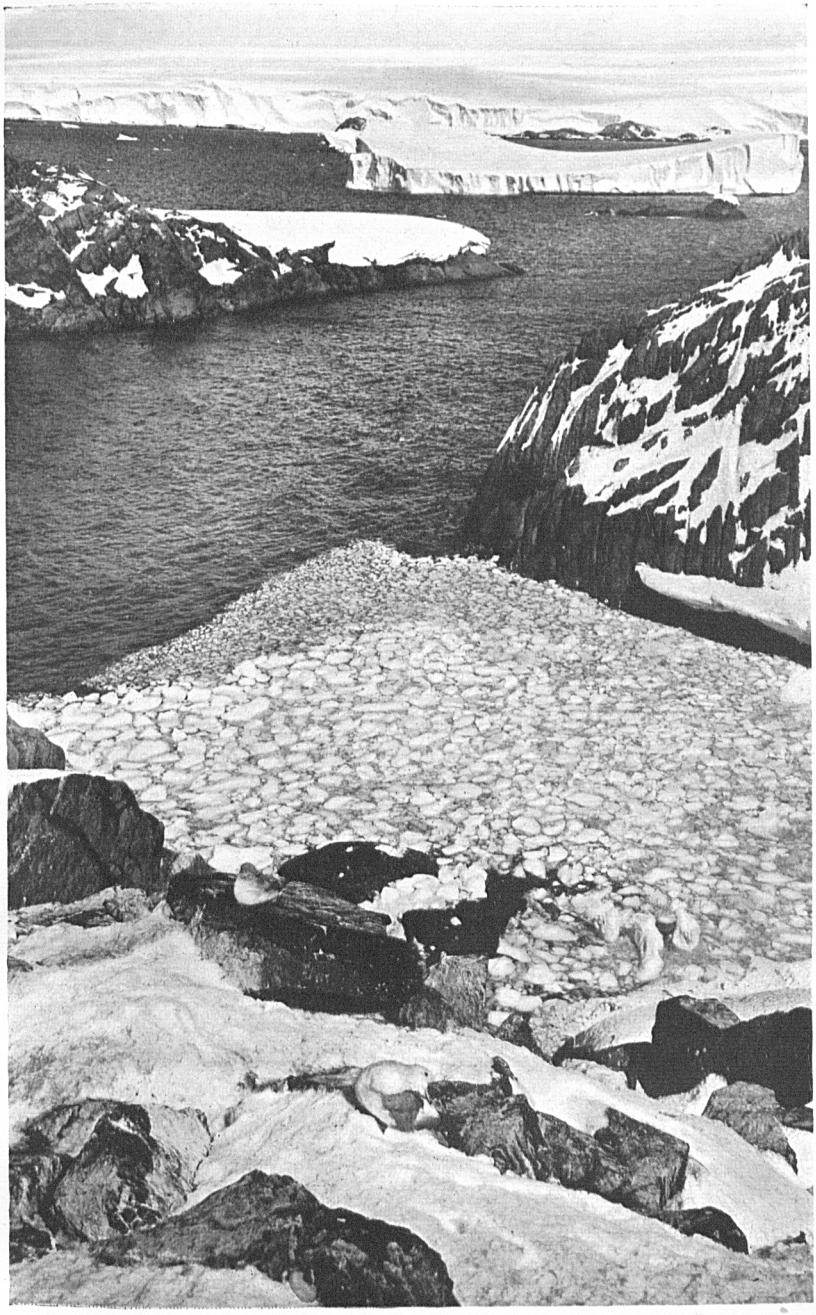
At ten o'clock the ship had come up with the land, and her course was turned sharply to the north-west towards a flotilla of bergs lying to the east of the Way Archipelago, which we intended to visit.

On December 30, 1913, the *Aurora* lay within a cordon of floating ice about one mile distant from the nearest islet of a group scattered along the coast off Cape Gray.

Immediately after breakfast a party of eight men set off in the launch to investigate Stillwell Island. The weather was gloriously sunny and every one was eager at the prospect of fresh discoveries. Cape Hunter had been the home of the Antarctic petrels, and on this occasion we were singularly fortunate in finding a resort of the Southern Fulmar or silver-grey petrels. During the previous summer, two of the eastern sledging parties had for the first time observed the breeding habits of these birds among isolated rocks outcropping on the edge of the coast. But here there was a stronghold of hundreds of petrels, sitting with their eggs in niches among the boulders or ensconced in bowers excavated beneath the snow which lay deep over some parts of the island.

The rock was a gneiss which varied in character from that which had been examined at Cape Denison and in other localities. All the scientific treasures were exhausted by midday, and the whale-boat was well laden when we rowed back to the ship.

Throughout a warm summer afternoon the *Aurora*



Adelie Land *Hurley*

LOOKING TOWARDS THE MAINLAND FROM STILLWELL ISLAND:
SILVER-GREY PETRELS NESTING IN THE FOREGROUND

threaded her way between majestic bergs and steamed west across the wide span of Commonwealth Bay, some fifteen miles off the land. At eleven o'clock the sky was perfectly clear and the sun hung like a luminous ball over the southern plateau. The rocks near the Hut were just visible. Close to the " Pianoforte Berg " and the Mackellar Islets tall jets of fine spray were seen to shoot upward from schools of finner whales. All around us and for miles shoreward, the ocean was calm and blue; but close to the mainland there was a dark curving line of ruffled water, while through glasses one could see trails of serpentine drift flowing down the slopes of the glacier. Doubtless, it was blowing at the Hut; and the thought was enough to make us thankful that we were on our good ship leaving Adelie Land for ever.

On the morning of December 31, 1913, Cape Alden was abeam, and a strong wind swept down from the highlands. Bordering the coast there was a linear group of islets and outcropping rocks at which we had hoped to touch. The wind continued to blow so hard that the idea was abandoned and our course was directed towards the north-west to clear a submerged reef which had been discovered in January 1912.

The wind and sea arose during the night, causing the ship to roll in a reckless fashion. Yet the celebration of New Year's Eve was not marred, and lusty choruses came up from the ward-room till long after midnight. Next morning at breakfast our ranks had noticeably thinned through the liveliness of the ship, but it is wonderful how large an assembly we mustered for the New Year's dinner, and how cheerfully the toast was drunk to " The best year we have ever had ! "

On January 2, 1914, fast ice and the mainland were sighted. The course was changed to the south-west so as to bring the ship within a girdle of loose ice disposed in big solid chunks and small pinnacled floes. A sounding realized two hundred fathoms some ten miles off the coast,

which stretched like a lofty bank of yellow sand along the southern horizon. On previous occasions we had not been able to see so much of the coastline in this longitude owing to the compactness of the ice, and so we were able to definitely chart a longer tract at the western limit of Adelie Land.

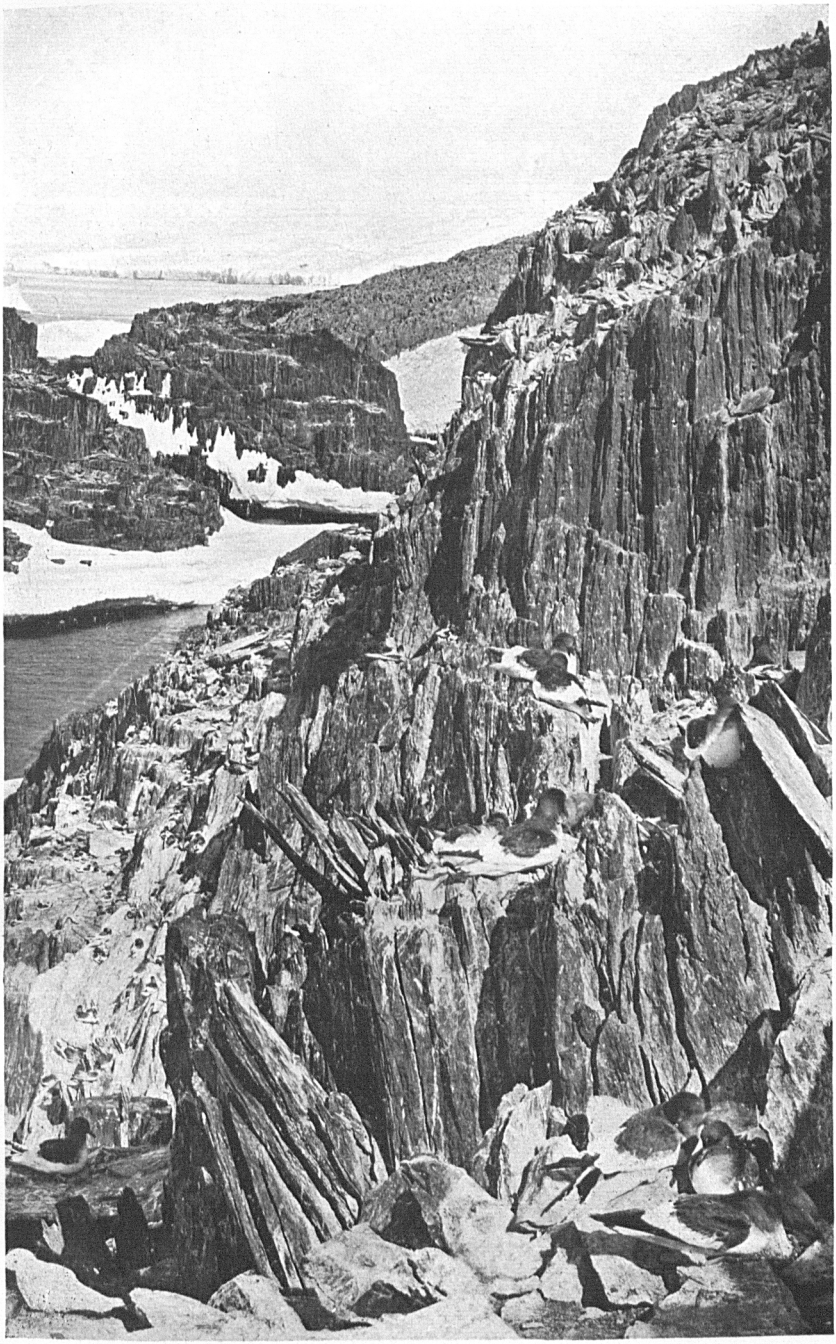
The ice became so thick and heavy as the *Aurora* pressed southward that she was forced at last to put about and steer for more open water. On the way, a sounding was made in two hundred and fifty fathoms, but a dredging was unsuccessful owing to the fact that insufficient cable was paid out in going from two hundred and fifty fathoms to deeper water.

Our north-westerly course ran among a great number of very long tabular bergs, which suggested the possibility of a neighbouring glacier-tongue as their origin.

At ten o'clock on the evening of the 2nd, a mountain of ice with a high encircling bastion passed to starboard. It rose to a peak, flanked by fragments toppling in snowy ruin. The pyramidal summit was tinged the palest lilac in the waning light; the mighty pallid walls were streaked and blotched with deep azure; the green swell sucked and thundered in the wave-worn caverns. Chaste snow-birds swam through the pure air, and the whole scene was sacred.

A tropical day in the pack-ice! Sunday January 4 was clear and perfectly still, and the sun shone powerfully. On the previous day we had entered a wide field of ice which had become so close and heavy that the ship took till late in the evening to reach its northern fringe.

From January 5 onwards for two weeks we steamed steadily towards the west, repeatedly changing course to double great sheets of pack which streamed away to the north, pushing through them in other places where the welcome "water-sky showed strong" ahead, making "southing" for days following the trend of the ice, then grappling with it in the hope of winning through to the land and at last returning to the western track along the margin

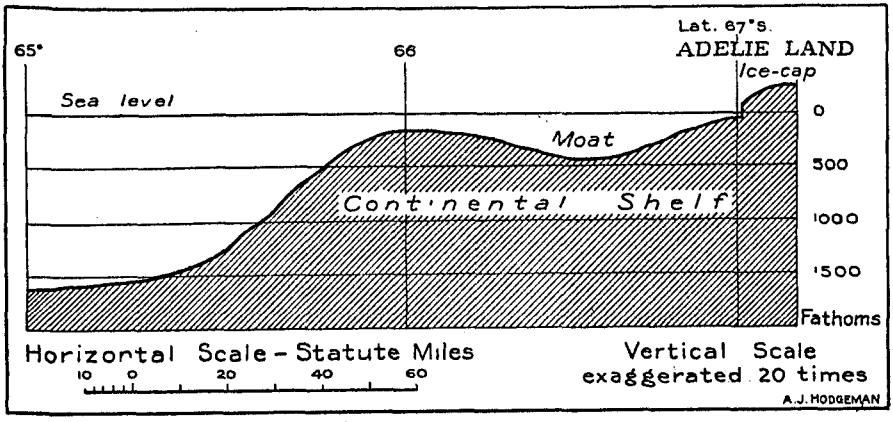


Adelie Land ANTARCTIC PETRELS NESTING ON THE ROCKY LEDGES OF THE CLIFFS NEAR CAPE HUNTER *Hurley*

of brash which breaks the first swell of the Southern Ocean.

The weather was mostly overcast with random showers of light snow and mild variable winds on all but two days, when there was a " blow " of forty miles per hour and a considerable sea in which the ship seemed more active than usual.

Many soundings were taken, and their value lay in broadly Of course, too, we were supplementing the ship's previous work in these latitudes.



SECTION ILLUSTRATING THE MOAT IN THE ANTARCTIC CONTINENTAL SHELF

One successful dredging in eighteen hundred fathoms brought up some large erratics and coaly matter, besides a great variety of animal life. It was instructive to find that the erratics were coated with a film of manganese oxide derived from the sea-water. Several tow-nettings were taken with large nets automatically closing at any desired depth through the medium of a " messenger." Small crustaceans were plentiful on the surface, but they were if anything more numerous at depths of fifty to one hundred fathoms. Amongst the latter were some strongly phosphorescent forms. The flying birds were " logged " daily by the biologists. Emperor and Adelie penguins were occasionally seen, among the floes as well as sea-leopards, crab-eater and Weddell seals.

Friday January 16 deserves mention as being a day full of incident. In the morning a thin, cold fog hung along the pack whose edge determined our course. Many petrels flew around, and on the brash-ice there were dark swarms of terns—small birds with black-capped heads, dove-grey backs and silvery-white breasts. They were very nervous of the ship, rising in great numbers when it had approached within a few hundred yards. One startled bird would fly up, followed by several more; then a whole covey would disturb the rest of the flock. Hamilton managed to shoot two of them from the fo'c'sle, and, after much manœuvring, we secured one with a long hand-net.

Soon after, there was a cry of "killer whales!" from the stern. Schools of them were travelling from the west to the east along the edge of the pack. The water was calm and leaden, and every few seconds a big black triangular fin would project from the surface, there would be a momentary glimpse of a dark yellow-blotched back and then all would disappear.

We pushed into the pack to "ice ship," as the water-supply was running low. Just as the *Aurora* was leaving the open water, a school of finner whales went by, blowing high jets of spray in sudden blasts, wallowing for a few seconds on the surface, and diving in swirls of foam. These finners or rorquals are enormous mammals, and on one occasion we were followed by one for several hours. It swam along with the ship, diving regularly underneath from one side to another, and we wondered what would happen if it had chosen to charge the vessel or to investigate the propeller.

Close to a big floe to which the ship was secured, two crab-eater seals were shot and hauled aboard to be skinned and investigated by the biologists and bacteriologist. When the scientists had finished their work, the meat and blubber were cut up for the dogs, while the choicer steaks were taken to the cook's galley.

After lunch every one started to "ice ship" in earnest. The sky had cleared and the sun was warm and brilliant

by the time a party had landed on the snow-covered floe with baskets, picks and shovels. When the baskets had been filled, they were hoisted by hand-power on to a derrick which had been fixed to the mizen mast, swung inboard and then shovelled into a melting tank alongside the engine-room. The melter was a small tank through which ran a coil of steam pipes. The ice came up in such quantity that it was not melted in time to keep up with the demand, so a large heap was made on the deck.

Later in the afternoon it was found that holes chipped in the sea-ice to a depth of six or eight inches filled quickly with fresh water, and soon a gang of men had started a service with buckets and dippers between these pools and the main hatch where the water was poured through funnels into the ship's tanks. The bulwarks on the port side of the main hatch had been taken down, and a long plank stretched across to the floe. At nine o'clock work was stopped and we once more resumed our western cruise.

It was found that as the region of Queen Mary Land approached, heavy pack extended to the north. While skirting this obstacle, we disclosed by soundings a steep rise in the ocean's floor from a depth of about fifteen hundred fathoms to within seven hundred fathoms of the surface, south of which there was deep water. It was named " Bruce Rise " in recognition of the oceanographical work of the Scottish Expedition in Antarctic seas.

