

VOL. VIII. No. 88.

THE MARINE OBSERVER.

APRIL, 1931.

TABLE OF PRINCIPAL CONTENTS.

	PAGE.	Lithographic illustrations after page 98 :—
The Organisation of the British Complement of "Selected Ships"	77	Chart V.—Ships' Wireless Weather Signals.
The Aims and Objects of THE MARINE OBSERVER	78	Fog Frequency in the South Atlantic—April.
The Marine Observer's Log (with illustrations)	79	Wind, Fog, Mist and Weather for the Region off the coast of Portugal—April.
Ice in the Western North Atlantic	82	Typhoons in the Far East during the years 1882 to 1926—April.
Southern Ice Reports during the years 1929 and 1930—April	89	Ice Chart of the Southern Hemisphere 1902 to 1930—April, May and June.
Weather Signals :—		Charts A, B, C and D—"Ice in the Western North Atlantic."
Wireless Stations Detailed to receive Routine Coded Weather Reports from "A Selected Ships"	91	
Wireless Stations Detailed to receive Routine Coded Weather Reports from "B Selected Ships"	93	
Denmark, Holland, Belgium and France	95	

THE ORGANISATION OF THE BRITISH COMPLEMENT OF SELECTED SHIPS.

According to the latest available figures Great Britain has 31.2 per cent. of the world mercantile tonnage of steam and motor vessels of over 100 tons and therefore the British complement of the 1,000 "Selected Ships" of all nations is 312.

We completed detailing 312 observing ships as "Selected Ships" on November 26th, 1930, and the fleet list in the January MARINE OBSERVER indicated that number for the first time.

When the other maritime Nations party to the International Convention of Safety of Life at Sea, 1929, have organised their complements of "Selected Ships" and lists of these are available, there should be an adequate service of Wireless Meteorological reports in all parts of the oceans traversed by the trade routes.

Meanwhile though the British complement of 312 "Selected Ships" is providing a much improved service, there are many parts of the oceans which are not served every day by "Selected Ships," and the distribution can be much improved. To improve the distribution of observing ships it will be necessary to make

a number of changes by cancelling the numbers allotted to some observing ships now detailed as "Selected Ships" and giving them to others. In fact, to maintain a good distribution it will probably always be necessary to change "Selected Ships" from time to time not only to replace those laying up or going out of commission, but also to freshen the nip and give others a chance of doing the work. All replacements of ships made in this Voluntary Service are made with a view to the interests of the whole service.

Now that we have got an organisation and a definite plan to work upon it will be easier for all to appreciate the need for central control in the matter of the detailing of "Selected Ships." A pendant board with 312 numbers and places for the names of the same number of ships is kept in the Marine Division so as to ensure the right number of "Selected Ships" being maintained in the British Voluntary Observing Fleet list. Every Commander volunteering the service of his ship as a regular observing ship undertakes to carry out the duties of a "Selected Ship" when called upon to do so, vide page 13 of the MARINE OBSERVER'S HANDBOOK, 5th Edition.

When a ship is detailed as a "Selected Ship" one of these numbers is allotted to her and is published as soon as possible in the Fleet list in THE MARINE OBSERVER. Meanwhile a letter is sent to her commander.

When it is necessary for the sake of good distribution to cancel any particular "Selected Ship," as such, so that another more suitably disposed observing ship may replace her, the number is deleted in the fleet list and her commander is informed through the appropriate Port Meteorological Officer, or Agent who will visit him at the first opportunity. Of course cancellation of number as a "Selected Ship" does not imply any dissatisfaction with service, nor does it mean cancellation as an observing ship. It is necessary to maintain about 500 regular observing ships for all branches of the work and from these to maintain the complement of "Selected Ships."

At present the majority of the 100 Meteorological Log keeping ships are detailed as "Selected ships"; but these combined duties have been found to be excessive in some cases and so certain Meteorological Log keeping ships are not detailed as "Selected Ships." In the Trans North Atlantic trades where there are sufficient A "Selected Ships," it is not desirable to maintain B "Selected Ships" which are engaged in that trade only, as the North Atlantic and the Pacific Oceans have not yet been adequately charted it is desirable to maintain the majority of Meteorological Log keeping ships in those trades.

THE AIMS AND OBJECTS OF THE MARINE OBSERVER.

Those who were members of our Corps in January, 1924, will remember what we said in these notes when THE MARINE OBSERVER was launched.

"It has been said that shipping and seamen since the advent of steam have lost interest in Meteorology. Post-war experience emphatically disproves such a contention; dealt with on seamanlike lines the Corps of Voluntary Marine Observers generally are unsurpassed as sea observers and are very efficient in practical application of the work too.

"The functions of THE MARINE OBSERVER are to provide information useful to navigation concerning winds, weather, climate, currents, derelicts and ice, to stimulate interest in observation and the practice of Meteorology at sea; to promote the use of wireless weather reporting for shipping; to provide a means whereby mariners may give their experiences to others and to foster the traditions of Marine Meteorology upon international lines."

The fact that the British Merchant Navy was the first to fulfil its national obligation in the "Selected Ship" system again proves the soundness of the principle of conducting this work on seamanlike lines. In this case upon lines which have been laid down as a result of consultation between those seamen ashore who are responsible for administration of wireless as well as marine meteorology and those who volunteer to do the actual work at sea.

Concerning the functions of THE MARINE OBSERVER and the provision of information, and particularly information compiled in the Marine Division—now that seven volumes have been completed—there is sufficient to make a general manual or handbook covering nearly every aspect of Marine Meteorology. The Navigation schools and many officers of the Merchant Navy have asked again and again for a simple handbook of general Marine Meteorology written and put together in a seamanlike manner, sufficient not only for the purpose of candidates for certificates of competency as mate and master of foreign going ships, but sufficiently handy, simple, concise and complete to answer the general purpose of navigators of British Merchant ships in all parts of the world.

One of our aims in the first seven volumes of THE MARINE OBSERVER has been to collect in them the necessary information for such a book; but of course the information so collected now requires to be sifted, abbreviated, and to a large extent re-written in such a form as will be most useful to the Merchant Navy. Most of the information as now published in THE MARINE OBSERVER is in a form more suitable for those who specialise in this work. The general handbook must be suitable for all masters and mates.

The maintaining of a good distribution of "Selected Ships" all regularly carrying out the desired service requires constant care and attention and the handling of the whole organisation is a delicate business. All correspondence is addressed to the Captain and the Port Meteorological Officers and Agents will do everything possible to uphold his authority.

We have recently passed on to the Port Meteorological Officers and Merchant Navy Agencies a greater measure of responsibility in the matter of the recruitment and maintenance of the Regular Observing Fleet and they each have a definite complement to maintain of observing ships using their ports, so that they may not be hampered unnecessarily in carrying on. They make recommendations as to which observing ships may be most suitable to carry out the duties of "Selected Ships," but the detailing of "Selected Ships" lies only with the Marine Division in London.

The Captains of all regular observing ships present and future will greatly facilitate smooth working by falling in with this procedure and informing us at any time after protracted "Selected Ship" service if they have reasons for asking for relief for a time from these duties. At present it is not possible to relieve ships detailed as "Selected Ships" capable of carrying out the duties of A "Selected Ships" as there are only sufficient to maintain this long range service.

The Port Meteorological Officers and Agents should be referred to for information or advice which may be desired regarding this service.

The question now is how are we to find the time to do this work? We cannot continue as during the last seven years in writing articles month by month, nor is there such need to do so, for one of our objects has been accomplished—the provision of the information with which to make a general handbook for the Merchant Navy. Of course my monthly notes will continue and we shall review the current charts as they are published, and write such articles as are desirable to develop the work.

If meanwhile mariners will continue and increase their efforts in giving their experiences to others, following here more closely one of the main aims and objects of THE MARINE OBSERVER, the usefulness of the journal will be increased.

The Marine Observer's Log.

The pages each month, headed thus, afford the best means for Mariners to give the benefit of their experiences to others. Manuscript reports for this purpose are welcome from the captain of any British ship, and special pages headed "Additional Remarks" are provided in the Meteorological Log and Record so that Marine Observers may give full descriptions of all interesting experiences which they may have.

In the earlier volumes of THE MARINE OBSERVER we were able to publish some very useful information received from Commanders of ships of great experience.

For instance in the first number of THE MARINE OBSERVER, "The Marine Observer's Log" contained the remarks of Captain H. STRONG upon weather and currents in South African waters, based upon his experience and study over a great many years while serving in the steamers of the Union Line and Union-Castle Line.

Then in the October, 1925, number, Captain SYDNEY MARMERY, of R.M.S. *Dieppe*, gave us the benefit of his long experience and careful observation upon the Tidal Currents and wind effect on the Newhaven-Dieppe route.

In the September, 1926, number, Captain S. ROBINSON, of R.M.S. *Empress of Australia*, gave a vivid account of his experiences at Yokohama in the great earthquake of September 1st, 1923.