On the 17th, in latitude 62° 21′ S., longitude 95° 9′ E., the course ran due south for more than seven hours. For the two ensuing days the ship was able to steer approximately south-west through slackening ice, until on the 19th at midday we were in latitude 64° 59′ S., longitude 90° 8′ E. At length it appeared that land was approaching, after a westward run of more than twelve hundred miles. Attempts to reach the charted position of Totten's Land, North's Land, Budd Land and Knox Land had been successively abandoned when it became evident that the pack occupied a more northerly situation than that of the two

previous years, and was in most instances thick and impenetrable.

At 10 P.M. on the 19th, the ice fields still remaining loose and navigable, a dark line of open water was observed ahead. From the crow's-nest it was seen to the south stretching east and west within the belt of pack-ice—the Davis Sea. We had broken through the pack less than twenty-five miles north of where the *Gauss* (German Expedition, 1902) had wintered.

All next day the *Aurora* steamed into the eye of an easterly wind towards a low white island, the higher positions of which had been seen by the German Expedition of 1902, and charted as Drygalski's High Land. Dr. Jones' party had, the year before, obtained a distant view of it and regarded it as an island, which proved to be correct, so we named it Drygalski Island. To the south there was the dim outline of the mainland. Soundings varied between two hundred and three hundred fathoms.

On January 21, Drygalski Island was close at hand, and a series of soundings which showed from sixty to seventy fathoms of water deepening towards the mainland proved beyond doubt that it was an island. In shape it is like a flattened dome about nine miles in diameter and twelve hundred feet in height, bounded by perpendicular cliffs of ice, and with no visible evidence of outcropping rock.

The dredge was lowered in sixty fathoms, and a rich assortment of life was captured for the biologists—Hunter and Hamilton. A course was then made to the south amidst a sea of great bergs; the water deepening to about four hundred fathoms.

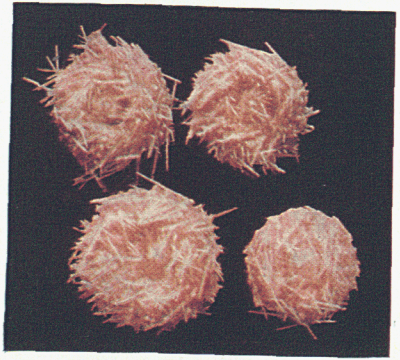
During the evening the crevassed slopes of the mainland rose clear to the south, and many islets were observed near the coast, frozen in a wide expanse of bay-ice. Haswell Island, visited by Jones, Dovers and Hoadley of the Western Party, was sighted, and the ship was able to approach within eight miles of it; at ten o'clock coming up to flat bay-ice, where she anchored for the night. Before we retired

DEEP-WATER FISH LIVING IN THE VICINITY OF THE SHACKLETON ICE-SHELF

SEA-URCHINS
A SHALLOW-WATER FORM

A HOLOTHURIAN OR "SEA-CUCUMBER"
AN EXAMPLE OF ANIMAL LIFE FROM
THE GREATEST DEPTHS

ANTARCTIC MARINE LIFE
Paget colour photos by Correll



to bunk, a Ross seal was discovered and shot, three-quarters of a mile away.

Next day, January 22, an unexpected find was made of five more of this rare species of seal. Many Emperor penguins were also secured. It would have been interesting to visit the great rookery of Emperor penguins on Haswell Island, but, as the ship could only approach to within eight miles of it, I did not think it advisable to allow a party to go so far.

On the night of the 22nd, the *Aurora* was headed north-east for the Shackleton Ice-Shelf. In the early hours of the 23rd a strong gale sprang up and rapidly increased in violence. A pall of nimbus overspread the sky, and blinding snow commenced to fall.

We had become used to blizzards, but on this occasion several factors made us somewhat apprehensive. The ship was at least twenty-five miles from shelter on an open sea, littered with bergs and fragments of ice. The wind was very strong; the maximum velocity exceeding seventy miles per hour, and the dense driving snow during the midnight hours of semi-darkness reduced our chances of navigating with any certainty.

The night of the 23rd had a touch of terror. The wind was so powerful that, with a full head of steam and steering a few points off the eye of the wind, the ship could just hold her own. But when heavy gusts swooped down and the propeller raced on the crest of a mountainous wave, Davis found it impossible to keep steerage-way.

Drift and spray lash the faces of officer and helmsman, and through the grey gloom misty bergs glide by on either hand. A long slow struggle brings us to a passage between two huge masses of ice. There is a shock as the vessel bumps and grinds along a great wall. The engine stops, starts again, and stops once more. The yards on the fore-mast are swung into the wind, the giant seas are broken by the stolid barriers of ice, the engine commences to throb with its old rhythm, and the ship slowly creeps out to

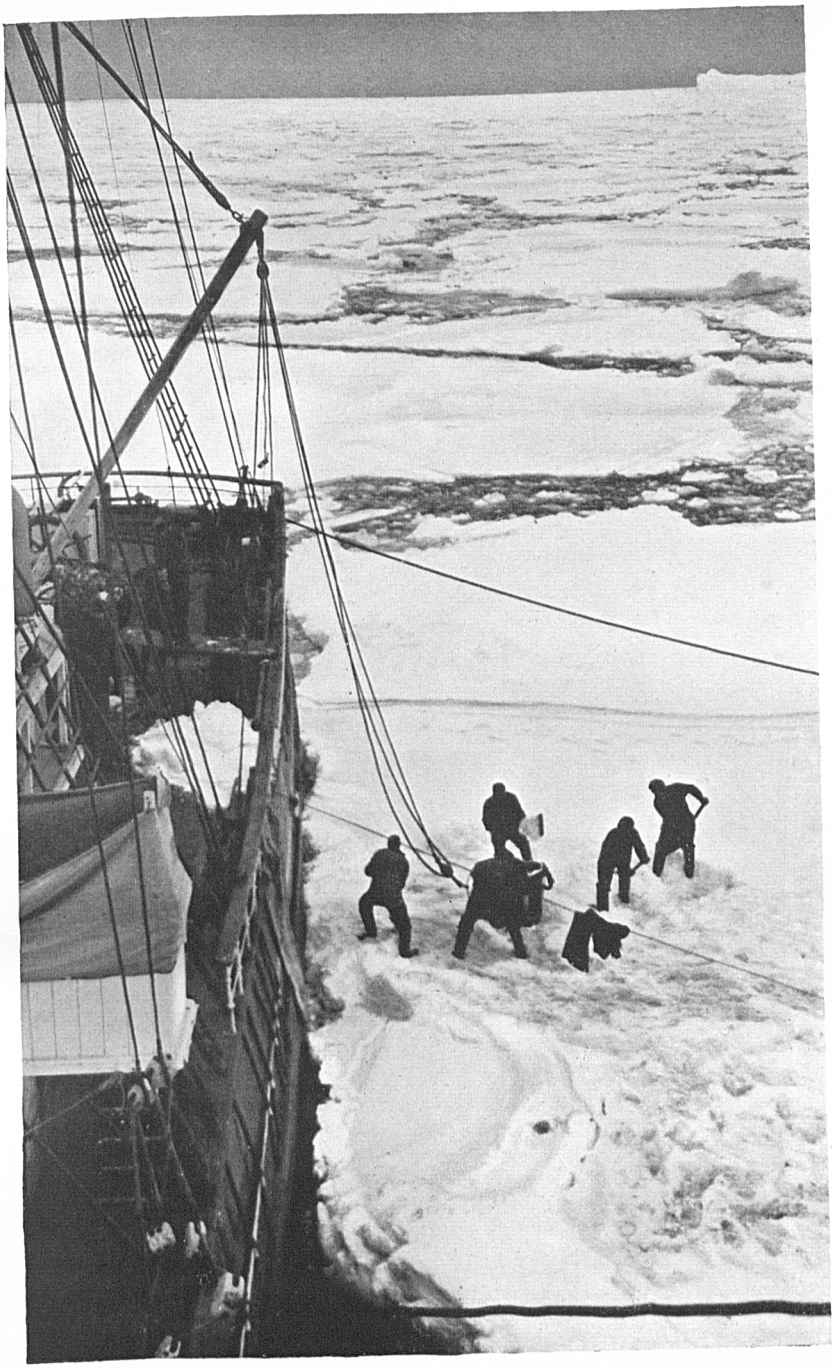
meet the next peril. It comes with the onset of a "bergy-bit" which smashes the martingale as it plunges into a deep trough. The chain stay parts, dragging loose in the water, while a great strain is put by the foremast on the bowsprit.

Early on the 24th the ship was put about and ran with the wind, while all hands assembled on the fo'c'sle. The crew, under the direction of Blair, had the ticklish job of replacing the chain stay by two heavy blocks, the lower of which was hooked on to the lug which secured the end of the stay, and the upper to the bowsprit. The running ropes connecting the blocks were tightened up by winding the hauling line round the capstan. When the boatswain and two sailors had finished the wet and chilly task of getting the tackle into position, the rest put their weight on to the capstan bars and the strain on the bowsprit was relieved. The fo'c'sle, plunging and swaying in the great waves, was encased in frozen spray, and along all the ropes and stays were continuous cylinders of ice. The *Aurora* then resumed her easterly course against the blizzard.

Saturday January 24 was a day of high wind, rough seas, watery decks, lively meals and general discomfort. At 11.30 P.M. the waves had perceptibly decreased, and it was surmised that we were approaching the berg, about thirty miles in length, which lay to the west of the Shackleton Ice-Shelf.

At 6 A.M. on the 25th the sun managed to glimmer through the low rack flying from the east, lighting up the carven face of an ice-cliff along which the *Aurora* was coasting. Up and down we steamed until the afternoon of the 26th, when the wind lulled away to nothing, and the grey, even pall of cloud rose and broke into fleecy alto-cumulus.

At the southern extremity of the long berg, fast bay-ice extended up to the land and for twenty miles across to the shelf on which the Winter Quarters of the Western Party had been situated. Further progress to the south was



ICING SHIP IN THE PACK NORTH OF TERMINATION ICE-TONGUE *Hurley*

blocked, so our course was directed to the north along the western border of the berg.

When not engaged in sounding, dredging, or tow-netting members of the land party found endless diversion in trimming coal. Big inroads had been made in the supply of more than five hundred tons, and it now became necessary to shift many tons of it from the holds aft to the bunkers where it was accessible to the firemen. The work was good exercise, and every one enjoyed the shift below, " trucking " and " heaving." Another undoubted advantage, in the opinion of each worker, was that he could at least demand a wash from Chief Engineer Gillies, who at other times was forced to be thrifty with hot fresh water.

After supper on the 28th it was evident that we had reached a point where the shelf-ice veered away to the eastward and a wide tract of adhering sea-ice barred the way. The floe was exceedingly heavy and covered with a deep layer of soft snow. Emperor and Adelie penguins, crab-eater and Weddell seals were recognized through glasses along its edge. As there was a light obscuring fog and dusk was approaching, the *Aurora* " hung up " for the night.

On January 29 the ship, after a preliminary trawling had been done in three hundred and twenty fathoms, pushed into the floe and was made fast with an ice-anchor. Emperor penguins were so plentiful in the neighbourhood that many specimens were secured for skins.

A sea-leopard was seen chasing a crab-eater seal quite close to the bow of the ship. The latter, after several narrow escapes, took refuge on an ice-foot projecting from the edge of the floe.

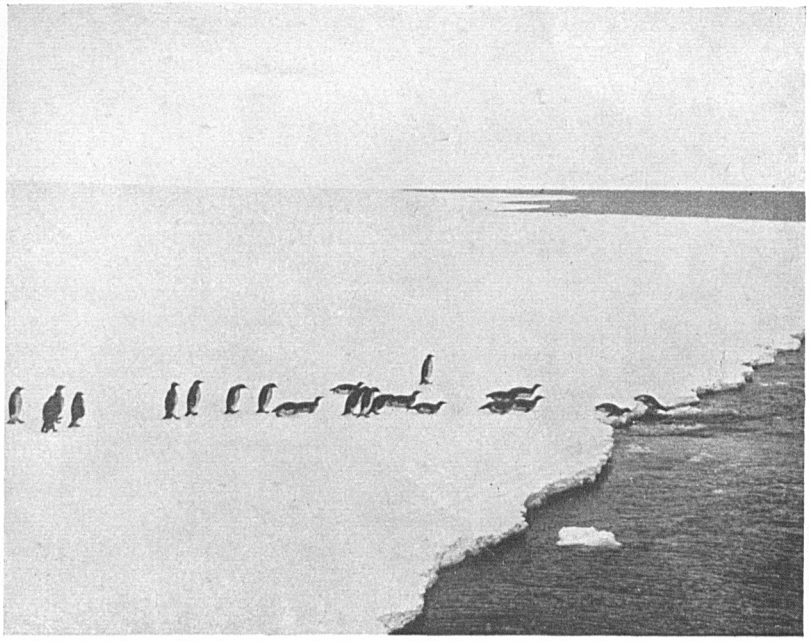
Advantage was taken of a clearing in the weather to walk over the sea-ice to a berg two and a half miles away, from the summit of which it was hoped that some sign of land might be apparent. Away in the distance, perhaps five miles further on, could be seen an immense congregation of Emperor Penguins—evidently another rookery. No certain land was visible.

The cruise was now continued to the north-west in order to skirt a collection of bergs and floe, with the ultimate object of proceeding in an easterly direction towards Termination Ice-Tongue at the northern limit of the Shackleton Shelf-Ice.

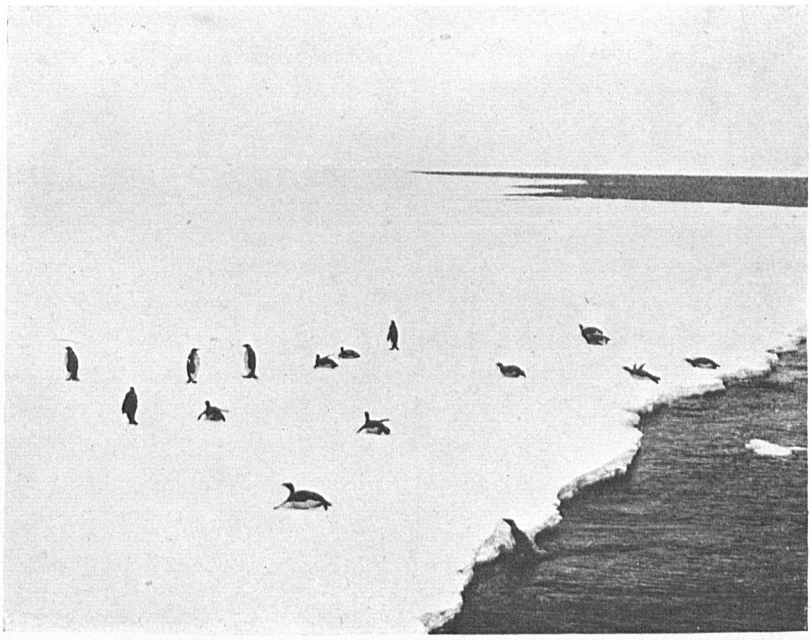
A glance at the map which illustrates the work done by the Western Party affords the best idea of the great ice-formation which stretches away to the north of Queen Mary Land. It is very similar in character to the well-known Ross Barrier over which lay part of Scott's and Amundsen's journeys to the South Pole. Its height is remarkably uniform, ranging from sixty to one hundred feet above the water-level. When allowance has been made for average specific gravity, its average total thickness should approximate to six hundred feet. From east to west the formation was proved to be as much as two hundred miles, with one hundred and eighty miles between its northern and southern limits.

This vast block of ice originates fundamentally from the glacial flow over the southern hinterland. Every year an additional layer of consolidated snow is added to its surface by the frequent blizzards. These annual additions are clearly marked in the section exposed on the dazzling white face near the brink of the ice-cliff. There is a limit, however, to the increase in thickness, for the whole mass is ever moving slowly to the north, driven by the irresistible pressure of the land-ice behind it. Thus the northern face crumbles down into brash or floats away as part of a berg severed from the main body of the shelf-ice.

On the morning of January 30 we had the unique experience of witnessing this crumbling action at work—a cataclysm of snow, ice and water! The ship was steaming along within three hundred yards of a cliff, when some loose drifts slid off from its edge, followed by a slice of the face extending for many hundreds of feet and weighing perhaps one million tons. It plunged into the sea with a deep booming roar and then rose majestically, shedding great



EMPEROR PENGUINS FOLLOW THE LEADER INTO THE SEA *Hurley*



EMPEROR PENGUINS JUMPING ON TO THE FLOE *Hurley*

masses of snow, to roll onwards exposing its blue, swaying bulk shivering into lumpy masses which pushed towards the ship in an ever-widening field of ice. It was a grand scene enacted in the subdued limelight of an overcast day.