Captain J. M. ISAACSON summarized his knowledge of the currents in the Caribbean Sea based on over fifteen years' experience where:—

*The Admiral Belize
was scraped to death with oyster shells
among the Caribbees*

in the March, 1927, number, and there are others; but these are a few of the "Remarks" of the captains of ships who by their experience and authority are best qualified to write of such matters for the general information of our profession. Few Masters of ships have at any time been prolific in their writings in *THE MARINE OBSERVER*, and it would seem that of recent months the more general use of code and other tendencies to academic methods, following modern developments, have had the effect of the writing of "Remarks" being left more to the younger officers.

The observing officers have provided a wealth of remarks, many of them accompanied by sketches, photos, and weather charts, and we wish to give them every encouragement.

There are, however, times and circumstances when Remarks can be made much better by the Captain himself, and we ask the Captains of ships when occasion occurs to give this matter their consideration, for we value very greatly the information which they themselves compile.

We would also ask them to look through the remarks in the Meteorological Log or Record made by their officers and to give them guidance. In some ships the Captain makes a practice of receiving from the Principal Observing Officer reports upon the application of the work whenever desirable, and of examining the Meteorological Log or Record at least once a week. This usually gives great encouragement, and where it is done excellent work is often the outcome.

In entering up "Additional Remarks" and in attaching weather charts, sketches and photos to the Log or Record, all Marine Observers are asked to consider the question of publication in "The Marine Observer's Log"; and having done so to make their remarks as clear, interesting and illuminating as possible, and to attach illustrations so finished that they are ready for reproduction by photography. It is best not to include in remarks the instrumental

readings and so on; these can be better given in tabular form following the additional remarks.

The Port Meteorological Officers at Liverpool and London will always be glad to advise Marine Observers in these matters. They know exactly what is desired; they themselves having excelled at this work at sea can speak from experience.

The great thing is to send in Remarks upon all really interesting experiences which will be useful to the Merchant Navy and the Meteorological Services, but not to overload returns with remarks made for the sake of writing something.

To repeat Captain Henry Toynbee—

"A blank space is preferable to a doubtful observation."

Generally this voluntary work at sea is done splendidly, and we cannot thank too often all members of the Corps of Voluntary Marine Observers from the oldest Captain to the youngest officer or apprentice and not forgetting the Wireless Operators, without whose help no progress could be made, for their fine Service. A Service which is benefiting the whole Merchant Navy also a great many ashore and in the air. We thank one and all again for their good work in 1930.

These notes are intended to guide and encourage; they do not criticize, far from it; we know only too well from experience at sea how unnecessary and undesirable written criticism of this work is from those ashore.

When mistakes appear, and particularly in the Selected Ship Service, the Port Meteorological Officers and Merchant Navy Agents are notified, and they—with understanding as well as knowledge—give the desired advice.

MARINE SUPERINTENDENT.

London,

December 31st, 1930.

THE MARINE OBSERVER'S LOG.

It is hoped that these pages will be filled each month with a selection of the contributions of Mariners in manuscript, or remarks from the Logs and Reports of regular Marine Observers.

Responsibility for statements rests with the Contributor.

CURRENT RIPS.

North Pacific Ocean.

THE following is an extract from the Meteorological Report of S.S. *Nebraska*, Captain E. A. BRIDGES, San Pedro, California, to Liverpool via Panama.

April 14th, 1930, during a period of twelve hours after the abatement of the "Nother" throughout the remainder of the day, passed frequent narrow "lanes" of disturbed water having the appearance of tide rips. They stretched as far as the eye could see, had a greatest width of about 200 yards, and extended in an E.N.E. to W.S.W'ly. direction. Whilst any wind remained, the water in these "lanes" was quite rough and tossed in all directions, but they became confused ripples about a foot high during the calms. Our wash was repeatedly caught up and thrown back towards the ship, giving exactly the same effect as when passing through tide rips. No discolouration, except the darker tint caused naturally by the disturbance, was noticeable. These peculiar "lanes" were probably caused by currents; probably the regular coastal currents being met by opposing currents set up by the "nother".

Position of ship from Latitude 10° 00' N., Longitude 87° 26' W. to Latitude 8° 48' N., Longitude 85° 00' W.

PHOSPHORESCENCE.

North Atlantic.

THE following is an extract from the Meteorological Log of S.S. *Buteshire*, Captain A. W. P. GIBB, Liverpool to Cape Town. Observer, Mr. P. McMILLAN, 2nd Officer.

April 30th, 1930, at 1.30 a.m. A.T.S. passed through numerous shoals of small fish, leaving bright, phosphorescent trails. Between 1.30 and 2.20 a.m. passed through several bright milky bands, about 100 ft. to 150 ft. in width. These bands appeared to be caused by the passage of large shoals of fish, at a considerable distance below the surface. At 2.30 a.m. passed through very brilliant patches, apparently consisting of minute particles of phosphorescence, no distinct cluster forms being seen. Several of these patches were passed through between 2.30 a.m. and 4.00 a.m.

Position of ship Latitude 13° 16' N., Longitude 17° 47' W. (D.R.).

SQUALLS.

Gulf of Suez.

THE following remarks with the accompanying weather chart are taken from the Meteorological Report of S.S. *Nagoya*, Captain C. P. COOPER, O.B.E., R.D., R.N.R., Calcutta to London. Observer, Mr. F. D. Shaw, 4th Officer.

April 10th, 1930, at 8.00 a.m. Standard Time, when in position indicated on the accompanying weather chart for 0600 G.M.T., wind was E.N.E., force 2, barometer 1009.0 mb., no clouds, but slight haze. At 10.00 a.m. wind veered to S.E. by S., force 3, and at 10.50 a.m. to S.S.W., force 4. At 11.30 a.m., after a short calm, when approaching Jubal Strait, wind came down squally from E.N.E., force 4, with white squalls of force 6. At times during the quarter hour when this wind prevailed, force 4 was experienced on the bridge, while the sea in the immediate vicinity of the ship was calm. Light Ci.-Cu. clouds began to form at this time. At 11.45 a.m. wind veered to E.S.E., force 4, and at 1.30 p.m. to S.E., force 4. Barometer, having previously remained steady, commenced to fall very slowly at 2.00 p.m. At 3.00 p.m. wind veered S., force 3, and thick A-Cu. and A-St. had formed overhead, though not to the southward; barometer 1007.8 mb. This was the lowest reading. It remained steady till 4.40 p.m., then started to rise very slowly. At 4.50 p.m. A-St. had developed into Nb. and heavy rain was seen to be falling over Ras-Gharib plain. At 5.15 p.m. a sudden squall from westward, force 6, lasted six minutes and the wind then backed to S., force 3. This was repeated ten minutes later, but no rain fell. At 6.30 p.m. a sudden squall came from East, force 4, when wind veered to S. by W., force 3. At 7.11 p.m. a final squall came from N.W., force 5, the wind afterwards remaining steady from the same direction, but decreasing to force 3. The lower clouds cleared away and the barometer at 8.00 p.m. had risen to 1009.3 mb.

MIRAGE.

West Coast of Scotland.

THE following is an extract from the Meteorological Report of Fishery Cruiser *Norna*, Captain J. W. WRIGHT, Fishery protection duties on East Coast of Scotland. Observer, Mr. T. R. NESS.

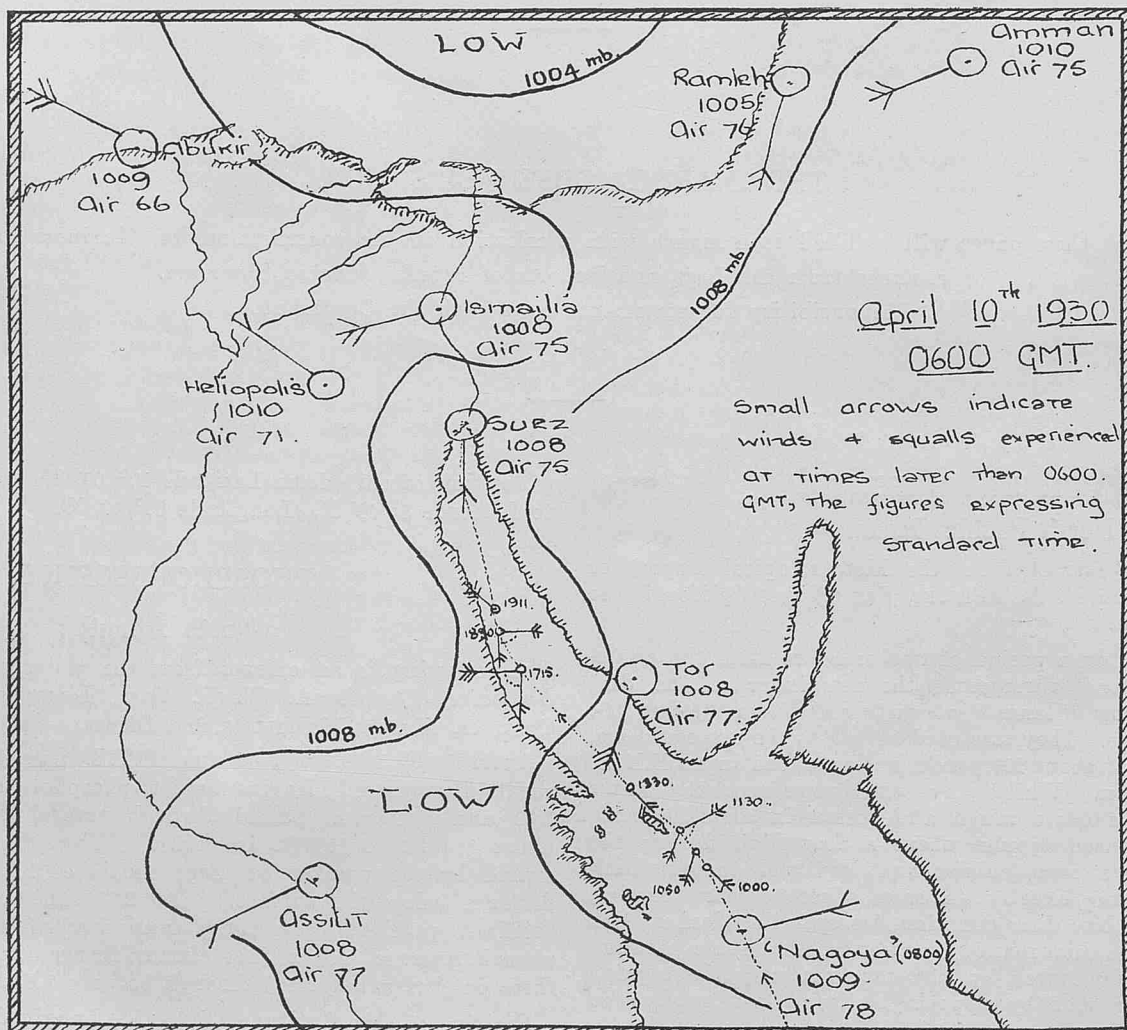
Sunday, April 6th, 1930, 7.20 to 8 p.m., position 8 to 14 miles East of Butt of Lewis. Vessel on passage, speed 8 knots towards the Butt. At sunset, which was perfectly clear, what looked remarkably like a high rocky piece of land was observed directly in the wake of the sun. As the sun sank other points and crags appeared between the first observed and the Butt, and for about an hour after sunset an outline of crags and peaks, remarkably clear and distinct and suggesting the outline of the West Sutherlandshire coast, attracted the attention of the whole ship's company. This outline gradually and imperceptibly changed in contour, a high cliff in five minutes becoming a low mound or undulation and *vice versa*. Darkness gradually rendered this phenomenon invisible.

The same night Aurora Borealis was very vivid, curtain variety, from N.W. to N.E'ly. points on the horizon with a long beam like a searchlight, but slightly arched, cutting across the curtain from a N.W'ly. point.

At 3.30 a.m. the following morning after a night of high visibility the sky rapidly filled with greasy looking alto-stratus and patches of dense fog with a light E'ly. air drifted across the ship's track (vicinity of Butt of Lewis) clearing again at 8 a.m. to high visibility.

Gulf of Suez.

THE following is an extract from the Meteorological Report of S.S. *Bampton Castle*, Captain J. S. JAMES, D.S.C., London to East Africa via Suez. Observer, Mr. W. A. COOKE, 3rd Officer.



April 15th, 1930, experienced exceptional mirage effects. The first one **Figure 1** was noticed at 0745 G.M.T. and lasted for some time, the whole effect seemed to be shivering, and at times completely disappeared for a few moments. The hills in sketch are the Zeiti Hills, and at time of first sketch were 50 miles distant. The second sketch—**Figure 2**—at 0815 G.M.T., made a few moments before it completely disappeared, shows the effect considerably lessened; the distance off being then 43 miles. Several other ranges were affected by mirage in the same way, but not so pronounced, and soon disappeared.

Position of ship, Latitude $28^{\circ} 40' N.$, Longitude $33^{\circ} 00' E.$

Weather at time of observation, fine. Temperatures, Air 77° , Sea $68^{\circ} F.$

Figure I. $7^h 45^m$ G.M.T.



Figure II $8^h 15^m$ G.M.T.



SOLAR HALOES.

Straits of Malacca.

THE following is an extract from the Meteorological Report of S.S. *Talma*, Captain R. W. HOCKING, Singapore to Penang. Observer, Mr. M. H. VINCENT.

On April 24th, 1930, 11.00, zone 7, a solar halo of singular clarity, showing the colours red, yellow, green and blue, was observed round the sun, having a radius of $22\frac{1}{2}^{\circ}$, and a breadth of spectrum of $\frac{1}{2}^{\circ}$. Also an arc of 40° of a second halo was seen below the sun, with a radius of 46° , and showing the colours, red, yellow, green (very faint) and white. The sun's altitude was 70° . In both rings the colours of the spectrum were very clearly defined. Both remained bright until 11.25, when the sun and surrounding sky became obscured by cumulus clouds. Wind variable, force 1. Barometer 29.80 in. Air temperature $83^{\circ} F.$ Clouds Ci. and Cu. amount 8, the Cu. clouds moving slowly from the westward.

Ship's position, Latitude $2^{\circ} 51' N.$, Longitude $100^{\circ} 57' E.$

LUNAR CORONAE.

West Coast of North America.

THE following is an extract from the Meteorological Report of S.S. *Canadian Importer*, Captain H. AKERLEY, Victoria B.C. to Panama. Observer, Mr. J. O'NEILL, 3rd Officer.

On April 14th, 1930, 9.35 p.m. a corona of approximately 16° diameter formed round the moon, gradually increasing from a faint outline to a well-defined perfect circle of two colours, the inner, light reddish brown and the outer light amber. At 9.45 A-Cu. clouds in vicinity of moon appeared to be deflected by contact with outer ring giving it the appearance of a rapidly revolving wheel with flying streamers and turning clockwise. At 9.55 the entire corona had disappeared. At 10.05 a second though incomplete corona appeared having the same colours as the first, though less brilliant. An arc of about 25° was missing in the south-east part of the corona and the clouds seemed to gather on each side of the gap. At 10.17 the inner ring faded until barely visible and at 10.24 the corona disappeared entirely. The third and strangest of this series of coronae began to form a few minutes after the last one had gone.

This was elliptical in shape with an irregular outer ring, whiter in colour than the preceding ones and having three separate arcs of the same reddish-brown colour and brilliance as the first. It was larger than the others, being about 18° horizontal diameter and about 20° vertical. The arc between moon and horizon was smallest (about 45°) and farthest from the moon. The one to W. extended for 105° , and the other about 120° . At 10.42 nothing remained of this phenomenon and the sky became cloudless shortly after the last one disappeared.

Position of ship, Latitude $20^{\circ} 39' N.$, Longitude $107^{\circ} 09' W.$ True Co. S $62^{\circ} E.$ Wind S., force 2. Barometer steady at 30.02 in. Temperatures, Sea 76° , Air 76° .

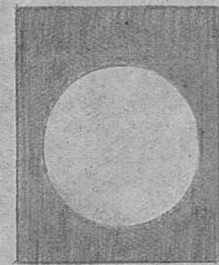
PARTIAL ECLIPSE OF THE MOON.

North Atlantic.

THE following is an extract from the Meteorological Log of S.S. *Cumberland*, Captain D. MACMILLAN, Curaçao to London. Observer, Mr. C. R. BROWN, 2nd Officer.

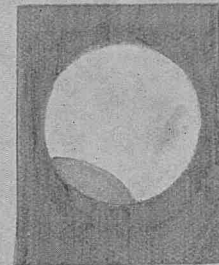
On April 13th, 1930, 1.30 a.m. A.T.S., a partial eclipse of the moon was observed on voyage from Curaçao, Dutch West Indies to London. The first sign of the eclipse was manifest by the appearance of slight shadow in lower left section of the moon as shown in **Figure I**. At 1.49 a.m. a definite arc of shadow was formed on the

Figure I.



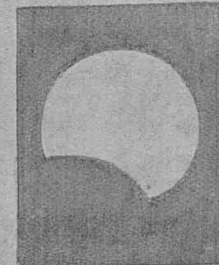
1.30 AM 0519 GMT

Figure II.



1.49 AM 0538 GMT

Figure III.



1.58 AM 0547 GMT

face of the moon as shown in **Figure II**. At 1.58 a.m. a large and darker arc of shadow was formed on the face of the moon giving it the appearance shown in **Figure III**. Unfortunately a heavy bank of A-Cu clouds prevented any further observations of the eclipse.

Ship's position, Latitude $25^{\circ} 40' N.$, Longitude $56^{\circ} 36' W.$

South Atlantic.

THE following is an extract from the Meteorological Report of S.S. *La Paz*, Captain C. W. BENSON, Magallanes to London. Observer, Mr. G. REDMOND, 3rd Officer.