During the afternoon the *Aurora* changed her north-westerly course round to north-east, winding through a wonderful sea of bergs grounded in about one hundred and twenty fathoms of water. At times we would pass through narrow lanes between towering walls and emerge into a straight wide avenue along which these mountains of ice were ranged. Several were rather remarkable; one for its exquisite series of stratification lines, another for its façade in stucco, and a third for its overhanging cornice fringed with slender icicles.

On January 31 a trawling was made in one hundred and twelve fathoms. Half a ton of life emptied on the deck gave the biologists occupation for several days. Included in the catch were a large number of monstrous gelatinous ascidians or "sea-squirts." Fragments of coal were once more found; an indication that coaly strata must be very widely distributed in the Antarctic.

The pack was dense and in massive array at the extremity of Termination Ice-Tongue. Davis drove the ship through some of it and entered an open lead which ran like a dark streak away to the east amid ice which grew heavier and more marked by the stress of pressure.

Our time was now limited and it seemed to me that there was little chance of reaching open water by forcing a passage either to the east or north. We therefore turned on our tracks and broke south-west back into the Davis Sea, intending to steam westward to the spot where we had so easily entered two weeks previously.

On February 4 the pack to the north was beginning to thin out and to look navigable. Several short-cuts were taken across projecting "capes," and then on February 5 the *Aurora* entered a zone of bergs and broken floe. No one slept well during that night as the ship bumped and ground

into the ice which crashed and grated along her stout sides. Davis was on watch for long hours, directing in the crow's-nest or down on the bridge, and throughout the next day we pushed on northwards towards the goal which now meant so much to us—Australia—Home!

At four o'clock the sun was glittering on the great ocean outside the pack-ice. Many of us climbed up in the rigging to see the fair sight—a prevision of blue skies and the calm delights of a land of eternal summer. Our work was finished, and the good ship was rising at last to the long swell of the southern seas.

On February 12, in latitude 55° S, a strong south-wester drove behind, and, with all sails set, the *Aurora* made eight knots an hour. The last iceberg was seen far away on the eastern horizon. Albatrosses followed in our wake, accompanied by their smaller satellites—Cape hens, prions, Lesson's and Wilson petrels.

Before leaving the ice, Sandell and Bickerton had fixed an aerial between the fore and mizen masts, while the former installed a wireless receiving-apparatus within the narrow limits of his cabin. There was no space on the ship to set up the motor-engine, dynamos and other instruments necessary for transmitting messages over a long distance.

As the nights began to darken, Sandell listened eagerly for distant signals, until on February 16, in latitude 47° S, the "calls" of three ships in the vicinity of the Great Australian Bight were recognized. After this date news was picked up every night, and all the items were posted on a morning bulletin pinned up in the ward-room.

The first real touch of civilization came unexpectedly early on the morning of February 21. A full-rigged ship on the southern horizon! It might have been an iceberg, the sails flashed so white in the morning sun. But onward it came with a strong south-wester, overhauled and passed us, signalling "*Archibald Russell*, fifty-four days out from Buenos Ayres, bound for Cape Borda." It was too magical to believe.

On February 26 we gazed on distant cliffs of rock and earth—Kangaroo Island—and the tiny cluster of dwellings round the lighthouse at Cape Borda. Then we entered St. Vincent's Gulf on a clear, hot day, marvelling at the sandy-blue water, the long, flat mainland with its clumps of trees and the smoke of many steamers.

The welcome home—the voices of innumerable strangers —the hand-grips of many friends—it chokes one—it cannot be uttered!

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APPENDICES

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APPENDIX I

THE STAFF

The Ship's Officers

J. K. Davis	Master of S. Y. *Aurora* and Second-in-Command of the Expedition.
J. H. Blair	First Officer during the later stages of the Expedition.
P. Gray	Second Officer.
C. P. de la Motte	Third Officer.
F. J. Gillies	Chief Engineer.

Macquarie Island Party

G. F. Ainsworth	Leader : Meteorologist.
L. R. Blake	Geologist and Cartographer.
H. Hamilton	Biologist.
C. A. Sandell	Wireless Operator and Mechanic.
A. J. Sawyer	Wireless Operator.

Main Base Party

Dr. D. Mawson	Commander of the Expedition.
Lieut. R. Bage	Astronomer, Assistant Magnetician and Recorder of Tides.
C. T. Madigan	Meteorologist.
Lieut. B. E. S. Ninnis	In charge of Greenland dogs.
Dr. X. Mertz	In charge of Greenland dogs.
Dr. A. L. McLean	Chief Medical Officer, Bacteriologist.
F. H. Bickerton	In charge of air-tractor sledge.
A. J. Hodgeman	Cartographer and Sketch Artist.
J. F. Hurley	Official Photographer.
E. N. Webb	Chief Magnetician.
P. E. Correll	Mechanic and Assistant Physicist.
J. G. Hunter	Biologist.

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C. F. Laseron	Taxidermist and Biological Collector.
F. L. Stillwell	Geologist.
H. D. Murphy	In charge of Expedition stores.
W. H. Hannam	Wireless Operator and Mechanic.
J. H. Close	Assistant Collector.
Dr. L. A. Whetter	Surgeon.

WESTERN BASE PARTY

F. Wild	Leader.
A. D. Watson	Geologist.
Dr. S. E. Jones	Medical Officer.
C. T. Harrisson	Biologist.
M. H. Moyes	Meteorologist.
A. L. Kennedy	Magnetician.
C. A. Hoadley	Geologist.
G. Dovers	Cartographer.

In addition to these were the following gentlemen who accompanied the Expedition for a portion of the time only or who joined later.

S. N. Jeffryes	Wireless Operator, who relieved W. H. Hannam during 1913.
E. R. Waite	(Curator, Canterbury Museum, Christchurch), Biologist, first Sub-Antarctic cruise of *Aurora*.
Professor T. T. Flynn	(Hobart University), Biologist, second Sub-Antarctic cruise of *Aurora*.
J. van Waterschoot van der Gracht	Marine Artist, second Antarctic cruise of *Aurora*.
Captain James Davis	Whaling authority, second Antarctic cruise of *Aurora*.
C. C. Eitel	Secretary, second Antarctic cruise of *Aurora*.
N. C. Toucher, and later F. D. Fletcher	Served in the capacity of Chief Officer on the *Aurora* during the earlier voyages.

G. F. AINSWORTH, thirty* years of age, single, was born in

* The ages refer to the date of joining the Expedition and are but approximate.

Sydney, New South Wales. His services were loaned to the expedition by the Commonwealth Meteorological Bureau, Melbourne. For a period of two years he acted as leader of the Macquarie Island Party, carrying out the duties of Meteorologist. In the summer of 1913-1914 he visited the Antarctic during the final cruise of the *Aurora*.

R. BAGE, twenty-three years of age, single, was a graduate in Engineering of Melbourne University and a lieutenant in the Royal Australian Engineers. A member of the Main Base Party (Adelie Land) and leader of the Southern Sledging Party, he remained in the Antarctic for two years. During the first year he was in charge of chronometers, astronomical observations and tidal records, and throughout the second year continued the magnetic work and looked after stores.

F. H. BICKERTON, F.R.G.S., twenty-two years of age, single, was born at Oxford, England. Had studied Engineering: joined the Expedition as Electrical Engineer and Motor Expert. A member of the Main Base Party and leader of the Western Sledging Party, he remained in the Antarctic for two years, during which time he was in charge of the air-tractor sledge, and was engineer to the wireless station. For a time, during the second year, he was in complete charge of the wireless plant.

J. H. BLAIR, twenty-four years of age, single, was born in Scotland. For five years he served with the Loch Line of Glasgow as apprentice and third mate. As second mate he joined A. Currie and Company, of Melbourne, in the Australian-Indian trade, reaching the rank of first mate, in which capacity he acted during the final Antarctic cruise of the *Aurora* in the summer of 1913-14.

L. R. BLAKE, twenty-one years of age, single, was born in England, but had lived for many years in Queensland previous to joining the Expedition. Before accompanying the Macquarie Island Party as Geologist and Cartographer, he obtained leave from the Geological Survey Department, Brisbane. He visited the Antarctic during the final cruise of the *Aurora* in the summer of 1913-1914.

J. H. CLOSE, F.R.G.S., forty years of age, married, was born in Sydney, New South Wales. During the South African War he saw active service in Rhodesia, and at the time of the Expedition's departure was a teacher of physical culture at Sydney. A member of the Main Base Party (Adelie Land) and of several sledging parties, he spent two summers and one winter in the Antarctic.

P. E. CORRELL, nineteen years of age, single, was a student in Science of the Adelaide University. He joined the Expedition

as Mechanician and Assistant Physicist. He was a member of the Main Base Party accompanying the Eastern Coastal Party during their sledging journey. He spent three summers and one winter in the Antarctic, acting as colour photographer during the final cruise of the *Aurora*.

J. K. DAVIS, twenty-eight years of age, single, was master of the *Aurora* and Second-in-Command of the Expedition. Born in Ireland and educated in England, he served his apprenticeship on the Liverpool-owned sailing-ship, *Celtic Chief*, obtaining his certificate as second mate before joining the barque *Westland* trading between England and New Zealand. His next post was that of second officer on the training ship *Port Jackson*, following which he joined Sir Ernest Shackleton's Expedition (1907-1909) as chief officer of the *Nimrod*, acting subsequently as master. Throughout the whole period of the Australasian Antarctic Expedition (1911-1914) Captain J. K. Davis commanded the *Aurora* during five cruises.

G. DOVERS, twenty-one years of age, single, of Sydney, New South Wales, was completing his term for Licensed Surveyor in the service of the Commonwealth Government when he joined the Expedition. He was in the Antarctic for two summers and one winter, being stationed with the Western Party (Queen Mary Land). A member of several sledging parties, he acted as Cartographer to the party which reached Gaussberg.

F. J. GILLIES, thirty-five years of age, single, was born at Cardiff, Wales. He served his apprenticeship as an engineer on the steamers of John Shearman and Company and P.Baker and Company of Cardiff. For six years previous to joining the Expedition he was in the Indian trade. Throughout the five cruises of the *Aurora* between 1911 and 1914 F. J. Gillies was Chief Engineer.

P. GRAY, twenty-two years of age, single, was born and educated in England. He served on the *Worcester* as cadet captain for eighteen months and as apprentice on the *Archibald Russell*, of Glasgow, and in the New Zealand Shipping Company. In 1909 he entered the Peninsula and Oriental Company and reached the rank of third officer, joining the Australasian Antarctic Expedition as second officer of the *Aurora*. Throughout five cruises, from 1911 to 1914, he served in this capacity.

H. HAMILTON, twenty-six years of age, single, was born at Napier, New Zealand. Graduate of the Otago University. Besides being employed on the New Zealand Geological Survey, he acted as Entomological Collector to the Dominion Museum at Wellington. A member of the Macquarie Island Party, of which he was the Bio-

logist for two years, H. Hamilton visited the Antarctic during the final cruise of he *Aurora* in the summer of 1913-1914.

W. H. HANNAM, twenty-six years of age, single, was of Sydney, New South Wales, and joined the Expedition in charge of the arrangements for a wireless telegraphic system. He was in the Antarctic at the Main Base (Adelie Land) for two summers and a winter, and was successful in transmitting wireless messages for a short time during 1912 through Macquarie Island to Australia, assistant magnetition for a time.

C. T. HARRISSON, forty-three years of age, married, was born in Hobart, Tasmania. For many years previous to joining the Expedition he had done illustrative and artistic work and had been engaged on a survey and in botanical and other scientific observations on the west coast of Tasmania. Stationed with the Western Base (Queen Mary Land) he acted as Biologist and Artist, accompanying F. Wild on his main eastern journey and several other sledging parties.

C. A. HOADLEY, twenty-four years of age, single, was a graduate in Mining Engineering of Melbourne University. A member of F. Wild's Western Party (Queen Mary Land), he took part in several sledging journeys and was Geologist of the party who explored westwards to Gaussberg.

A. J. HODGEMAN, twenty-six years of age, single, was born at Adelaide, South Australia. For four years he was an articled architect, and for five years a draughtsman in the Works and Buildings Department, Adelaide. A member of the Main Base Party (Adelie Land), he took part in several sledging journeys, and throughout two years in the Antarctic acted in the capacity of Cartographer and Sketch Artist, as well as that of Assistant Meteorologist.

J. G. HUNTER, twenty-three years of age, single, was a graduate in Science of Sydney University, New South Wales. A member of the Main Base Party (Adelie Land) he carried on the work of Biologist during two summers and one winter; and in the same capacity accompanied the *Aurora* in her final summer cruise 1911-1914.

J. F. HURLEY, twenty-four years of age, single, was of Sydney, New South Wales. He had been the recipient of many amateur and professional awards for photographic work before joining the Expedition. At the Main Base he obtained excellent photographic and cinematographic records and was one of the three members of the Southern Sledging Party. He was also present on the final cruise of the *Aurora*.

S. N. JEFFRYES, twenty-seven years of age, single, of Towoomba,

Queensland, was a qualified operator of the Australasian Wireless Company. During the second year (1913) he took W. H. Hannam's place in charge of the wireless plant, wintering at the Main Base (Adelie Land).

S. E. JONES, twenty-four years of age, single, was a graduate in Medicine of Sydney University, New South Wales. A member and Medical Officer of F. Wild's Western Base (Queen Mary Land), he took part in several sledging journeys during 1912 and was leader of the party who explored westward to Gaussberg.

A. L. KENNEDY, twenty-two years of age, single, was a student in Science of Adelaide University, South Australia. Receiving special tuition, he acted as Magnetician at the Western Base (Queen Mary Land) during the year 1912. He was a member of several sledging parties and accompanied F. Wild on his main eastern journey as Cartographer.

C. F. LASERON, twenty-five years of age, single, had gained a Diploma in Geology at the Technical College, Sydney, New South Wales, and for some years was Collector to the Technological Museum. At the Main Base (Adelie Land), during 1912, he acted as Taxidermist and general Collector, taking part, as well, in sledging journeys to the south and east of Winter Quarters.

C. T. MADIGAN, twenty-three years of age, single, was a graduate in Science (Mining Engineering) of Adelaide University, South Australia. Through the courtesy of the Trustees of the Rhodes Scholarship, the necessary leave to accompany the Expedition was granted just as he was on the eve of continuing his studies at Oxford University. A member of the Main Base Party (Adelie Land) he acted as Meteorologist for two years, and during the second year (1913) was also in charge of the Greenland dogs. An important journey in the spring and one to the east in the summer were made under his leadership, and the Party, left in Adelie Land in 1913, was to have been under his charge, but for my return.

D. MAWSON, thirty years of age, single, was the Organiser and Leader of the Australasian Antarctic Expedition and was, previous to it, a member of Sir Ernest Shackleton's Antarctic Expedition of 1907-1909, being one of the party under Professor David which reached the South Magnetic Pole. A graduate in Science and Engineering of Sydney and Adelaide Universities, he had filled for some time the post of Lecturer in Mineralogy and Petrology at the Adelaide University. The only survivor of a party sledging to the east from the Main Base in the summer of 1912–1913.

A. L. MCLEAN, twenty-six years of age, single, was a graduate

in Arts and Medicine of Sydney University, New South Wales. He acted as Chief Medical Officer at the Main Base (Adelie Land) and carried out observations in Bacteriology and Physiology during the first year. In 1913 (the second year) he was Biologist, Ice-Carrier and Editor of the *Adelie Blizzard.* He took part in a sledging journey along the eastern coast in the summer of 1912-1913.

X. MERTZ, twenty-eight years of age, single, of Basle, Switzerland, was a graduate in Law of the Universities of Leipzic and Berne. Prior to joining the Expedition he had gained the Ski-running Championship of Switzerland and was an experienced mountaineer. At the Main Base (Adelie Land) he was assisted by B. E. S. Ninnis in the care of the Greenland dogs. On January 7, 1913, during a sledging journey, he lost his life, one hundred miles south-east of Winter Quarters.

C. P. DE LA MOTTE, nineteen years of age, single, of Bulli, New South Wales, had early training at sea on the barque *Northern Chief* of New Zealand, obtaining his certificate as second mate in March 1911. During the eight months prior to joining the Expedition he served as fourth officer on the S.S. *Warrimoo* of the Union Steamship Company of New Zealand. Throughout the five cruises of the *Aurora* between 1911 and 1914, C. P. de la Motte was third officer with the Ship's party.