April 13th, 1930, at 3.25 a.m. A.T.S., a partial eclipse of the moon was observed which was visible until 4.40 a.m. The moon at that time was bearing about 270° and the shadow of the earth was plainly visible on the south and west sides of the moon, gradually growing plainer and larger until 4.10 a.m. when it commenced to recede. The moon observed through an ordinary telescope showed up the mountains very distinctly and its polar cap was very brilliant at the time of the maximum eclipse. Clouds, upper cirrus, lower passing cumulus amount one-tenth.

Position of ship, Latitude 7° 18' S., Longitude 29° 57' W.

LUNAR RAINBOW.

North Atlantic Ocean.

THE following is an extract from the Meteorological Log of S.S. *Rotorua*, Captain E. HOLLAND, Caracas Bay to Southampton. Observer, Mr. H. F. C. WILKINSON, 3rd Officer.

April 13th, 1930, 9.45 p.m. A.T.S. Observed very clear lunar rainbow, distinct colours:—red, orange, yellow, green and purple. Three quarters of a semicircle was visible for 10 minutes, altitude of vertex approximately 25°. It bore W.N.W. while the moon at the full bore S.E. by E. Clouds in vicinity of rainbow were Ci-St/Cu-Nb/Nb with a small rain squall on horizon. Clouds in vicinity of moon were Cu-Nb. A striking feature was that most of the time the moon was completely obscured by low Cu/Cu-Nb and apparently the moon's rays passed above Cumulus to form bow on Ci-St and Nb on opposite bearing.

Ship's position, Latitude 36° 05' N., Longitude 42° 30' W., Course 052°, 13.8 knots.

At the time of observation wind North, force 3. Barometer 1008.4 mb. Temperature, Air dry 62°, wet 59.6°, Sea 66°.

ICE IN THE WESTERN NORTH ATLANTIC.

PREPARED IN THE MARINE DIVISION BY J. HENNESSY, SENIOR NAUTICAL ASSISTANT.

THE greatest menace to the safe navigation of ships in the Western North Atlantic is the almost constant presence of ice in the vicinity of the Grand Banks of Newfoundland. The ice acted upon by wind and current makes it very difficult to locate and the danger is greatly intensified by the prevalence of fog in these waters.

There are two main types of ice found in the Western North Atlantic constituting a danger to navigation, namely, pack or sea ice and berg or glacier ice.

Formation and Drift of Sea Ice.—Towards the end of autumn, in the Arctic sea and on the coasts of Labrador and Newfoundland, owing to the fall in temperature, the surface cooling of the sea causes numberless small ice plates called frazil crystals to form. During calm weather these crystals collect and form a thin scum on the surface which at first has little stiffness owing to heat conduction from the water below, preventing the brine remaining between the crystals which are themselves fresh from freezing. As the season progresses the sheet of ice and brine thickens, the temperature being reduced to a sufficient extent to allow the brine to freeze, when the whole becomes a rigid sheet of ice.

The diverse character of the ice forming the Arctic pack, prevents the fragments freezing together and forming a solid mass during the polar winter. It is this characteristic which permits the free movement of the pack, otherwise the ice would not be navigable and would probably become permanent by addition of snow.

During the summer much of the pack is set free and drifting southward, arrives off the N.E. coast of Labrador in November at the

WATERSPOUT.

Off Singapore.

THE following is an extract from the Meteorological Report of S.S. *Cyclops*, Captain W. COSKER, Penang to Singapore. Observer, Mr. R. A. HANNEY, 3rd Officer.

On April 7th, 1930, 6.45 a.m. Singapore Standard Time, observed waterspout bearing S. 45° E. from ship distant about three miles, which appeared to be travelling in a S'y direction. A bank of heavy cumulus clouds south of ship stretched east and west. The spout appeared to originate behind a fold in the cloud and curved down to the sea, where a disturbance resembling a rock awash was apparent.

This disturbance had a radius of approximately 60 to 70 feet. The phenomenon lasted for 20 minutes, when a kink appeared in the upper portion. The disturbance on the water lasted for several minutes after the spout disappeared. Fifteen minutes later there was a heavy rain squall which lasted for 20 minutes—accompanied by thunder and lightning.

Ship's position, Latitude 3° 35' N., Longitude 100° 17' E. Barometer 29.63 in. Air Temperature, Dry 81°F., Wet 79°F. Wind E. by S., force 2.

METEORS.

China Sea.

THE following is an extract from the Meteorological Report of S.S. *Talma*, Captain R. W. HOCKING, Singapore to Calcutta. Observer, Mr. M. H. VINCENT, 3rd Officer.

April 19th, 1930, 11.02 p.m. A.T.S., observed two meteors bearing 220° (approximate) at an altitude of 2° with an interval of two seconds between them.

No track was observed, the effect being that of a flashing light, yellowish-white in colour. Each meteor showed for about one second, having about the same magnitude as the planet Venus.

The meteors appeared just below the base of Cu-Nb cloud.

Position of ship, Latitude 9° 34' N., Longitude 109° 44' E. Course 214°. Speed 13 knots.

same time as sludge ice is forming there. By the end of November the waters around the whole Labrador coast have generally frozen over, and the whole pack drifts south, arriving off the east coast of Newfoundland about the end of January.

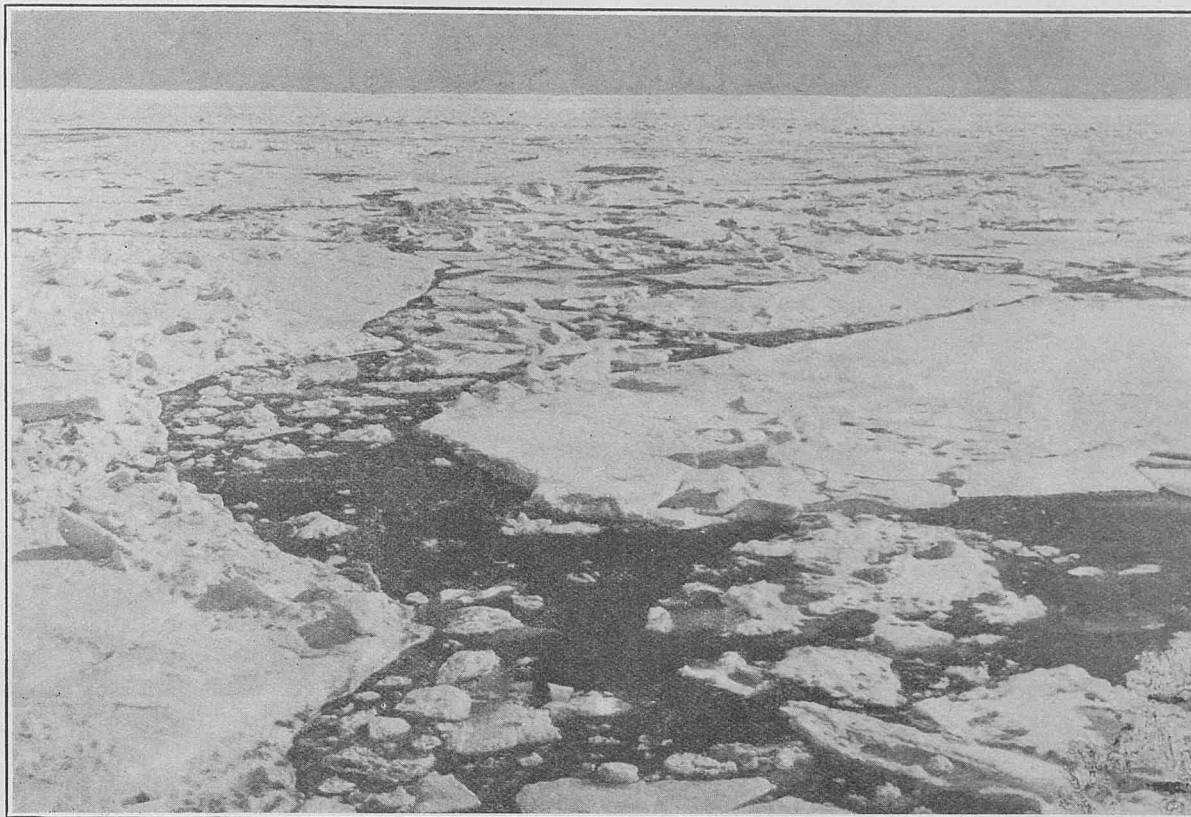
When clear of the Newfoundland coast the ice spreads east and west forming fields and floes which may be met with north of the 43rd parallel, between the 45th meridian and the east coast of Nova Scotia. Off the Newfoundland coast, ice fields may be met with late in summer, but further south it quickly melts, rarely existing south of Newfoundland after the early part of May.

The thickness of pack ice ranges from about 15 feet in the Arctic to about 6 feet on the coast of Newfoundland, but these thicknesses may be greatly exceeded owing to the interposals of capes in the way of moving ice-fields, and to the unequal movement between the floes exerting pressure on the ice, causing it to hummock.

Navigation within the Gulf of St. Lawrence is completely suspended, usually from the beginning of December to the end of April. During the winter months the ice increases rapidly forming extensive sheets. These are, however, frequently broken across by the wind, leaving leads of open water between the separated parts. At other times the wind presses the sheets of ice together forming a close pack extending for many miles.

At the break-up of winter conditions, towards the end of April, the ice commences to move out of the Gulf sometimes causing a block between St. Paul Island and Cape Ray. This block, known as "the Ridge," sometimes continues for three weeks completely closing the

Field Ice, Gulf of St. Lawrence.



Cabot Straits to navigation. On leaving the Gulf, the movement of the ice is chiefly dependent on the prevailing winds, but if the winds are light or variable the movement is affected by current alone, and it will move in the direction of the Banquereau Bank, where it quickly melts under the influence of the sun and warm winds.

Formation of Land Ice and Calving of Icebergs.—Research on the formation of glaciers by the scientific staff of Scott's last Antarctic expedition, shows that ice is formed entirely by the growth and modification of snow crystals. The larger crystals grow at the expense of the smaller and tend to unite by a kind of distillation in which water molecules leave small crystals and join large crystals. The growth of the large and diminution of the small crystals permits them to pack more closely under pressure. When closely packed the crystals still remain distinct, being separated by air spaces at their boundaries. Snow in this condition is known as *nêvé*. The subsequent change from *nêvé* to ice takes place in exactly the same manner as the change from snow to *nêvé*. In the course of time the crystals grow so as to include the air cavities, which in the form of *nêvé* marked the boundaries between them.

The rate of change from snow to ice depends upon the temperature and pressure. The rate being quicker at high than at low temperatures, and when subject to great pressure the crystals come in closer contact, allowing direct movement of the water molecules between them.

In the interior of Greenland, owing to the low temperature, one layer of snow cannot melt before the next falls, there is, therefore, a huge accumulation of snow which, in the course of time is changed into ice in the manner described, thus forming a massive ice sheet known as the "Greenland ice cap." From this cap the ice, subject to enormous pressure, flows outward in all directions but mainly where its motion is least obstructed. The chief flow is therefore down the sloping valleys towards the sea.

When the ice of a glacier reaches the coast it continues to move seawards, its weight being taken by the ocean bed until the water deepens sufficiently to make the ice buoyant, when it becomes waterborne. Such an extension of glacier ice from the shore, seaward, is termed an "Ice Tongue."

The bergs which menace the shipping lanes of the North Atlantic are huge masses of ice which are broken off from the ice tongues

of the Greenland glaciers, chiefly through the undermining action of the surface sea water and the formation and development of cracks and crevices in the ice tongue, due to the strain exerted by the action of tides, heavy swell and wind pressure.

Colour of Ice.—The white light of the sky, reflected from numberless facets of the snow crystals when separated by the included air gives snow its white appearance. In the case of ice formed directly from a snow drift falling upon ice, the direction or growth of the crystals is upwards from the ice upon which the snow falls, so that the air is able to escape from between the crystals as they join up, thereby forming clear air-free ice which at great thicknesses appears blue.

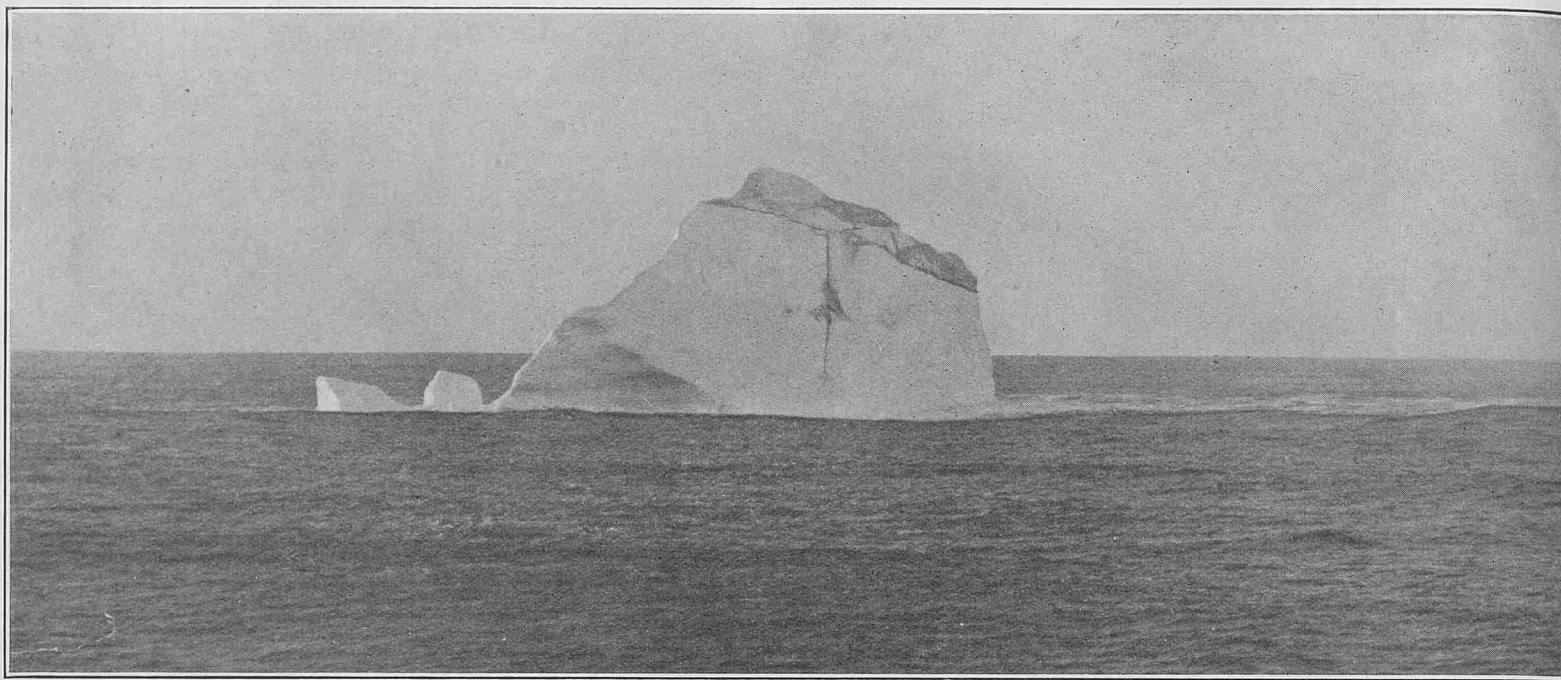
Most glacier ice, however, contains air which is included in the crystals themselves in the form of small spherical bubbles, and this gives to the ice a whiteish opaque appearance. Many crevices in the glaciers become filled with sand and debris blown down from the surrounding land, thus forming silt bands in the ice which greatly discolour it.

Density and Size of Bergs.—The density of ice in icebergs is variable. In some the snow is not so completely transferred into ice as in others, while some carry appreciable loads of rock material. An iceberg, if composed of pure ice only, would float with approximately one-ninth of its mass above water, the weight of a cubic foot of sea water being 64 lbs., and that of a cubic foot of ice 57 lbs. Recent research into the density of Greenland Bergs by Professor H. T. BARNES, D.Sc., F.R.S., records that from one-sixth to one-tenth of the volume of an iceberg consists of air, causing it to displace less water than ordinary ice. It was found that many bergs float with as much as one-third of their mass out of water.

Professor E. VON DRYGALSKI measured 87 bergs shortly after calving from the Greenland glaciers and found the highest to be 449 feet above the surface. He found that their height decreases rapidly with the length of time that elapses after their formation a difference of 13 feet being noticed in one instance after an interval of one week and in another a decrease of 76 feet in about eight weeks.

The highest berg measured by the International Ice Patrol was 248 feet above water while the longest berg measured 1,690 feet from end to end. During the 1928 season ships steaming on the Belle Isle tracks reported many bergs of such dimensions as have hitherto been thought to exist only in Southern waters. One berg

Iceberg in Western North Atlantic.



reported was of tabular form approximately 100 feet in height and six and a half miles in length.

The apparent size of bergs when observed at sea at a distance of two or more miles may be very deceptive, there rarely being any object of known size near them with which they can be compared. It is especially difficult to estimate the size of bergs which are sighted floating in the mixed waters of the Gulf Stream and Labrador currents, where abnormal refraction frequently causes them to loom large. Under such circumstances the Ice Patrol Cutter has sighted bergs, not over 30 feet in height, at a distance of 30 miles from a height of eye of 20 feet, and on one occasion the white painted cutter was reported to herself as a berg by a steamer passing 10 miles distant.

Drift of Icebergs.—The movements of icebergs are mainly controlled by the set of prevailing currents. The direct effect of wind upon their drift is negligible owing to the immersion of so great a proportion of their mass. The effect of the wind, however, indirectly plays an important part by its action on the retardation or acceleration of the currents which govern the movement of the bergs.

There are three currents, two cold water and one warm water, chiefly concerned in causing the ice menace to Atlantic shipping. The East Greenland and Labrador currents bring the ice south from their place of calving, while the Gulf Stream determines the southern limit of their drift, and is responsible for the disintegration and melting of the bergs.