M. H. MOYES, twenty-five years of age, single, of Koolunga, South Australia, was a graduate in Science of Adelaide University. With the Western Base Party (Queen Mary Land) he acted as Meteorologist and took part in several sledging journeys in the autumn and spring of 1912. During the summer of 1912-1913, through an unavoidable accident, he was left to carry on work alone at Winter Quarters for a period of nine weeks.

H. D. MURPHY, thirty-two years of age, single, of Melbourne, one-time Scholar in History of Oxford University. At the outset he was to have been leader of a third Antarctic Base which was eventually amalgamated with the Main Base (Adelie Land). Here he had charge of the stores and during the early summer of 1912 was leader of the Southern Supporting Party.

B. E. S. NINNIS, twenty-three years of age, single, was educated at Dulwich, England, and entered His Majesty's Army, having a commission as Lieutenant in the Royal Fusiliers prior to joining the Expedition in London. At the Main Base (Adelie Land) he was assisted by X. Mertz in the care of the Greenland dogs. On December 14, 1912, while on a sledging journey, he lost his life by falling into a crevasse three hundred miles east of Winter Quarters.

C. A. SANDELL, twenty-five years of age, single, of Surrey, England, studied electrical engineering for some years and then came to Australia in 1909 and entered the Commonwealth Branch of Telephony. Having a practical knowledge of wireless telegraphy he joined the Expedition as a Wireless Operator and Mechanic and was stationed with the Macquarie Island Party for two years. After the departure of A. J. Sawyer in August 1913, he was in complete charge of the wireless station. C. A. Sandell visited the Antarctic during the final cruise of the *Aurora* in the summer of 1913-1914.

A. J. SAWYER, twenty-six years of age, single, was born in New Zealand. Having had considerable experience in wireless telegraphy, he joined the Expedition as an operator from the Australasian Wireless Company. At the Macquarie Island Station he was chief wireless until August 1913, when on account of illness he returned to New Zealand.

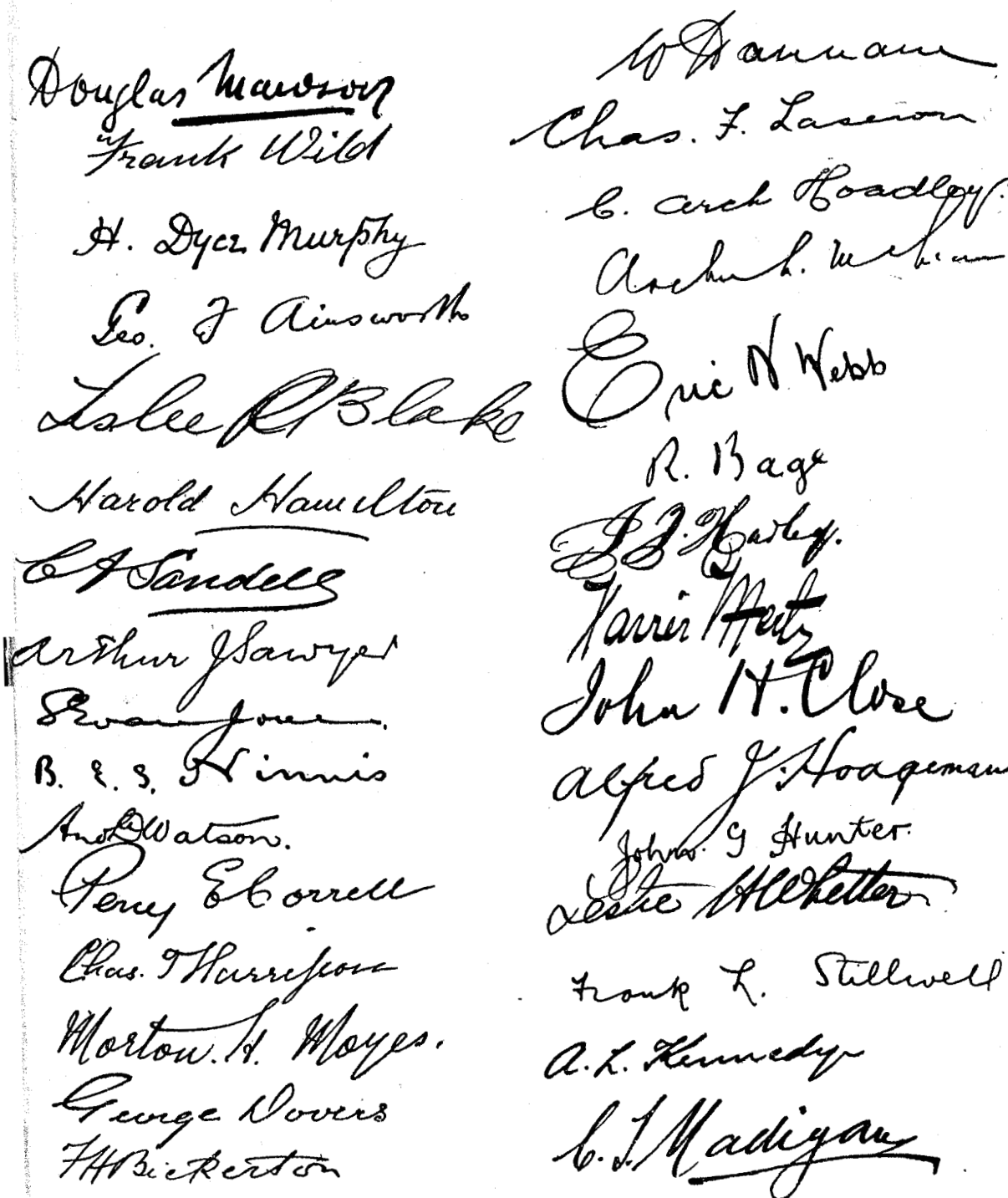
F. L. STILLWELL, twenty-three years of age, single, was a graduate in Science of Melbourne University, Victoria. A member of the Main Base Party (Adelie Land) he acted as Geologist. F. L. Stillwell was leader of two sledging parties who did detail work for about sixty miles along the coast eastward of Winter Quarters.

A. D. WATSON, twenty-four years of age, single, was a graduate in Science of Sydney University, New South Wales. A member of the Western Base Party (Queen Mary Land) he acted as Geologist. A. D. Watson took part in several sledging journeys, accompanying F. Wild in his main eastern trip during the summer of 1912–1913.

E. N. WEBB, twenty-two years of age, single, was an Associate of Civil Engineering of Canterbury University College, and, for the five months previous to joining the Expedition, carried out magnetic observations under the Carnegie Institute of Washington, U.S.A. At the Main Base (Adelie Land) E. N. Webb was Chief Magnetician, accompanying the Southern Sledging Party.

L. A. WHETTER, twenty-nine years of age, single. He graduated at Otago University, New Zealand, and joined the Expedition as Surgeon, acting in that capacity at the Main Base (Adelie Land) during 1912. He accompanied a sledging party which explored to the westward of Winter Quarters.

F. WILD, thirty-eight years of age, single, was Leader of the Western Base Party (Queen Mary Land). He joined the Merchant Service in 1889 and the Navy in 1900, served on an extended sledge journey during the National Antarctic Expedition (Capt. R. F. Scott) of 1901-1904, and was one of the Southern Party of Sir Ernest Shackleton's Expedition from 1907–1909. During the



SIGNATURES OF MEMBERS OF THE LAND PARTIES IN ANTARCTICA AND AT MACQUARIE ISLAND

Australasian Expedition he opened up a new tract of country—Queen Mary Land.

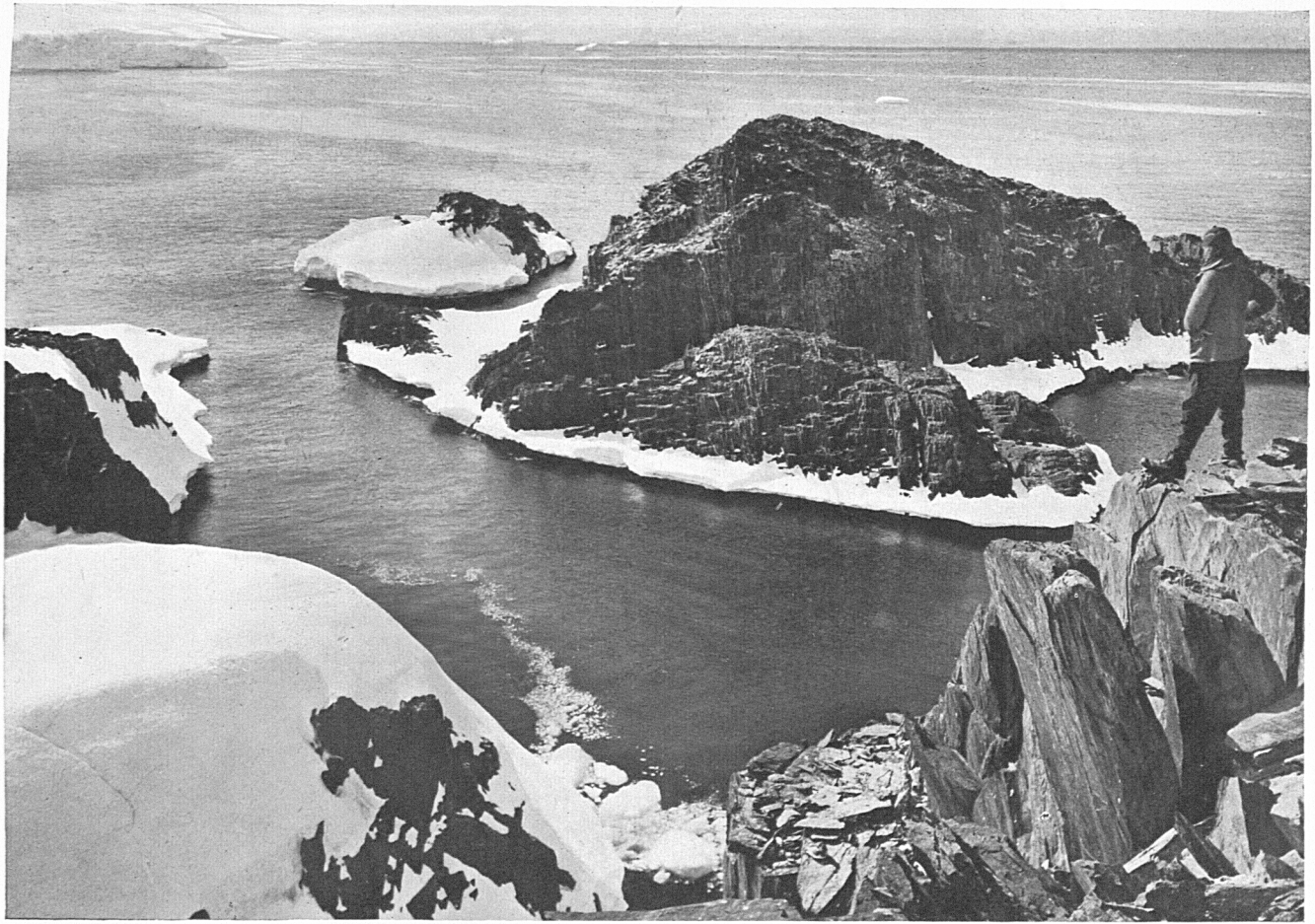
I desire to make specia' mention of the Ship's Party who faced the rigorous conditions of Antarctica and the stormy Southern Ocean, during five separate voyages, with a cheerfulness and devotion to duty which will always stand to their lasting credit. In regions of heavy pack-ice and sudden blizzard winds, Captain Davis piloted the Ship safely through many situations of extreme danger. In a report to me on the work of the Ship he writes an appreciative note :—

"I wish to draw particular attention to the loyal way in which the officers and men of the *Aurora* supported me. Messrs. Toucher, Fletcher, Blair, Gray, de la Motte, and Gillies, in their respective positions, carried out the duties assigned to them with ability and cheerfulness, often under very trying conditions.

"Mr. Gillies not only looked after the engines but assisted materially in the deep-sea work by the invention of a new form of sounding driver which was used successfully during the various cruises of the *Aurora*.

"The Chief Officer was in charge of the stores and equipment of the Expedition on board the vessel, in addition to his ordinary executive duties. Messrs. Toucher, Fletcher and Blair served in this capacity on different voyages.

"Mr. P. Gray, as Second and Navigating Officer, and Mr. C. P. de la Motte, as Third Officer, acted capably and thoroughly throughout the Expedition."



Adelie Land CAPE HUNTER, COMPOSED OF ANCIENT SEDIMENTARY ROCKS (PHYLLITES) *Hurley*

APPENDIX II

SCIENTIFIC WORK

IT should be remarked that there is no intention of furnishing anything more than a suggestion of the general trend of the scientific observations of the Expedition. The brief statement made below indicates the broad lines on which the work was conducted and in some cases the ground which was actually covered. It may thus give the general reader a clue to the nature of the scientific volumes which will serve to record permanently the results amassed during a period of more than two years.

Terrestrial Magnetism

1. *Field Work.* (*a*) Dip determinations were made at Macquarie Island, on the eastern and southern journeys from the Main Base (Adelie Land) and on a short journey from the Western Base (Queen Mary Land).

(*b*) Declination by theodolite observations was determined at Macquarie Island and at intervals on all sledging journeys in the Antarctic.

(*c*) Rough observations of magnetic variation were made daily on the *Aurora* during her five cruises.

2. *Station Work.* (*a*) Regular magnetograph records were kept at the Main Base (Adelie Land) for a period of eighteen months. A system of term days for quick runs was also followed; Melbourne, Christchurch, and other stations co-operating. In connexion with the magnetograph work, Webb conducted regular, absolute observations throughout the year 1912. Bage continued the magnetograph records for a further six months in 1913, observed term days, and took absolute observations.

(*b*) At the Western Base (Queen Mary Land) Kennedy kept term days in the winter, using a magnetometer and dip-circle.

APPENDIX II

Biology

1. *Station Collections.* (*a*) At Macquarie Island, Hamilton worked for two years amongst a rich fauna and a scanty but interesting flora. Amongst other discoveries a finch indigenous to Macquarie Island was found.

(*b*) In Adelie Land, Hunter, assisted by Laseron, secured a large biological collection, notwithstanding the continuous bad weather. Dredgings from depths down to fifty fathoms were made during the winter. The eggs of practically all the flying birds known along Antarctic shores were obtained, including those of the silver-grey petrel and the Antarctic petrel, which were not previously known; also a variety of prion, of an unrecorded species, together with its eggs.

(*c*) At the Western Base (Queen Mary Land) eggs of the Antarctic and other petrels were found, and a large rookery of Emperor penguins was located; the second on record. Harrisson, working under difficulties, succeeded in trapping some interesting fish on the bottom in two hundred and fifty fathoms of water.

2. *Ship Collections.*—(*a*) A collection made by Mr. E. R. Waite, Curator of the Canterbury Museum, on the first Sub-Antarctic cruise.

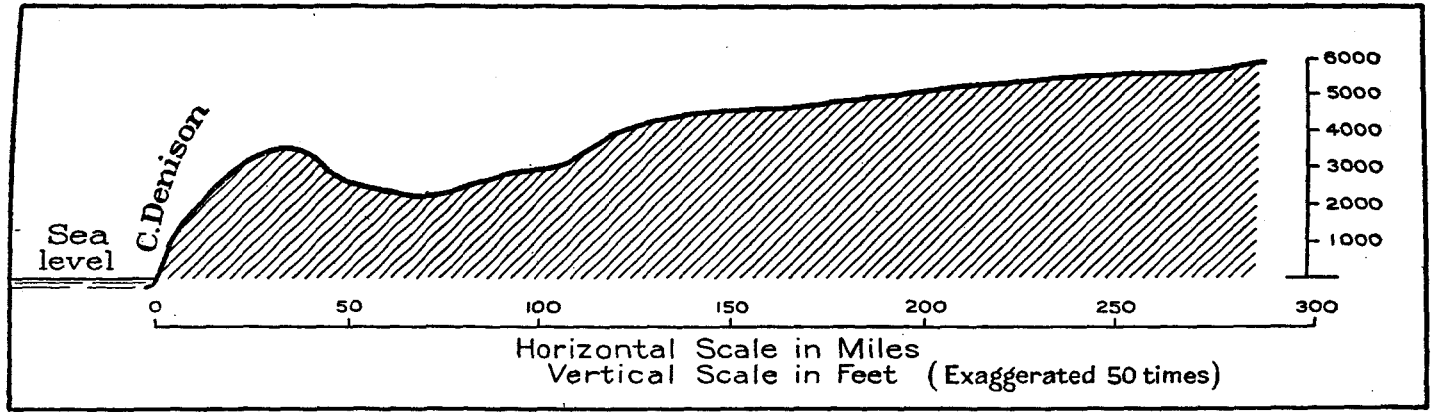
(*b*) A collection made by Professor T. T. Flynn, of Hobart, on the second Sub-Antarctic cruise.