The East Greenland current flows south from the East Greenland Sea in the vicinity of Spitzbergen. Converging towards Denmark Strait, it passes between Iceland and the mainland, whence it follows the East Greenland coast to Cape Farewell. Its course is then diverted northward by the pressure of water setting northward from the Atlantic, and, rounding Cape Farewell, it proceeds up the west coast of Greenland. In about Latitude 63° North, a branch of the main stream shoots westward across Davis Strait and joins the Labrador current flowing down the west side of the Strait.

The Labrador Current.—Ice bearing currents of polar origin setting out of Smith and Lancaster Sounds unite and set south on the western side of Baffin Bay and Davis Strait. Entering the Atlantic, it continues south along the coasts of Labrador and Newfoundland. It expands over the northern part of the Great Bank and divides into two branches. One branch setting S.W., flows through the deep water channel south-eastward of Cape Race, while the other flows south along the eastern edge of the Great Bank until it meets the northern edge of the Gulf Stream, forming what is known as the "cold wall."

The Gulf Stream, flowing out of the Straits of Florida, follows the United States coast northward, to the Latitude of Cape Hatteras, when its width rapidly expands and its course gradually inclines to the eastward. On arriving in the vicinity of the Great Bank of Newfoundland its course is east. During the winter, it flows to the southward of the Bank, but during the summer, creeps north flowing over the Tail of the Bank. The "cold wall" is the line of demarcation between the cold water of the Labrador current and the warm water of the Gulf Stream.

From observations obtained by the Ice Patrol Cutters, the movement of the currents which determine the drift of bergs around the Tail of the Bank are now fairly established. Lieutenant-Commander E. H. SMITH, U.S.C.S., Oceanographer to the International Ice Patrol, states:—"The Labrador current impinges itself at the Tail of the Bank on the northern edge of the Gulf Stream. At times the push is strong enough to split the Labrador current into an east and west branch. In this case the stronger branch determines the berg drift, the relative strength of the branches probably depending to a great extent on the angle of impingement of the Labrador current, against the Gulf Stream. The conflict of the two currents together with the position of the Bank, produces a frictional arresting of the Gulf Stream on its northern edge, which in turn swings it in sharply to the north and north-west immediately after passing the Tail. The inshore westward swirl of frictional bands of the Gulf Stream sets up an interlacing movement of the two waters." In the vicinity of the Tail the surface temperature of the Labrador current during April is 32° to 34° Fahr., in May its temperature is 36° to 38° Fahr., and in June, its temperature rises to 40° to 44° Fahr.

At the break-up of the Arctic winter in the Spring of the year, the bergs calved from the glaciers on the east coast of Greenland drift south in the East Greenland current, arriving off Cape Farewell in early summer. Continuing in the current they round Cape Farewell and drift north to about the 63rd parallel, where they are caught in the westerly branch of the current and drift into the centre of the Davis Strait. In the centre of the Strait the water is comparatively warm and the majority of these bergs disintegrate, very few of them reaching the Labrador current on the western side of the Strait. The majority of the bergs which reach the Great Bank are calved from the ice tongues of the glaciers on the west coast of Greenland, north of the 68th parallel. The bergs are carried up the west coast of Greenland to the head of Baffin Bay where they are caught in the southerly drift setting out of Smith Sound down the western side of Baffin Bay.

The Labrador current in the higher latitudes is to a large extent caused by the action of north and north-easterly winds. Such winds are predominant in spring when the current attains its maximum velocity. It is also at this time that the break-up of the ice occurs, so that large quantities drift down from Baffin Bay through Davis Strait and along the coast of Labrador and Newfoundland, to the Tail of the Bank, where they finally disintegrate under the influence of the Gulf Stream.

In the vicinity of the Great Bank the average hourly drift of icebergs increase as the season advances owing to the strengthening of the Labrador current. Observations carried out by the Patrol show that in March the average drift of bergs is from 0.0 to 0.3 knots, while in April the Patrol observed a berg drifting along the east side of the Great Bank at the rate of 1.5 knots. The average drift of bergs, however, around the Tail of the Bank in the mixed waters is 0.4 to 0.7 knots and when in the water of the northern edge of the Gulf Stream is 0.8 to 1.4 knots.

The following tables compiled from the records of the United States Hydrographic Office and those of the International Ice Patrol, for the years 1900-1926, show the average number of bergs that drift south of the 28th parallel during each month of the year.

NORMAL NUMBER OF ICEBERGS SOUTH OF THE 48TH PARALLEL.

(Menace to the Cape Race Tracks).

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
3	10	36	83	130	68	25	13	9	4	3	2

NORMAL NUMBER OF ICEBERGS SOUTH OF THE 43RD PARALLEL.

(Menace to the United States to Europe Tracks).

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
0	1	4	9	18	13	3	2	1	0	0	0

The International Ice Patrol has found that an average sized berg, drifting in the mixed waters south of the Tail of the Bank, takes from 12 to 14 days to disintegrate during April, May or June. In July, August and September the time is shortened to from 10 to 12 days. The life of a similar sized berg actually located within the Gulf Stream is about seven days. Bergs grounded on the south-west slope of the Great Bank may last for a month or six weeks.

CHART A shows the general drift of ice in the ice bearing currents, and the position of the glaciers in Greenland from which the majority of the bergs which reach the Great Bank of Newfoundland are calved. CHART B shows the actual drift of bergs in the vicinity of the Great Bank as compiled by the International Ice Patrol in the years 1914-1926.

North Atlantic Limits of Ice.—The southern and eastern limits of ice in the Western North Atlantic vary considerably from month to month and from year to year.

CHART C shows the monthly limits within which reports of ice have been received by the Meteorological Office during the year 1930 also the monthly limits reached by ice over the period 1901-1930. It must be understood that the limits defined on this Chart are obtained from reports of ice sighted by vessels, the majority of which are following tracks specially laid down to avoid ice; it is therefore possible that ice may exist outside these limits. The following list gives the particulars of all reported ice which have made phenomenal drifts. It is not possible to indicate, even approximately the drift followed by the ice. The position of this ice, when reported, is shown on CHART D.

Phenomenal positions of ice.

No.	Date.	Source of Report.	Position of ice.		Remarks.
			Latitude N.	Longitude W.	
1	14.1.1836	H.M.S. <i>Cove</i> ...	60° 55'	5° 50'	Two bergs.
2	9.1.1913	S.S. <i>Oriflamme</i> ...	48° 37'	34° 42'	Berg 40 ft. high, 400 ft. long.
3	27.1.1916	S.S. <i>Rio Verde</i> ...	33° 34'	70° 32'	Hummock 2 ft. high, 30 ft. in circumference.
4	3.2.1922	S.S. <i>Weehawken</i> ...	41° 42'	58° 59'	Ice (sustained bow damage).
5	24.3.1913	S.S. <i>Floride</i> ...	46° 21'	34° 05'	Berg 60 ft. high, 200 ft. long.
6	20.3.1915	S.S. <i>Wanaby</i> ...	36° 55'	48° 32'	Piece; supposed portion of a berg, 5 ft. high, 60 ft. long.
7	21.3.1920	U.S. Hyd., Bulletin	38° 02'	40° 38'	3 ft. high, 30 ft. long.
8	21.3.1921	S.S. <i>Hollandia</i> ...	37° 50'	47° 23'	Berg.
9	6.4.1909	S.S. <i>Trafalgar</i> ...	35° 54'	31° 47'	Two pieces 18 ins. in diameter.
10	11.4.1914	S.S. <i>Erodiade</i> ...	32° 55'	62° 11'	Apparently river ice about the size of a lifeboat.
11	24.4.1916	S.S. <i>Communipaw</i>	49° 05'	36° 48'	4 ft. high, 50 ft. wide, and 100 ft. long.
12	4.4.1921	S.S. <i>Hollandia</i> ...	43° 35'	35° 57'	Large berg.
13	16.4.1926	Trawler <i>Orizaba</i> ...	61° 03'	10° 30'	Floating ice about 40 ft. long, and 3 ft. high.
14	7.4.1930	S.S. <i>La Crescenta</i>	42° 24'	34° 22'	Small berg about 20 ft. in diameter.
15	20.5.1907	S.S. <i>Lord Landsdowne</i> .	31° 00'	38° 00'	Two small pieces 6 ft. by 6 ft. and 12 ft. by 4 ft. out of water.
16	6.5.1908	S.S. <i>Oceano</i> ...	150-200 miles North of Bermuda.		Pieces.
17	27.5.1909	S.S. <i>Reventazon</i>	32° 28'	44° 10'	60 ft. long, 10 ft. high.
18	15.5.1911	S.S. <i>Camillo</i> ...	10 miles East of Nantucket Shoal Lt.-V.		Small berg.
19	11.5.1914	S.S. <i>Indradeo</i> ...	42° 18'	62° 43'	Large slabs of field ice and growlers 100-150 ft. long, 5 ft. out of water.
20	17.5.1915	S.S. <i>Pola</i> ...	33° 16'	61° 50'	Some field ice.
21	15.5.1920	U.S. Hyd., Bulletin	45° 11'	36° 42'	Berg.
22	27.5.1930	S.S. <i>Valperga</i> ...	40° 37'	37° 50'	Iceberg about 16 ft. high with growlers.
23	25.6.1886	Brig. <i>Blanch</i> ...	48° 40'	15° 22'	Large berg.
24	5.6.1907	S.S. <i>Kingswell</i> ...	32° 37'	64° 25'	Several bergs.
25	-6.1907	Bque. <i>Silverstream</i>	80 miles West of Fastnet.		Berg.
26	11.6.1912	S.S. <i>Valetta</i> ...	37° 30'	74° 24'	Three pieces of ice.
27	7.6.1913	S.S. <i>Holtby</i> ...	39° 35'	64° 50'	Berg 10 ft. high.
28	27.6.1915	S.S. <i>Stella</i> ...	36° 28'	57° 45'	Small piece.
29	30.6.1921	U.S. Navy Dept....	33° 20'	49° 16'	Berg 10 ft. high.
30	16.6.1924	S.S. <i>West-Irmo</i> ...	38° 03'	63° 20'	Growler.
31	25.6.1926	S.S. <i>Baxtergate</i> ...	30° 20'	62° 32'	Large piece about 30 ft. long and 15 ft. wide, showing about 3 ft. above water.
32	-7.1890	S.S. <i>Slavonia</i> ...	48° 53'	24° 11'	Last remnants of berg.
33	-7.1902	Two reports by fishermen.	56° 30' (appx.).	6° 30'	40-50 ft. long, 15 ft. wide, 2 ft. 6 ins. out of water.
34	31.7.1909	S.S. <i>Shimosa</i> ...	36° 59'	30° 01'	25 ft. long, 3 to 8 ft. wide.
35	10.7.1913	S.S. <i>Lothian</i> ...	37° 27'	36° 48'	Piece, 6 ft. high, 50 ft. in circumference.
36	18.7.1916	U.S. Hyd., Bulletin	32° 09'	54° 26'	Piece of berg, 3 or 4 ft. out of water.
37	23.7.1916	S.S. <i>San Giorgio</i> ...	42° 09'	63° 24'	Berg 60 ft. long.
38	23.7.1918	U.S. Hyd., Bulletin	44° 25'	35° 01'	Large berg.
39	18.7.1921	" "	44° 30'	39° 26'	Small berg about 15 ft. square.
40	21.7.1921	" "	39° 09'	40° 39'	Berg.
41	31.7.1921	" "	37° 37'	27° 29'	Berg.
42	10.7.1926	S.S. <i>Chelatos</i> ...	42° 42'	36° 45'	Two pieces of ice.
43	12.8.1903	S.S. <i>Saxon Prince</i>	37° 52'	71° 30'	Piece, 3 ft. high, 40 ft. long.
44	7.8.1908	S.S. <i>Caronia</i> ...	50° 31'	18° 55'	Two pieces, 10 ft. square, and 15 ft. square.
45	2.8.1909	S.S. <i>Shimosa</i> ...	37° 16'	42° 06'	Piece, 18 ft. by 5 ft., 2 ft. out of water.
46	14.8.1912	S.S. <i>Ulstermore</i> ...	43° 55'	39° 16'	Piece.
47	27.8.1912	S.S. <i>Lux</i> ...	42° 30'	15° 26'	50 ft. square, 4 ft. out of water.
48	10.8.1915	S.S. <i>St. Louis</i> ...	41° 02'	48° 00'	Berg.
49	16.8.1915	S.S. <i>St. Leonards</i>	41° 09'	56° 43'	Berg.

No.	Date.	Source of Report.	Position of ice.		Remarks.
			Latitude N.	Longitude W.	
50	21.8.1915	S.S. <i>Strathgarry</i> ...	40° 46'	68° 20'	Growler.
51	-8.1915	" "	39° 00'	46° 20'	Piece, 20 ft. long, 4 ft. high.
52	29.8.1920	U.S. Hyd., Bulletin	40° 30'	47° 52'	Berg.
53	2.9.1883	Bque., <i>Olivette</i> ...	35° 40'	30° 00'	Lump of ice.
54	-9.1895	S.S. <i>Gulf of Taranto</i>	36° 35'	71° 36'	Two bergs 30 ft. high, 300-400 ft. long, and much field ice over two miles area.
55	19.9.1906	S.S. <i>Lord Landsdowne</i> .	54° 20'	22° 00'	Small berg 20 ft. by 6 ft.
56	10.9.1908	S.S. <i>Deutschland</i>	45° 28'	27° 18'	Two small bergs and one large.
57	6.9.1920	U.S. Hyd., Bulletin	47° 10'	38° 04'	Bergs.
58	2.9.1922	S.S. <i>Hallgjerd</i> ...	50° 00'	40° 05'	Berg.
59	15.9.1922	S.S. <i>Empress of Britain</i> .	52° 52'	40° 12'	Large berg.
60	3.9.1923	S.S. <i>Djambi</i> ...	40° 10'	31° 36'	Piece of ice about 30 ft. long, 1½ ft. out of water.
61	15.10.1883	S.S. <i>Elenora</i> ...	37° 00'	18° 00'	Piece ice.
62	8.10.1912	S.S. <i>Putney Bridge</i>	35° 15'	44° 50'	Small berg 35 ft. long, 6 ft. high.
63	27.10.1916	S.S. <i>Montreal</i> ...	51° 17'	41° 17'	Small berg.
64	2.10.1918	U.S. Hyd., Bulletin	50° 10'	40° 50'	Large berg.
65	19.10.1920	" "	45° 22'	40° 09'	Berg.
66	19.10.1920	" "	45° 24'	40° 07'	Berg.
67	17.10.1921	S.S. <i>Mount Vernon</i>	48° 23'	42° 19'	Berg about 70 ft. high, 400 ft. long.
68	6.10.1922	S.S. <i>Christian Krogh</i>	50° 43'	40° 42'	Berg 60 ft. high.
69	7.10.1923	S.S. <i>Eastern Dawn</i>	40° 46'	65° 54'	Large growler about 100 ft. square.
70	23.10.1927	Trawler, <i>Grecian Empire</i> .	30 miles E.S.E. of the Outer Skerries, Shetland Islands.		Piece of ice 100 ft. long, 6 ft. above water.
71	7.11.1922	Cape Race, W/T Station.	47° 38'	40° 04'	Berg and growlers.
72	-12.1903	S.S. <i>Lord Antrim</i>	42° 00'	55° 00'	Ice.
73	22.12.1915	S.S. <i>Carolyn</i> ...	42° 53'	57° 39'	Large berg.
74	16.12.1920	S.S. <i>Oriana</i> ...	43° 53'	44° 39'	Berg.
75	16.12.1927	S.S. <i>Ascania</i> ...	47° 52'	40° 50'	Four large bergs. (approximate).

Detection of Ice.—The practical utility of the work carried out by the Ice Patrol Cutters has greatly reduced the danger of ice to vessels trading between European and United States Ports, but the frequent long periods of fog and low visibility make it impossible for the Patrol to include the latest position of all bergs in their Radio reports, therefore the danger of collision with ice within the area where bergs are liable to exist remains a very real one. Experiments carried out by the Ice Patrol during recent years show that seamen can depend upon no fore-warning of ice beyond the limit of their visibility; the greatest safeguards are therefore the keeping of a sharp lookout and navigating at such a speed as will enable the ship to stop or sheer before striking a berg just visible ahead.

Up to the present there has been no instrument devised whereby the presence of ice can be detected in the dark hours or during fog. No reliance whatever can be attached to echoes from the steam whistle or syren giving a warning of ice, nor does the presence of a berg have any appreciable effect on the temperature of the air or water, but it has been found that when navigating in the vicinity of the Great Bank, if the temperature of the sea remains at or about 60° Fahr. the chances of meeting ice are greatly reduced.

The approximate temperature of the warm water abutting the cold wall is as follows:—

Throughout the winter and up to April, 54°, April 54°-56°, May 58°-60°, and from June throughout the summer to November, 61°-63°, when it falls to a minimum in February. On ordinary clear days the average berg can be picked up by the masthead look-out when 18 miles distant and will be seen from the bridge when between 12 to 15 miles away. On a cloudy day with good visibility deduct about 2 miles from the foregoing:—

In clear weather with hazy horizon the tops of bergs have been observed 11 miles. During light fog or drizzling rain, bergs are

visible at from 2 to 3 miles. In light low fogs bergs are generally picked up by the look-out aloft observed from the bridge.

In dense fog a berg cannot be seen more than 200 yards ahead of ship, when, if the sun is shining, it appears as a luminous white mass. With no sun it first appears close aboard as a dark mass. In dense fog the bow look-out will probably first detect the ice, as the first visible sign is the wash and breaking of the sea on the base of the berg.

On a clear dark night a berg will not be seen with the naked eye further than one-quarter of a mile, but should the bearing be known it may be picked up with glasses when 1 mile distant.