(*c*) A collection made by Hunter, assisted by Hamilton, in Antarctic waters during the summer of 1913-1914. This comprised deep-sea dredgings at eleven stations in depths down to one thousand eight hundred fathoms and regular tow-nettings, frequently serial, to depths of two hundred fathoms. Six specimens of the rare Ross seal were secured. A large collection of external and internal parasites was made from birds, seals and fish.

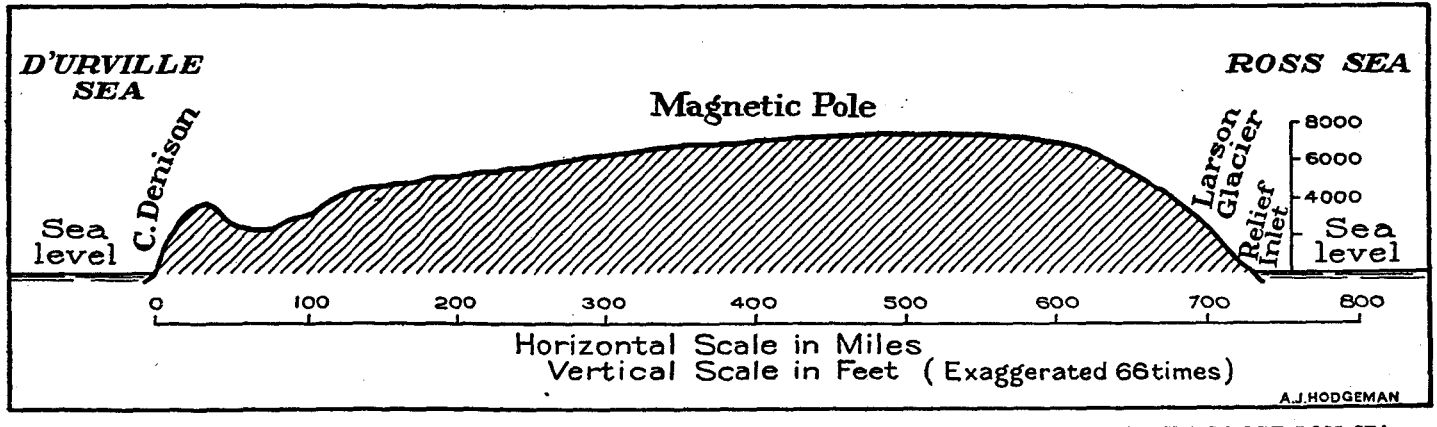
Geology

(*a*) A geological examination of Macquarie Island was made by Blake. The older rocks were found to be all igneous. The Island has been overridden in comparatively recent times by an ice-cap travelling from west to east.

(*b*) Geological collections at the Main Base. In Adelie Land the rocky outcrops are metamorphic sediments and gneisses. In King George V Land there is a formation similar to the Beacon



A SECTION OF THE ANTARCTIC PLATEAU FROM THE COAST TO A POINT THREE HUNDRED MILES INLAND, ALONG THE ROUTE FOLLOWED BY THE SOUTHERN SLEDGING PARTY (ADELIE LAND)



A SECTION ACROSS THE ANTARCTIC CONTINENT THROUGH THE SOUTH MAGNETIC POLE FROM THE D'URVILLE SEA TO THE ROSS SEA; COMPILED FROM OBSERVATIONS MADE BY THE BRITISH ANTARCTIC EXPEDITION (1907–1909) AND BY THE AUSTRALASIAN ANTARCTIC EXPEDITION (1911–1914)

sandstones and dolerites of the Ross Sea, with which carbonaceous shales and coaly strata are associated.

(*c*) Stillwell met with a great range of minerals and rocks in the terminal moraine near Winter Quarters, Adelie Land. Amongst them was red sandstone in abundance, suggesting that the Beacon sandstone formation extends also throughout Adelie Land but is hidden by the ice-cap. A solitary stony meteorite was found by a sledging party lying on the ice of the plateau.

(*d*) In the collections made by Watson and Hoadley at the Western Base (Queen Mary Land) gneisses and schists were ascertained to be the predominant types.

(*e*) A collection of erratics was brought up by the deep-sea trawl in the course of dredgings in Antarctic waters.

Glaciology

(*a*) Observations of the pack-ice, coastal glaciers and shelf-ice from the *Aurora* during her three Antarctic cruises.

(*b*) Observations of the niveous and glacial features met with on the sledging journeys from both Antarctic bases.

Meteorology

(*a*) Two years' observations at Macquarie Island by Ainsworth.

(*b*) Two years' observations in Adelie Land by Madigan.

(*c*) One year's observations in Queen Mary Land by Moyes.

(*d*) Observations by the Ship on each of her five voyages.

(*e*) Observations during the many sledging journeys from both Antarctic Bases.

Bacteriology, Etc.

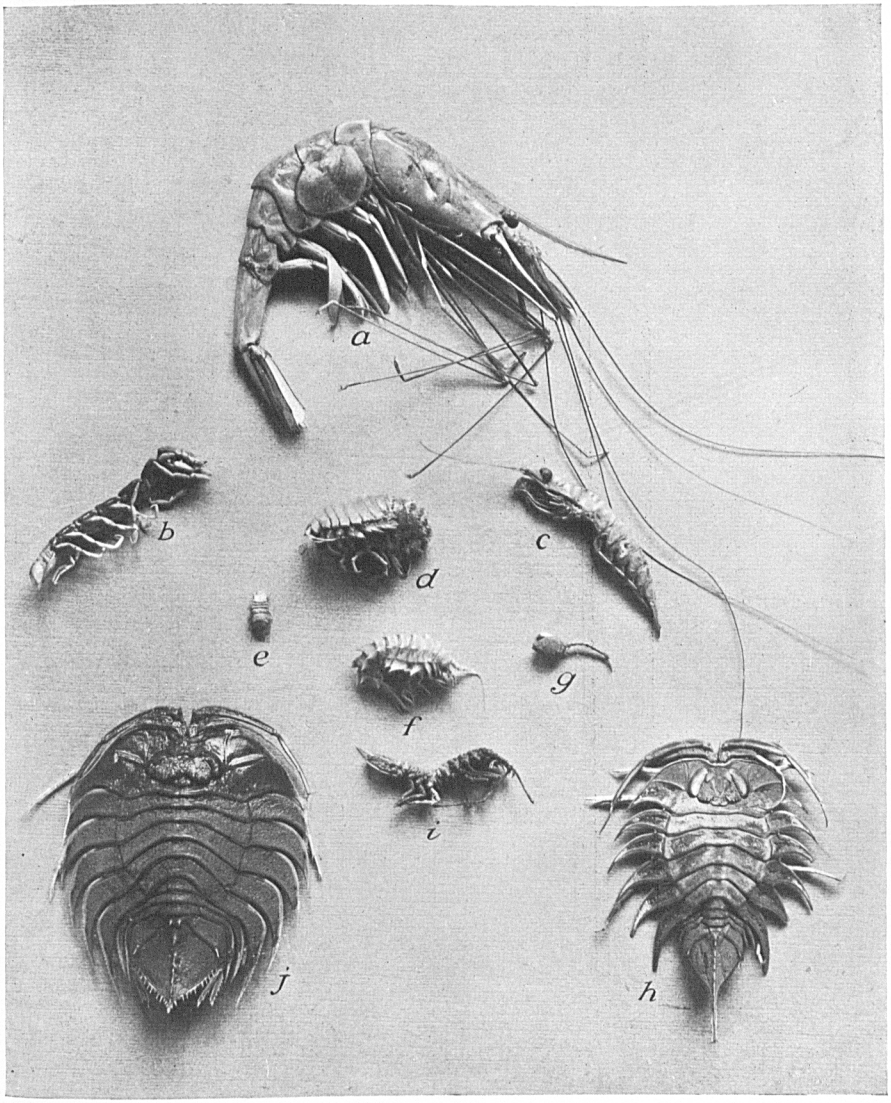
In Adelie Land, McLean carried out many months of steady work in Bacteriology, Hæmatology and Physiology.

Tides

Self-recording instruments were run at Macquarie Island by Ainsworth and at Adelie Land by Bage.

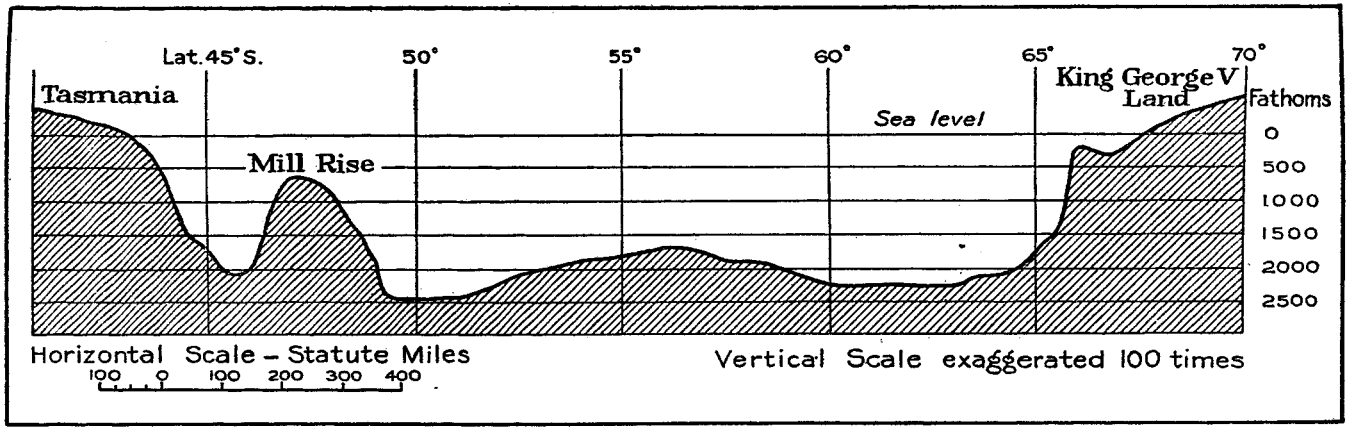
Wireless and Auroral Observations

A very close watch was kept upon auroral phenomena with interesting results, especially in their relation to the " permeability " of the ether to wireless waves.

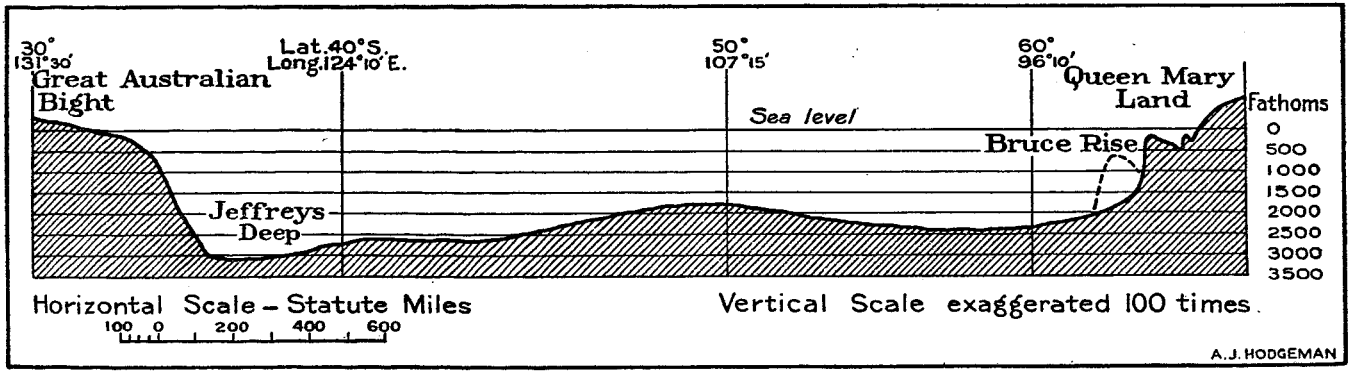


EXAMPLES OF ANTARCTIC MARINE CRUSTACEANS *Hunter*

a. Decapoda—a bright red shrimp from 870 fathoms. *b*. Isopoda—from 318 fathoms. *c*. Euphausiacea—a common surface-water form. *d*. Amphipoda—from 60 fathoms. *e*. Isopoda—from 60 fathoms. *f*. Amphipoda—from 318 fathoms. *g*. Cumacea—from 318 fathoms. *h*. Isopoda—from 240 fathoms. *i*. Isopoda—from 325 fathoms. *j*. Isopoda—from 870 fathoms



A SECTION OF THE FLOOR OF THE SOUTHERN OCEAN BETWEEN TASMANIA AND KING GEORGE V LAND



A SECTION OF THE FLOOR OF THE SOUTHERN OCEAN BETWEEN WESTERN AUSTRALIA AND QUEEN MARY LAND

APPENDIX II

Geographical Results

1. The successful navigation by the *Aurora* of the Antarctic pack-ice in a fresh sphere of action, where the conditions were practically unknown, resulting in the discovery of new lands and islands.

2. Journeys were made over the sea-ice and on the coastal and upland plateau in regions hitherto unsurveyed. At the Main Base (Adelie Land) the journeys aggregated two thousand four hundred miles, and at the Western Base (Queen Mary Land) the aggregate was eight hundred miles. These figures do not include depot journeys, the journeys of supporting parties, or the many miles of relay work. The land was mapped in through 33° of longitude, 27° of which were covered by sledging parties.

3. The employment of wireless telegraphy in the fixation of a fundamental meridian in Adelie Land.

4. The mapping of Macquarie Island.

Oceanography

1. By soundings the fringe of the Antarctic Continent as well as the Continental Shelf has been indicated through 55° of longitude.

2. The configuration of the floor of the ocean southward of Australia and between Macquarie Island and the Auckland Islands has been broadly ascertained.

3. Much has been done in the matter of sea-water temperatures and salinities.

A "Cushion Star"

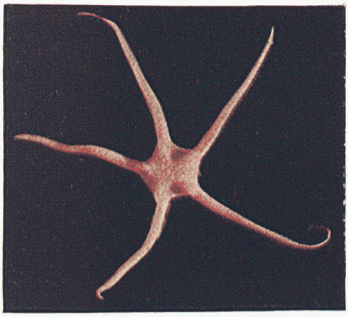
A "Brittle Star"

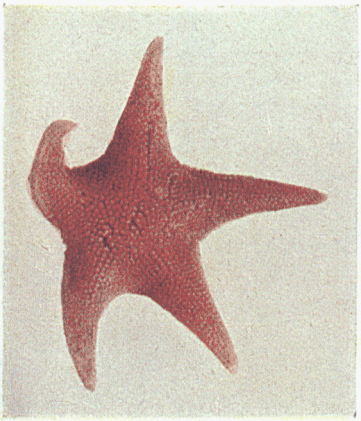
A "Haul" in 220 Fathoms off Queen Mary Land

A Starfish

BROUGHT UP BY THE DEEP SEA TRAWL

Paget colour photo by Correll





APPENDIX III

AN HISTORICAL SUMMARY *

1775. James Cook circumnavigated the Globe in high southern latitudes, discovering the sub-antarctic island of South Georgia. He was the first to cross the Antarctic Circle.

1819. William Smith, the master of a merchant vessel trading between Montevideo and Valparaiso, discovered the South Shetland Islands.

1819. Fabian Gottlieb von Bellingshausen, despatched in command of an Expedition by the Emperor, Alexander I of Russia, with instructions to supplement the voyage of Captain Cook, circumnavigated the Antarctic continent in high southern latitudes. The first discovery of land south of the Antarctic Circle was made; namely, Peter I Island and Alexander I Land (also an island), in the American Quadrant of Antarctica.

1820. Nathaniel Palmer, master of an American sealing-vessel, sighted new land to the south of the South Shetland Islands. It seems clear that he was the first to view what is now known as the Palmer Archipelago (1820–21).

1823. James Weddell, a British sealer, sailing southward of the Atlantic Ocean, reached 74° 15′ south latitude in the American Quadrant, establishing a "farthest south" record.

1830. John Biscoe, a whaling master of the British firm of Enderby Brothers, sailed on a voyage circumnavigating the Antarctic Regions. Enderby Land was discovered south of the West Indian Ocean in the African Quadrant of Antarctica. This was apparently a part of the Antarctic continent. New land was also met with to the south of America and charted as Graham's Land, Biscoe Island and Adelaide Island.

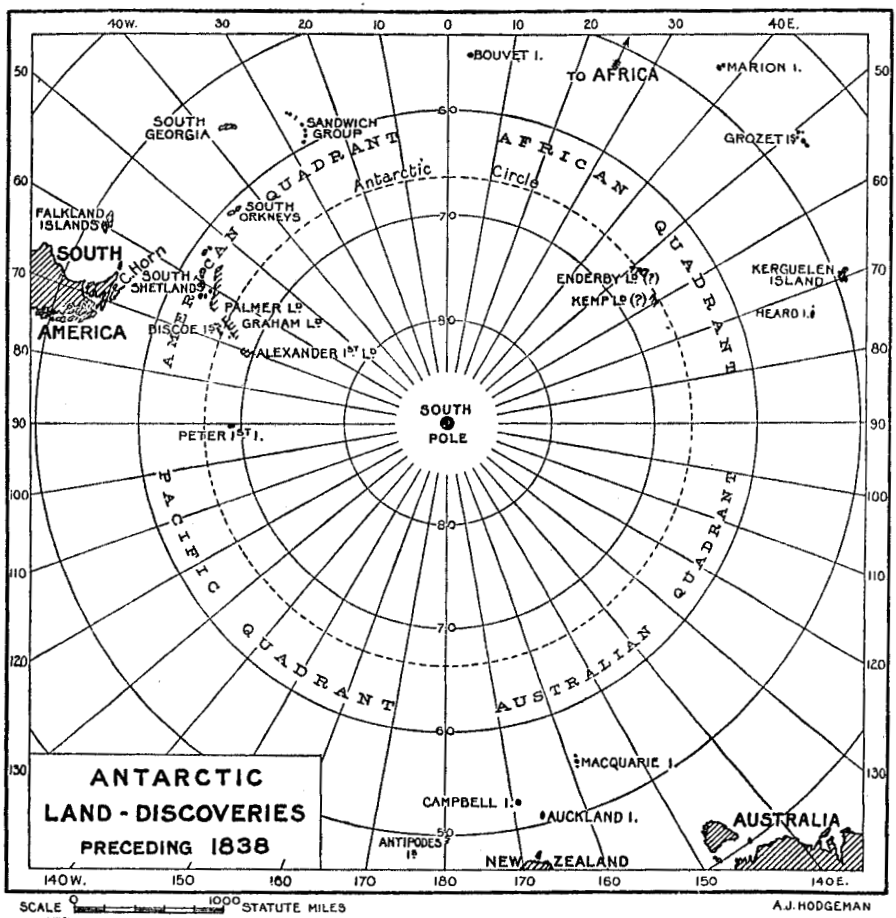
Kemp, a sailing master of Enderby Brothers, extended Biscoe's

* For this compilation reference has been largely made to Dr. H. R. Mill's "The Siege of the South Pole." Several doubtful voyages during the early part of the nineteenth century have been omitted.

discoveries shortly after by the report of land east of, and adjacent to, Enderby Land.

Neither of these discoveries has yet been proved, though Enderby Land (Biscoe) undoubtedly exists.

1839. John Balleny, another of Enderby's whaling captains, discovered the Balleny Islands within the Antarctic Circle, in the



Note. This and the two following maps of the series illustrate land discoveries only. In cases where the existence of land once reported has since been disproved no record at all is shown

Australian Quadrant of Antarctica, and gave a vague description of an appearance of land to the westward. This has been charted on maps, without adequate evidence, as Sabrina Land.

1837. Jules Sebastian Cesar Dumont D'Urville, was despatched

by King Louis Philippe of France for the prosecution of scientific researches on a voyage round the World. His cruise in the Antarctic resulted in the charting of Joinville Island and Louis Philippe Land to the south of America (American Quadrant) and the discovery of a portion of the Antarctic continent, named Adelie Land, southward of Australia (Australian Quadrant).

1838. Charles Wilkes, United States Navy, in accordance with a bill passed by Congress, set out on an exploring expedition to circumnavigate the World. His programme included the investigation of the area of the Antarctic to the south of Australia—the Australian Quadrant. The squadron composing this American expedition first visited the Antarctic regions in the American Quadrant, and then proceeded eastward round to the Australian Quadrant from which, after a long cruise, they returned, reporting land at frequent intervals in the vicinity of the Antarctic Circle between longitudes 157° 46′ E. and 106° 19′ E. He shares with D'Urville the full honour of the discovery of Adelie Land. Some of the supposed landfalls described are now known to be non-existent.

1839. James Clark Ross proceeded south in charge of a scientific expedition fitted out by the Admiralty at the instance of the British Association for the Advancement of Science and approved of by the Royal Society. His aim was to circumnavigate the Antarctic regions and to investigate the Weddell Sea. The geographical results were fruitful; the Ross Sea, the Admiralty Range and the Great Ice Barrier were discovered and some eight hundred miles of Antarctic coastline were broadly delineated.

1844. T. E. L. Moore was detailed by the Admiralty to supplement the magnetic work of Ross and to explore to the southward of Africa and of the Indian Ocean, but no additions were made to geographical knowledge.

1872. Eduard Dallmann, whilst engaged in whaling with a German steamer to the southward of America, added some details to the map of the Palmer Archipelago but did not go further south than 64° 45′ S. latitude.

1874. The *Challenger* scientific expedition, under the command of George Strong Nares, in the course of their voyage from the Cape to Australia during the circumnavigation of the World penetrated within the Antarctic Circle in longitude 78° 22′ E.

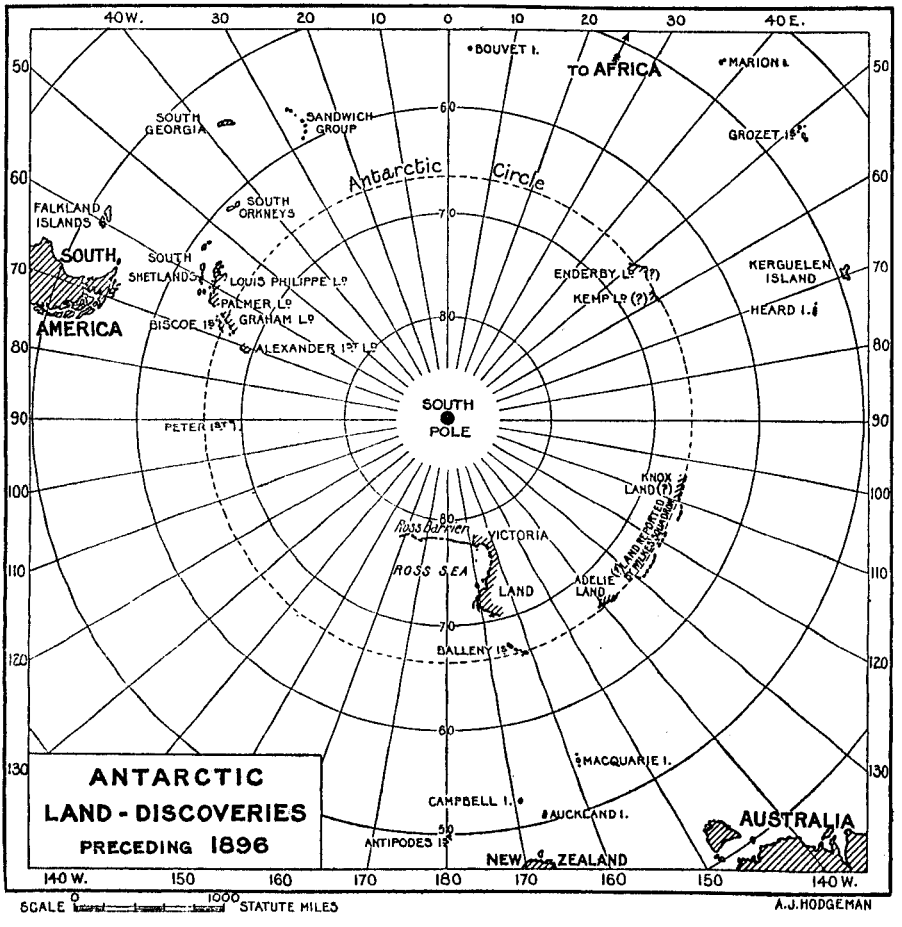
1892. A fleet of four Scottish whalers cruised through the north-western part of the Weddell Sea. Scientific observations were made by W. S. Bruce and others, but no geographical discoveries were recorded.

APPENDIX III

1892. C. A. Larsen, master of a Hamburg whaler, added important details to the geography of the American Quadrant of Antarctica on the western side of the Weddell Sea.

1894. Evensen, master of another Hamburg whaler, brought back further information of the American Quadrant on the Pacific Ocean side.

1895. H. J. Bull organized a whaling venture and with Leonard Kristensen, master of the ship, revisited the Ross Sea area where



a landing was made at Cape Adare (Australian Quadrant). This was the first occasion on which any human being had set foot on the Antarctic continent.

1897. Adrien de Gerlache sailed from Belgium on a scientific

exploring expedition to the American Quadrant. Important additions were made to the map, but the ship became frozen into the pack-ice and drifted about for a whole year south of the Antarctic Circle. The members of this expedition were the first to experience an Antarctic winter. Antarctic exploration now entered upon a new era.

1898. Carstens Egeberg Borchgrevink led an expedition, fitted out by Sir George Newnes; its objective being the Ross Sea area. Further details were added to the map, but the most notable fact was that the expedition wintered at Cape Adare, on the mainland itself. The Great Ross Barrier was determined to be thirty miles south of the position assigned by Ross in 1839.

1898. Chun of Leipsig, in charge of the *Valdivia* Expedition, carried out oceanographical researches far to the south, in the vicinity of Enderby Land (African Quadrant), though he did not come within sight of the continent.

1901. Robert Falcon Scott, in command of the *Discovery* Expedition, organised by the Royal Geographical Society and Royal Society with the co-operation of the Admiralty, in accordance with a scheme of international endeavour, passed two winters at the southern extremity of the Ross Sea and carried out many successful sledging journeys. Their main geographical achievements were; the discovery of King Edward VII Land; several hundred miles of new land on a "farthest south" sledging journey to latitude 82° 17′ S.; the discovery of the Antarctic plateau; additional details and original contributions to the geography of the lands and islands of the Ross Sea.

1901. A German national expedition, led by Erich von Drygalski, set out for the region south of the Indian Ocean. After a small party had been stationed on Kerguelen Island, the main party proceeded south close to the tracks of the *Challenger*. They came within sight of Antarctic shores but were frozen into the pack-ice for a whole year. Kaiser Wilhelm II Land was discovered close to the junction between the Australian and African Quadrants.

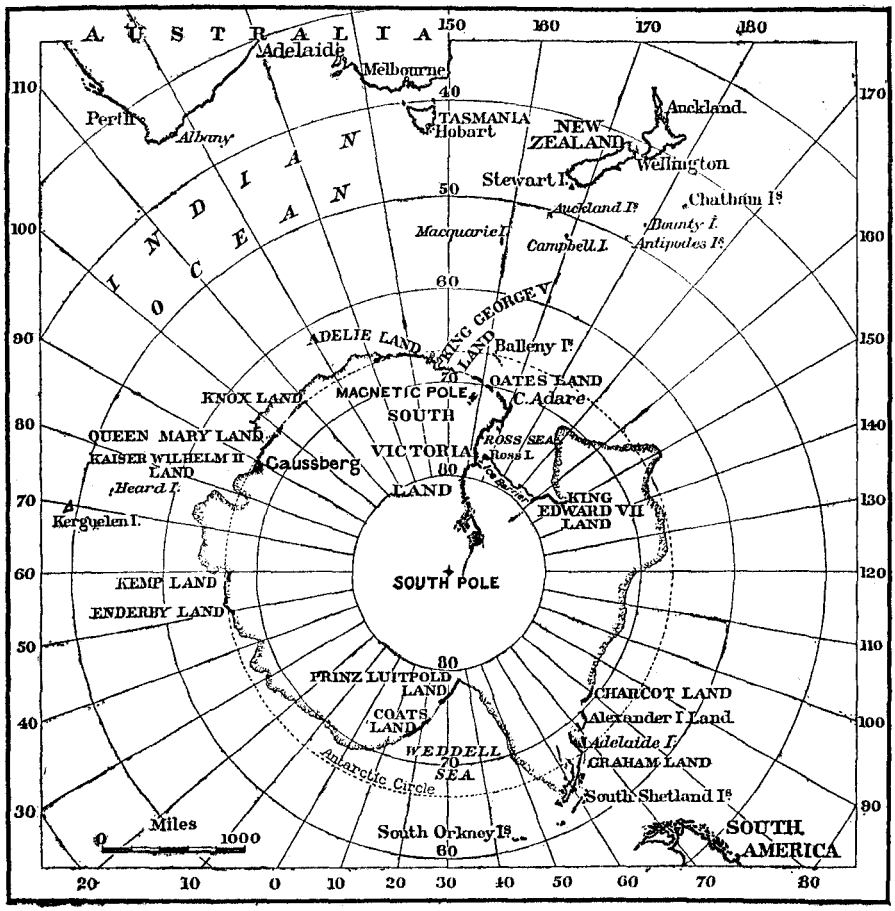
1901. A Swedish national expedition, planned and led by Otto Nordenskjöld, wintered for two years on Snow Hill Island in the American Quadrant, and did much valuable scientific work.

1902. William Speirs Bruce organized and led a Scottish expedition to the Weddell Sea, southward of the Atlantic Ocean. The party effected notable oceanographic researches and wintered at the South Orkney Islands, but were foiled in their attempt to penetrate the pack-ice. During the second season, conditions were

more favourable and the ship reached Coats Land in 74° 1′ S. latitude.

1903. Jean Charcot organized and led a French expedition to the American Quadrant and there added many details to the existing chart.

1907. Ernest Henry Shackleton organized and led a British expedition with the main object of reaching the South Geographical



A MAP OF THE ANTARCTIC REGIONS AS KNOWN AT THE PRESENT DAY

Pole. His party wintered at Cape Royds, McMurdo Sound, and two main sledging parties set out in the early summer. E. H. Shackleton's party ascended the Antarctic plateau and penetrated to within ninety-seven geographical miles of the South Pole, discovering new

land beyond Scott's "farthest south." T. W. Edgeworth David's party reached the South Magnetic Polar Area, filling in many details of the western coast of McMurdo Sound.

1908. Jean Charcot organized and led a second French expedition to extend the work accomplished in 1903 in the American Quadrant. He was successful in discovering new land still further to the south. Loubet, Fallières and Charcot Lands, towards and beyond Alexander I Land, were added to the map of Antarctica.

1910. Roald Amundsen organized an expedition for scientific research in the vicinity of the North Pole but changed his plans, eventually heading for the South Pole. The expedition wintered on the Ross Barrier near King Edward VII Land, from which point he set out and attained the South Geographical Pole, mapping in new land on the way. Another party visited King Edward VII Land.

1910. Robert Falcon Scott led a second Antarctic expedition, the main object of which was to reach the South Geographical Pole. The principal party wintered near his old winter quarters at Hut Point, McMurdo Sound. A second party was landed at Cape Adare. Scott reached the Pole soon after the Norwegian Amundsen, but he and his party perished on the return journey. Other parties added details to the map of Victoria Land. Oates Land was sighted from the ship to the westward of Cape Adare in the Australian Quadrant.

1910. A Japanese expedition sailed to the Ross Sea, but on account of the lateness of the season was forced to turn back without landing. The winter was spent at Sydney, New South Wales. Next year a summer visit was made to the South, but no additional land discoveries were made.

1911. A German expedition, led by Wilhelm Filchner, proceeded to the Weddell Sea; the South Pole being its objective. The party succeeded in reaching further south in that region than any previous navigators and discovered new land, to be named Prince Luitpold Land. They were driven northwards amongst the pack in a blizzard and spent the winter frozen in south of Coats Land.

APPENDIX IV

GLOSSARY

Oceanography. The study of the ocean, including the shape and character of its bed, the temperature and salinity of the water at various depths, the force and set of its currents, and the nature of the creatures and plants which haunt its successive zones.

Névé. The compacted snow of a snow-field; a stage in the transition between soft, loose snow and glacier-ice.

Sastrugi. The waves caused by continuous winds blowing across the surface of an expanse of snow. These waves vary in size according to the force and continuity of the wind and the compactness of the snow. The word is of Russian derivation (from *zastruga* [sing.], *zastrugi* [pl.]), denoting snow-waves or the irregularities on the surface of roughly-planed wood.

Ice-foot. A sheath of ice adhering along the shores of polar lands. The formation may be composed of attached remnants of floe-ice, frozen sea-spray and drift-snow.

Nunatak. An island-like outcrop of rock projecting through a sheet of enveloping land-ice.

Shelf-ice. A thick, floating, fresh water ice-formation pushing out from the land and continuous with an extensive glacier. Narrow prolongations or peninsulas of the shelf-ice may be referred to as *ice-tongues* or *glacier-tongues.*

Barrier is a term which has been rather loosely applied in the literature of Antarctic Exploration. Formerly it was used to describe a formation, which is mainly shelf-ice, known as the Great Ross Barrier. Confusion arose when "Barrier" came to be applied to the seaward ice-cliff (resting on rock) of an extensive sheet of land-ice and when it was also employed to designate a line of consolidated pack-ice. Spelt with a small "b" the term is a convenient one, so long as it carries its ordinary meaning; it seems unnecessary to give it a technical connotation.

Blizzard. A high wind at a low temperature, accompanied by drifting, not necessarily falling snow.

Floe or Floe-ice. The comparatively flat, frozen surface of the sea intersected by cracks and *leads* (channels of open water).

Pack or Pack-ice is a field of loose ice originating in the main from broken floe, to which may be added material from the disintegration of bergs, and bergs themselves.

Brash or Brash-ice. Small, floating fragments of ice—the débris of larger pieces—usually observed bordering a tract of pack-ice.

Bergschrund has been "freely rendered" in the description of the great cleft between the lower part of the Denman Glacier and the Shackleton Shelf-Ice (Queen Mary Land). In a typical glacier, "the upper portion is hidden by névé and often by freshly fallen snow and is smooth and unbroken. During the summer, when little snow falls, the body of the glacier moves away from the snow-field and a gaping crevasse of great depth is usually established, called a *Bergschrund,* which is sometimes taken as the upper limit of the glacier" ("Encyclopædia Britannica").

Sub-Antarctica. A general term used to denote the area of ocean, containing islands and encircling the Antarctic continent, between the vicinity of the 50th parallel of south latitude and the confines of the ice-covered sea.

Séracs are wedged masses of icy pinnacles which are produced in the surface of a glacier by dragging strains which operate on crevassed areas. A field of such pinnacles, jammed together in broken confusion, is called *sérac-ice.*

The following colloquial words or phrases occurring in the narrative were largely determined by general usage: To depot = to cache or to place a stock of provisions in a depot; drift = drift-snow; fifty-mile wind = a wind of fifty miles an hour; burberry = "Burberry gabardine" or specially prepared wind-proof clothing; whirly (pl. whirlies) = whirlwind carrying drift-snow and pursuing a devious track; night-watchman = night-watch; glaxo = "Glaxo" (a powder of dried milk); primus = primus stove used during sledging; hoosh = pemmican and plasmon biscuit "porridge"; tanks = canvas bags for holding sledging provisions; boil-up = sledging meal; ramp = bank of snow slanting away obliquely on the leeward side of an obstacle; radiant = an appearance noted in clouds (especially cirro-stratus) which seem to radiate from a point on the horizon.

The following appended list may be of biological interest:

APPENDIX IV

BIRDS	AVES
Emperor penguin	*Aptenodytes forsteri*
King penguin	*Aptenodytes patagonica*
Adelie penguin	*Pygoscelis adeliæ*
Royal penguin	*Catarrhactes schlegeli*
Victoria penguin	*Catarrhactes pachyrynchus*
Gentoo or Rockhopper penguin	*Pygoscelis papua*
Wandering albatross	*Diomedea exulans*
Mollymawk or Black-browed albatross	*Diomedea melanophrys*
Sooty albatross	*Phoebetria fuliginosa*
Giant petrel or nelly	*Ossifraga gigantea*
MacCormick's skua gull	*Megalestris maccormicki*
Southern skua gull	*Megalestris antarctica*
Antarctic petrel	*Thalassoeca antarctica*
Silver-grey petrel or southern fulmar	*Priocella glacialoides*
Cape pigeon	*Daption capensis*
Snow petrel	*Pagodroma nivea*
Lesson's petrel	*Oestrelata lessoni*
Wilson petrel	*Oceanites oceanicus*
Storm petrel	*Fregetta melanogaster*
Cape hen	*Majaqueus æquinoctialis*
Small prion or whale bird	*Prion banksii*
Crested tern	*Sterna sp.*
Southern black-backed or Dominican gull	*Larus dominicanus*
Macquarie Island shag	*Phalacrocorax traversi*
Mutton bird	*Puffinus griseus*
Maori hen or " weka "	*Ocydromus scotti*

SEALS	PINNIPEDIA
Sea elephant	*Macrorhinus leoninus*
Sea-leopard	*Stenorhynchus leptonyx*
Weddell seal	*Leptonychotes weddelli*
Crab-eater seal	*Lobodon carcinophagus*
Ross seal	*Ommatophoca rossi*

WHALES AND DOLPHINS	CETACEA
Rorqual, finner, or blue whale	*Balaenoptera sibbaldi*
Killer whale	*Orca gladiator*

APPENDIX V

MEDICAL REPORTS

WESTERN BASE (QUEEN MARY LAND)

By S. E. Jones, M.B., Ch.M.

THERE was a very marked absence of serious illness during the whole period of our stay at the Base. After the *Aurora* left Adelie Land on January 19, 1912, for her western cruise, an epidemic of influenza broke out. It should be noted that one case occurred on the voyage south from Hobart, and then an interval of almost a month occurred before the infection spread. An interesting feature of the outbreak was the fact that the recovery of those who were convalescing, when we arrived at Queen Mary Land, was much more rapid than was the case with those whose convalescence occurred on the Ship.

By the careful use of snow-goggles during the summer, snow-blindness was practically prevented, and such cases as occurred yielded quickly when zinc and cocaine tablets were used and the eyes obtained rest. An undoubted factor in the causation of snow-blindness is the strain caused by the continual efforts at visual accommodation made necessary on dull days when the sun is obscured, and there is a complete absence of all light-and-shade contrast.

Although frostbites were frequent during the winter months, immediate attention to the restoration of circulation prevented the occurrence of after-effects, so that no one suffered the loss of any more tissue than the superficial epithelium. The nose, ears, fingers and toes were the parts which suffered first.

Our supplies of food were excellent in point of view of variety. Some tinned onions were responsible for several mild attacks of poisoning, but these were not used after our first experience. There was no sign of scurvy in any form.

Hoadley, on one occasion, had an unpleasant experience. He was alone in the hut sleeping one night when he awoke to find the

room filled with smoke. On going outside he found that the chimney had become blocked with snow; as the fire was banked, the hut was filled with the gases from the imperfect combustion of the coal. It was three or four days before Hoadley recovered from his experience, having marked symptoms of carbon monoxide poisoning.

On my return from the Western Depot journey I found that Wild was suffering from an attack of herpes zoster. The illness came on while he was out sledging, and he suffered severely from the pain and irritation.

Beyond a few cases of minor illness, and one or two accidents, there was nothing of serious moment to report.

MAIN BASE (ADELIE LAND)

By A. L. McLean, M.B., Ch.M., B.A.

Throughout the whole period of the Expedition—from December 2, 1911, to February 26, 1914—the health of the expedition was remarkably good. Undoubtedly Antarctica has a salubrious climate, and it is simply because one returns in a measure to the primitive that such an ideal result is obtained.

The first thing to resist is the cold, and additional clothing is the first and adequate means to such an end. No one needs to be specially inured to a rigorous climate. If he has a normal circulation he immediately reacts to a new set of temperature conditions, and in a few weeks may claim to be acclimatized. Most of the members of the expedition were Australians, so that the change of latitudes was rather abrupt but none the less stimulating and healthful.

Appetite for food had suddenly a new piquancy, hard manual work was a pleasure in a novel and wonderful environment, the intellect and imagination were quickened and the whole man embodied the *mens sana in corpore sano*. That is why illness was practically unknown for more than two years; and, further, it may be said with partial truth that in the high sense of physical and mental fitness he possessed for a time, lies the explanation of the proverbial desire of an explorer to return to the ice-lands.

Regular monthly examinations of the blood were made from the date of leaving Hobart in December 1911 until October 1912, with an interval of about nine weeks between the first and second examinations. The hæmoglobin or red colouring-matter went up with a leap and then very steadily increased in amount during the

winter months in Adelie Land. The blood pressure became slightly more marked, the weight increased, but as one might have expected, the resistance to ordinary civilized germs was decreased. With regard to weight, the maximum amount gained by a single individual during a period of eight weeks was almost two stones, and every one became heavier by as much as ten pounds. As clinical evidence of the loss in immunity may be quoted the epidemic of influenza to which Dr. S. E. Jones referred. As well, it was noted that several members had attacks of "boils" during the voyage southward; in Adelie Land during 1912 there were two instances of acute abscesses on the fingers (whitlows) and one jaw abscess. It appears as if, with its new and unbounded energy of function, the body attempts to throw off its waste products. Then, too, experimental observations of opsonic index pointed towards the lowering of resistance, and, by the way, it was rather a remarkable fact that after a few months in Adelie Land, staphylococcus pyogenes aureus—a common germ in civilization—could not be cultivated artificially from the throat, nose or skin, of six individuals from whom monthly bacteriological cultures were made.

Within the Hut, at a temperature which ranged from 40° to 45° F., the number of micro-organisms continuously increased, if the exposure of agar plates at regular intervals (by night) gave a true indication. The organisms were staphylocci albi, bacilli, yeasts, and moulds; the latter overgrowing the plate after it had been for forty-eight hours in the incubator.

Frostbites were common, but, perhaps for that reason, were not regarded seriously. No one suffered permanent harm from being frost-bitten, though in several cases rather extensive blisters formed and nails and skin were lost.

Whilst the Hut was being built, minor casualties often occurred; the common remedy being to cover the injured part with a small piece of gauze surrounded by adhesive tape; for open wounds will not heal when exposed to the cold. The Greenland dogs had small accidents and ailments which often required treatment.

On sledging journeys snow-blindness was an affection which sooner or later caught every one in an unguarded moment. That moment was when he ceased to use goggles if the light were at all trying to his eyes. Prevention came first, and then the "zinc and cocaine" cure.

Adelie Land can only be regarded as an intolerable country in which to live, owing to the never-ceasing winds. Usage and necessity helped one to regard the weather in the best possible light; for the

sake of a few hours of calm which might be expected to occasionally intervene between the long spells of the blizzards. It is, therefore, with regret and some diffidence that I speak of the illness of Mr. S. N. Jeffryes, who took up so conscientiously the duties of wireless operator during the second year (1913); but upon whom the monotony of a troglodytic winter life made itself felt. It is my hope that he is fast recovering his former vigour and enthusiasm.*

So many miles of sledging were done at both Antarctic Bases in a climate which is surely without a parallel in the history of polar travelling, the Ship was so often in jeopardy during her three main cruises to the South, that we feel the meagre comment should be made on our providential return to civilization with the loss of two comrades whose memory will ever be imperishable to each one of us.

* With the advent of summer, Jeffryes became normal, but unfortunately suffered a temporary relapse upon his return to Australia.—D. M.

APPENDIX VI

FINANCE

A GENERAL reference was made to the finances of the expedition in the Introduction. Here is an extended statement which, more fully amplified with a detailed list of donations, will be again published when additional funds have been raised to pay off the debit balance and establish equilibrium.

GRANTS AND DONATIONS

	£	£
AUSTRALIA, *January* 1911:		
Australasian Association for the Advancement of Science, £1000; R. Barr Smith (South Australia), £1000; Hugh Denison (Sydney), £1000; Samuel Hordern (Sydney), £1000 (subsequently increased to £2500)		4,000
LONDON, *June* 1911:		
S. Hordern (Sydney), £1500 (second donation); Roderick Murchison (Melbourne), £1000; W. A. Horn (South Australia), £1000; Lord Strathcona, £1000; Eugene Sandow, £1050; Imperial Government, £2000; Royal Geographical Society, £500; Lionel Robinson (Sydney), £250; C. D. Mackellar, £150; G. P. Doolette, £150; G. Buckley, £150; Lord Denman, £100; Madame Melba (Melbourne), £100; S. Y. Buchanan, £100 (later increased to £200); *Daily Mail*, £100; Messrs. Bullivants £100, &c., aggregating an additional £593		9,843
AUSTRALIA, *October* 1911:		
Sydney: Government grant, £7000; collected by Professor David, £50; Sydney *Morning Herald*, £100; Professor David's own donation and lecture proceeds, £100	7,250	
Melbourne: Government grant, £6000; collected by Professor Masson, £70	6,070	
Adelaide: Government grant, £5000; collected by Mr. Piper, £250 (including Angus £100, Simpson £85, Scarfe £50)	5,250	
Hobart: Government grant, £500; collected, £55 .	555	
Commonwealth grant	5,000	
		24,125
Carried forward		37,968

APPENDIX VI

	£
LONDON, 1913: Brought forward . .	37,968
Sir Lucas Tooth, £1000 (Sydney); Imperial Treasury, £1000; Royal Geographical Society, £100; S. Y. Buchanan, £100; Lady Scott, £100; Commander Evans, £100; other members of Scott Expedition and general subscriptions, £227 . . .	2,627
AUSTRALIA, 1913:	
Commonwealth grant, £5000; collected by Professor David (approximately), £50	5,050
AUSTRALIA, 1914:	
Collected by Professor Masson (approximately), £80; G. J. R. Murray (Adelaide), £100; Sir Samuel Way, £50 . . .	230
COLLECTED IN LONDON, 1914	10
Total moneys donated	£45,885

ASSETS REALIZED AND ADDED TO THE FUND:	£	£
Sale of photos and newspaper articles, £490; sale of ship and materials, £3699; lectures, films, &c., £726 .		4,915
BILLS OWING . . .	5,932	5,932

ASSETS TO BE REALIZED:	£		
In hand	560		
Owing	340		
Anticipated sale of gear	570		
	—	1,470	
Debit balance		£4,462	
Total cost * of Expedition . . .			£56,732

There is therefore a deficit of £4462 to be made up by the royalty on the sale of the book, lectures, donations, &c., and the cost of the publication of the scientific results, which will be approximately £8000, has yet to be defrayed.

* An estimate of the cost of the expedition should also take account of donations in kind, which, as can be gathered, were numerous. Facilities offered by harbour boards and valuable assistance extended in the matter of docking and repairing the *Aurora*, particularly in the case of the State of Victoria, and to a less extent in New South Wales.

Then there were valuable contributions of coal, particularly by Mr. J. Brown of Newcastle (N.S.W.), Mr. H. D. Murphy (Melbourne), and the Lithgow Collieries Company.

APPENDIX VII

EQUIPMENT

Clothing

WITH regard to the clothing, the main bulk was of woollen material as supplied by Jaeger of London. This firm is unexcelled in the production of camel's-hair garments and has supplied most polar expeditions of recent years with underclothing, gloves, caps, and the like. From the same firm we also secured heavy ski-boots, finnesko-crampons, and the blankets which were used at Winter Quarters at both Antarctic Bases. Some of the Jaeger woollens were damaged by sea water on the voyage from London to Australia and were replaced by Eagley goods; an Australian brand, which proved very satisfactory. The Ship's Party were outfitted with Kaipoi woollens (New Zealand).

Outer garments were made up to our design from Jaeger fleece by tailors in Hobart. The suit consisted of a single garment, to be worn with combination underclothing, and was calculated to meet the requirements of a severe climate.

An over-suit of wind-proof material, which may be worn when required, is a necessary adjunct to woollen clothing. Such a suit should have the additional properties of being light, strong, not readily absorbing moisture, and not affected by the cold. Burberry gabardine was found to possess all these properties, and two complete suits were made up for each man. One suit consisted of three pieces, whilst the other was made of two; the blouse-jacket and helmet of the latter being combined.

Furs, which were obtained from Norway, were restricted to sleeping-bags, finnesko or fur-boots, and wolfskin mitts (Lapland).

The outfit of clothing for the party at Macquarie Island and on the Ship, respectively, differed from that used in the Antarctic. Warmer temperatures and wet conditions had to be taken into account, and so rubber boots, oilskins, and rubberized materials were provided as outer coverings.

APPENDIX VII

Food

The food-stuffs were selected with at least as much consideration as was given to any of the other requisites. The successful work of an expedition depends on the health of the men who form its members, and good and suitable food reduces to a minimum the danger of scurvy; a scourge which has marred many polar enterprises. Thus our provisioning was arranged with care and as a result of my previous experience in the Antarctic with Sir Ernest Shackleton's Expedition.

A summary which may be of possible use to future expeditions is appended below:

In the matter of canned meats we had some six tons of the excellent Australian article supplied by the Sydney Meat Preserving Company, Ramornie Meat Company (N.S.W.), Baynes Brothers (Brisbane), and the Border (rabbit) Preserving Company of South Australia. For use on the Ship three tons of salt beef and pork served to replenish the "harness cask," largely obtained in Melbourne from Cook and Sons.

For a ton of sauces and pickles we were indebted to Brand and Company (London) and to Mason and Company (London).

Of course fresh meat was consumed as far as possible; a number of live sheep being taken by the *Aurora* on each cruise. Some of these were killed and dressed after reaching 60° south latitude and supplied our two Antarctic Bases with the luxury of fresh mutton about once a week throughout a year.

One ton of preserved suet came from the firms of Hugon (Manchester) and Conrad (Adelaide).

Almost all our bacon and ham, amounting to well over one ton, was of the Pineapple Brand (Sydney), and to the firm which supplied them we are indebted alike for the quality of its goods and for its generosity.

Soups in endless variety, totalling two tons, came chiefly from the Flemington Meat Preserving Company (Melbourne).

Fours tons of canned fish were supplied by C. & E. Morton (London).

Variety in vegetables was considered important. We decided to reduce the amount of dried vegetables in favour of canned vegetables. About six and a half tons of the latter in addition to one ton of canned potatoes were consumed; from Laver Brothers (Melbourne) and Heinz (Pittsburgh). There were one and a half tons of dried vegetables. In addition, large quantities of fresh potatoes and

other vegetables were regularly carried by the *Aurora*, and many bags of new and old potatoes were landed at the Main Base. In the frozen condition, the former kept satisfactorily, though they were somewhat sodden when thawed. The old potatoes, on the other hand, became black and useless, partly owing to the comparatively high temperature of the ship's hold, and in part to the warmth of the sun during the first few weeks in Adelie Land.

Canned fruits, to the extent of five tons, were supplied by Jones Brothers (Hobart) and Laver Brothers (Melbourne). This stock was eked out by some two and a half tons of dried fruits, chiefly from South Australia.

The management of Hartley (London) presented us with two tons of jam, and James Keiller and Son (London) with one ton of marmalade.

Of the twelve tons of sugar and half a ton of syrup consumed, all were generously donated by the Colonial Sugar Refining Company (Sydney).

For milk we were provided with two tons of Glaxo (a dry powder) which was used at the land bases, and a ton and a half of Nestlé's condensed variety for use on the ship.

Three tons of cereal meals, largely from Parsons (Sydney), were consumed.

As one might have expected, the amount of flour used was enormous. In the thirteen tons of this commodity from Colman (London) there were three varieties, self-rising, plain, and wheatmeal flour, encased in stout metal linings within strong, well-finished cases of a convenient size. Until required, the cases of flour were used to solidify the break-wind on the southern side of the Hut.

Bird and Company (Birmingham) more than satisfied our needs in the matter of baking powder, custard powder, jelly crystals, and the like.

There was over half a ton of fancy biscuits of excellent quality and great variety, for which we were indebted to Jacob and Company (Dublin), Arnott Brothers (Sydney), and Patria Biscuit Fabriek (Amsterdam). "Hardtack," the name by which a plain wholemeal biscuit of good quality, made by Swallow and Ariell (Melbourne) was known, constituted the greater part of the remaining two and a half tons of ordinary biscuits. "Hardtack" was much appreciated as a change from the usual "staff of life"—soda bread.

For sledging we had secured one ton of biscuits specially prepared by the Plasmon Company (London) containing 30 per cent. of plasmon. These, together with one ton of pemmican and half a

ton of emergency ration prepared by the Bovril Company (London), are specially referred to in the chapter on sledging equipment.

Butter was an important item; the large stock of two and a half tons coming from the Colac Dairying Company (Melbourne). The butter was taken fresh in fifty-six lb. blocks, packed in the usual export cases. On the *Aurora* it was carried as deck-cargo, and at the Main Base was stacked in the open air on the southern side of the Hut. At the end of the second year (1913) it was still quite good; a fact which speaks well for the climate as a refrigerator. Of Australian cheese we used half a ton, and this was supplied in forty-pound blocks.

The firm of Messrs. Cadbury, well known for their cocoa and eating chocolate, supplied us with these commodities, and receive our unqualified praise for the standard of the articles and the way in which they were packed. The total consumption was one ton of cocoa and half a ton of chocolate.

The three-quarters of a ton of tea was donated by "Te Sol" (Guernsey) and Griffiths Brothers (Melbourne). In both cases the articles were well packed and much appreciated. Half a ton of coffee was used, partly supplied from London and partly donated by Griffiths Brothers.

Rose's (London) lime juice, as an antiscorbutic, was mainly reserved for consumption on the Ship. This lime juice was much in favour as a beverage.

Other supplies, taken in bulk, and for which we are indebted to the manufacturers, are: one ton of Cerebos Salt, half a ton of Castle salt, one ton of Sunlight Soap, our complete requirements in toilet soap from Pears, candles from Price, matches from Bryant and May including special sledging vestas, and dried milk from the Trufood Company.

Sweets, which were used for dessert and on special occasions, were presented by the firms of Fuller and Batger of London, and by Farrah of Harrogate, &c. There were also small quantities of aerated waters, ales, wines, and whisky for each Base.* At the Main Base, at least, there was no demand for whisky until penguin omelettes became fashionable.

The smokers were well provided for by a generous donation of Capstan tobaccos, cigarettes and cigars from the British American Tobacco Company in London. At a later date, when our Macquarie Island party was formed, the Sydney branch of the same firm met our added needs with the same generosity.

* Donated by Schweppes, Köpke, Burgoyne, and others.

APPENDIX VII

There are many other items which have not yet found a place in this summary which cannot be acknowledged severally, but for which we are none the less grateful. Mention is made of the following: Horlick's Malted Milk, Neave's Health Diet, Brown and Polson's Cornflour, International Plasmon Company's Plasmon chocolate and Plasmon powder, Bovril and lime juice nodules manufactured by Bovril Limited, Colman's Mustard and Groats, Flemington Meat Company's desiccated soups, Seager's meats, Nestlé's nut-milk chocolate, Escoffier's soups, &c.

The cooking range which served us well for two years in the Hut at Adelie Land was from J. Smith and Wellstood (London); others were presented by Metters (Adelaide).

The total supply of foods purchased and donated aggregated quite one hundred tons, exclusive of packing. Much of this was assembled in London. In Australia the Government Produce Department of Adelaide rendered valuable assistance.

Table of Food-Supplies for a Twelve-Man Base

The following are the food requirements for a party of twelve men wintering in the Antarctic. It is our own store list, with slight modifications where these are found desirable. The figures are based on the supposition that unlimited quantities of seal and penguin meat can be had on the spot, and, furthermore, are ample for a second year's requirements should the party be unavoidably detained. The fare during the second year might be somewhat less varied, but would otherwise be sufficient. Health was, of course, the first consideration in this selection, but economy was also studied. The quantities are stated in pounds weight.

	lbs.
Meats, tinned—Corned beef, 216; roast beef, 72; roast mutton, 72; boiled mutton, 72; Irish stew, 216; assorted meats, 168, including mutton cutlets, haricot mutton, ox tail, ox tongue, sausages, and brawn; sheep's tongues, 288; special meats, 192, including rabbit, hare, duck, fowl, and turkey	1296
Live sheep—16 sheep to be dressed south of 60° S. latitude (weight not included)	
Suet, tinned—400	400
Bacon and Ham—Bacon in sides, packed in salt, 250; ham, 250	500
Fish, tinned—Salmon, 360; haddocks, 96; kippered herrings, 216; herrings in tomato sauce, 72; fresh herrings, 72; sardines, 300; cods' roe, curried prawns, &c., 72	1188
Soups, assorted tinned, 1152	1152
	317

	lbs.
Vegetables, fresh, in wooden cases—new potatoes, 1200; onions, 360	1560
Tinned—potatoes, 864; onions, 216; peas, 450; French beans, 450; spinach, 360; cabbage, 144; beetroot, 288; carrots, 288; parsnips, 144; turnips, 108; celery, 144; leeks, 72; champignons, 144; Boston baked beans, 144; tomatoes, 288	3240
Cereals and Dried Vegetables, &c.—Split peas, 112; lentils, 56; marrowfat peas, 56; haricot beans, 56; barley, 72; rice, 252; tapioca, 144; semolina, 56; macaroni, 56; rolled oats, 648; cornflour, 156	1664
Flour, including plain, wholemeal, and self-rising	4480
Biscuits, &c.—Plasmon wholemeal, 1344; plain wholemeal, 560; assorted sweet, 560; cake tinned, 224; plum pudding, 224	1712
Fruit, tinned in syrup—peaches, 288; pears, 288; plums, 288; apricots, 288; pineapples, 288; apples, 288; gooseberries, 216; cherries, 216; mulberries, 48; strawberries, 48; red currants, 48; black currants, 48; raspberries, 48	2400
Dried fruits—Prunes, 112; apples, 112; peaches, 56; nectarines, 56; apricots, 56; raisins seeded, 224; currants, 112; figs, 224; dates, 112; candied peel, 56	1120
Sweets, &c.—Eating chocolate (chiefly for sledging) 504; assorted sweets, 168; crystallized fruits, 56; assorted nuts, 84	812
Milk—as dried powder, 2400	2400
Butter—in 56 lb. export cases, 1456	1456
Cheese—in original blocks or tins, 240	240
Cocoa, Tea, and Coffee—Cocoa, 576; tea, 288; coffee, 288	1152
Sugar, Jam, &c.—Sugar, 3584; jam, 1456; marmalade, 448; honey, 576; syrup, 288	6352
Sauces, Pickles, &c.—Tomato sauce, 180; Worcester sauce, 135; sweet pickles, 162; mango chutney, 81; assorted pickles (first quality) 216; vinegar, 210	984
Cooking requisites—Baking powder (in addition to that in self-rising flour) 56; sodium bicarbonate, 1; ground mixed spice, 3; ground ginger, 4; whole cloves, 1; nutmegs, 2; assorted essences, 10; desiccated cocoanut, 12; mixed dried herbs, 2; dried mint, 6; dried parsley, 1; onion powder, 9; curry powder, 30; mustard, 30; black pepper, 12; white pepper, 12; table salt, 784	975
Soap, &c.—Soap, 448; soda, 168	616
(16 tons approx.)	lbs. 35,699

Note. These weights are exclusive of packing. When high southern latitudes can be reached within three weeks, fresh eggs may be taken with advantage, preferably unfertilized, but care should be taken to freeze them as soon as possible, and not to allow them to thaw again until required for use. It is advisable to take

small quantities of whisky, ale, wines, and lime juice. Matches, candles, soap, and other toilet requirements, kerosene and fuel are not reckoned with here, appearing in a more general stores' list. Certain medical comforts, such as malted milk and plasmon, may also be included.

Medical Equipment

The medical equipment consisted of a complete outfit of Burroughs and Wellcome's drugs, dressings, &c., and Allen and Hanbury's surgical instruments. Sets, varying in character with particular requirements, were made up for the Ship and for each of the land parties. Contained within the fifty-five boxes was a wonderful assortment of everything which could possibly have been required on a polar expedition. There was in addition a set of Burroughs and Wellcome's medicines for the treatment of the dogs.

Scientific Equipment

The scope of our projected scientific work necessitated extensive purchases, and these were amplified by loans from many scientific bodies and individuals.

Instruments for surveying and navigation were loaned by the Royal Geographical Society and by the Admiralty, while many theodolites, chronometers, and half-chronometer watches were manufactured to order.

An assortment of oceanographical gear was generously supplied through H.S.H. The Prince of Monaco, from the Institut Océanographique of Monaco. Dr. W. S. Bruce made similar donations and supervised the construction of our largest deep-sea dredge. The three-thousand-fathom tapered steel cables and mountings, designed to work the deep-water dredges, were supplied by Messrs. Bullivant. Appliances were also loaned by Mr. J. T. Buchanan of the *Challenger* Expedition and by the Commonwealth Fisheries Department. The self-recording tide-gauges we employed were the property of the New South Wales Government, obtained through Mr. G. Halligan.

The taxidermists' requirements, and other necessaries for the preservation of zoological specimens, were for the most part purchased, but great assistance was rendered through Professor Baldwin-Spencer by the National Museum of Melbourne and by the South Australian Museum, through the offices of Professor Stirling. Articles of equipment for botanical work were loaned by Mr. J. H. Maiden, Director of the Botanical Gardens, Sydney.

A supply of heavy cameras for base-station work and light

cameras for sledging was purchased; our stock being amplified by many private cameras, especially those belonging to F. H. Hurley, photographer of the Expedition. Special Lumière plates and material for colour photography were not omitted, and, during the final cruise of the *Aurora*, P. E. Correll employed the more recent Paget process for colour photography with good results.

The programme of magnetic work was intended to be as extensive as possible. In the matter of equipment we were very materially assisted by the Carnegie Institute through Dr. L. A. Bauer. An instrument was also loaned through Mr. H. F. Skey of the Christchurch Magnetic Observatory. A full set of Eschenhagen self-recording instruments was purchased, and in this and in other dispositions for the magnetic work we have to thank Dr. C. Chree, Director of the National Physical Laboratory, and Dr. C. C. Farr of University College, Christchurch. Captain Chetwynd kindly assisted in arrangements for the Ship's compasses.

Two complete sets of Telefunken wireless apparatus were purchased from the Australasian Wireless Company. The motors and dynamos were got from Buzzacott, Sydney, and the masts were built by Saxton and Binns, Sydney. Manilla and tarred-hemp ropes were supplied on generous terms by Melbourne firms (chiefly Kinnear).

The meteorological instruments were largely purchased from Negretti and Zambra, but a great number were loaned by the Commonwealth Meteorological Department (Director, Mr. H. A. Hunt) and by the British Meteorological Office (Director, Dr. W. N. Shaw).

For astronomical work the following instruments were loaned, besides transit-theodolites and sextants: a four-inch telescope by the Greenwich Observatory through the Astronomer Royal: a portable transit-theodolite by the Melbourne Observatory through the Director, Mr. P. Baracchi; two stellar sidereal chronometers by the Adelaide Observatory through the Astronomer, Mr. P. Dodwell.

The apparatus for bacteriological and physiological work were got in Sydney, in arrangements and suggestions for which our thanks are due to Dr. Tidswell (Microbiological Laboratory) and Professor Welsh, of Sydney University.

Artists' materials were supplied by Winsor and Newton, London, while the stationery was partly donated by John Sands, Limited, Sydney.

Geological, chemical, and physical apparatus were all acquired at the instance of the several workers.

Adjuncts, such as a calculating machine, a typewriter, and duplicator were not forgotten.*

Apart from the acquisition of the instruments, there were long preparations to be made in the arrangement of the scientific programme and in the training of the observers. In this department the Expedition was assisted by many friends.

Thus Professor W. A. Haswell (Biology), Professor T. W. Edgeworth David (Geology), and Mr. H. A. Hunt (Meteorology), each drew up instructions relating to his respective sphere. Training in astronomical work at the Melbourne Observatory was supervised by Mr. P. Baracchi, Director, and in magnetic work by the Department of Terrestrial Magnetism, Carnegie Institute (Director, Dr. L. A. Bauer). Further, in the subject of magnetics, we have to thank especially Mr. E. Kidston of the Carnegie Institute for field tuition, and Mr. Baldwin of the Melbourne Observatory for demonstrations in the working of the Eschenhagen magnetographs. Professor J. A. Pollock gave us valuable advice on wireless and other physical subjects. At the Australian Museum, Sydney, Mr. Hedley rendered assistance in the zoological preparations. In the conduct of affairs we were assisted on many occasions by Messrs. W. S. Dun (Sydney), J. H. Maiden (Sydney), Robert Hall (Hobart), G. H. Knibbs (Melbourne), and to the presidents and members of the councils of the several Geographical Societies in Australia—as well, of course, as to those of the Royal Geographical Society, London.

In conclusion, the proffered, disinterested help, of all the above and many other friends contrived to make our scientific equipment well-nigh complete and eminently up-to-date.

* Acceptable donations of various articles were made by the firms of Ludowici, Sydney; Allen Taylor, Sydney; Sames and Company, Birmingham; Gamage, London; Gramophone Company, London; the Acetylene Corporation, London; Steel Trucks Ltd.; &c.

Through the offices of Mr. C. A. Bang we are indebted to "De Forenede Dampskibsselskab," of Copenhagen, for the transport of the dogs from Greenland.

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