The distance that a berg may be seen on a clear moonlight night depends upon (a) the altitude and age of the moon, and (b) the relative position of moon, berg and ship:

A berg placed between a ship and the moon when low is the most difficult to observe.

With a full moon at not less than 35° in altitude covered by a thin film of Cirro-Stratus clouds, a berg is visible to the naked eye at a distance of 5 miles, irrespective of the relative position of moon, berg and ship.

Observations carried out in the vessels of the Ice Patrol Service show the following average frequency of fog and low visibility experienced in the vicinity of the Great Bank:—

MONTH	PERCENTAGE OF FOG AND LOW VISIBILITY.	
	PERCENTAGE OF FOG.	PERCENTAGE VISIBILITY.
April	29	50
May	27	39
June	44	53

International Ice Patrol.—Arising out of the loss of the R.M.S. *Titanic* through striking a berg in 1912, an International Conference for Safety of Life at Sea was held in London in 1913. At this Conference it was decided to establish and maintain a regular patrol during the ice season of each year, the United States being asked to organise and manage the Service. Since 1914 the patrol has been entrusted to the United States Coast Guard, who each year detail two Coast Guard Cutters to cruise in the vicinity of the Great Bank of Newfoundland, there to locate and watch the movement of ice and ascertain its limits for the guidance of navigators.

The Patrol also carries out oceanographical and meteorological research into the conditions governing the movement of ice and drift of currents.

Commanders of ships are earnestly asked to co-operate in the work of the Patrol by reporting their position, course, and speed, and sea surface temperature every four hours when navigating in the area bounded by the 39th and 48th parallel of Latitude, and the 44th and 52nd meridians of Longitude. By this means the Patrol are able to keep track of all vessels within the danger zone, and are able to warn any vessel standing into danger.

Gulf of St. Lawrence Ice Patrol.—From the opening of navigation in the spring until the route is clear of ice an Ice Patrol is maintained by the Canadian Government in the Gulf of St. Lawrence between Cape Ray and Heath Point.

A regular message embodying ice conditions from Cape Race to Quebec and recommendations as to route to be followed is compiled by the Ice Patrol every four hours commencing at 0500 G.M.T. and kept for immediate transmission by W/T to ships upon request. Similar information is also broadcast four times daily.

Commanders of incoming ships are requested to facilitate the work of the Patrol by supplying information regarding ice in their vicinity.

Descriptions of particulars of ice warning messages broadcast by the Ice Patrol Vessels are published on the back of the Ice Chart in THE MARINE OBSERVER as soon as available each year.

North Atlantic Tracks.

The suggestion that all ships engaged in the Trans-North Atlantic Trade should follow separate routes when east bound to those used when west bound, was first made by Commander F. M. MAURY, U.S.N., in 1855, but it was not until 1875 that his suggestion was adopted. The Cunard Steamship Company then laid down specified

routes which all their ships were ordered to follow. On the recommendation of the United States Hydrographic Office these routes were amended in 1891 and seven years later the Trans-North Atlantic Track Conference was formed.

The Conference consists of the principal International Shipping Companies engaged in the Trans-North Atlantic trade, and they, working in conjunction with the United States Coast Guard, who operates the International Ice Patrol Service, revise the tracks from time to time as ice conditions necessitate during the different seasons of the year.

The Tracks are shown on Admiralty Route Charts published in two sections.

Chart No. 2058b, showing Lane routes South of Ireland and English Channel.

Chart No. 2058c, showing Lane routes North of Ireland.

The section of the routes running through the ice region in operation for the month is shown on the ice chart published with each number of THE MARINE OBSERVER.

The Tracks were revised in June, 1930, full particulars of which are as follows:—

North Atlantic Lane Routes.

United States.

Track "A" (Extra Southern).

Westbound:—Will only be brought into operation when necessity arises.

Steer from Fastnet or Bishop Rock on Great Circle course but nothing South, to cross the meridian of $47^{\circ} 00'$ West in Latitude $40^{\circ} 30'$ North, thence by either rhumb line or Great Circle to Boston Light Vessel or to a position South of Nantucket Light Vessel.

Eastbound:—Will only be brought into operation when necessity arises.

From the position of $70^{\circ} 00'$ West and $40^{\circ} 10'$ North, or from Boston, steer by rhumb line to cross the meridian of $47^{\circ} 00'$ West in Latitude $39^{\circ} 30'$ North, and from this last position nothing north of the Great Circle to Fastnet or Bishop Rock.

Track "B" (Southern).

Westbound:—From April 1st to August 31st (both days inclusive).

Except when Ice conditions necessitate the use of "A" Track.

Steer from Fastnet or Bishop Rock on Great Circle course, but nothing South, to cross the meridian of $47^{\circ} 00'$ West in Latitude $41^{\circ} 30'$ North, thence by either rhumb line or Great Circle to Boston Light Vessel, or to a position South of Nantucket Light Vessel.

Eastbound:—From April 1st to August 31st (both days inclusive).

Except when Ice conditions necessitate the use of "A" Track.

From the position of $70^{\circ} 00'$ West and $40^{\circ} 10'$ North, or from Boston steer by rhumb line to cross the meridian of $47^{\circ} 00'$ West in Latitude $40^{\circ} 30'$ North and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

Track "C" (Northern).

Westbound:—From September 1st to March 31st (both days inclusive).

Except when Ice conditions necessitate the use of "B" Track.

Steer from Fastnet or Bishop Rock on Great Circle course but nothing South, to cross the meridian of $50^{\circ} 00'$ West in Latitude $43^{\circ} 00'$ North thence by either rhumb line or Great Circle to Boston Light Vessel or to a position South of Nantucket Light Vessel.

Eastbound:—From September 1st to March 31st (both days inclusive).

Except when Ice conditions necessitate the use of "B" Track.

From the position of $70^{\circ} 00'$ West in $40^{\circ} 10'$ North, or from Boston steer by rhumb line to cross the meridian of $50^{\circ} 00'$ West in Latitude $42^{\circ} 00'$ North, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

General Instructions.

Vessels bound to or from United States ports calling at Halifax have the option of following either the Canadian or United States Seasonal tracks to or from that port, passing 40 miles South of Sable Island Westbound and 60 miles South of Sable Island Eastbound when proceeding on U.S. Tracks and Canadian Track "D." When proceeding on Canadian Tracks "E" or "F" via Halifax, ships pass North of Sable Island both Westbound and Eastbound. (NOTE.—General Instructions Canadian Tracks for vessels bound to or from the North of Ireland.)

Vessels bound direct to Portland (Maine) may follow the Canadian Seasonal Tracks.

When courses are changed at the intersections of meridians any time before or after noon, Commanders must note in their logs both distances to and from the meridians that the ship has sailed from noon to noon, and not the distance from the position at noon the day before to the position at noon the day after the meridian is crossed.

The date on which Tracks change is to apply to the meridian of the Fastnet for Westbound steamers and the meridian of $70^{\circ} 00'$ West for Eastbound Vessels.

Communications on General Track matters between the British Lines will pass through the Cunard Line. The Holland American Line will communicate with the Continental Lines excepting that, during the Ice Season, the Cunard Line will communicate direct with all lines.

With regard to proposals for any changes in Tracks owing to prevalence of Ice, the Cunard and White Star Lines in Liverpool will confer and decide dates on which changes are to become operative, advising Lines by telegraph. Lines undertake to give immediate instructions to their steamers in accordance with such advices.

North Atlantic Lane Routes—Canada.

Track "D".

From February 15th to April 10th (both days inclusive).

Westbound:—Steer from Fastnet, Inishtrahull, or Bishop Rock on Great Circle course, to cross the meridian of 50° West in Latitude 43° North, thence to Halifax or other Port, passing not less than 40 miles South of Sable Island.

Eastbound:—Steer from Halifax or other Port to pass 60 miles South of Sable Island to cross the meridian of 50° West in Latitude 42° North, thence on the Great Circle course to Fastnet, Inishtrahull or Bishop Rock.

Track "E".

From April 11th to May 15th, or until the Cape Race route clear of Ice, and December 1st to February 14th.

Westbound:—Steer from Fastnet, Inishtrahull, or Bishop Rock on the Great Circle course to the meridian of 50° West in $45^{\circ} 55'$ North thence to Halifax or the Gulf of St. Lawrence.

NOTE.—The Donaldson Line reserve the right to cross Longitude 45° West in Latitude 45° North on this track.

Eastbound:—Steer from Halifax or the Gulf of St. Lawrence to cross the meridian of 50° West in Latitude $45^{\circ} 25'$ North thence on the Great Circle course to the Fastnet, Inishtrahull, or Bishop Rock.

Track "F".

From May 16th to the opening of Belle Isle Route, and to November 30th when not using the Belle Isle Route.

Westbound:—Steer from Fastnet, Inishtrahull, or Bishop Rock, on a course 10 miles North of the Great Circle track until approaching Cape Race, then steer a course to pass 10 miles South of Cape Race, then to Halifax or the Gulf of St. Lawrence.

Eastbound:—Steer from Halifax or the Gulf of St. Lawrence to a position 25 miles South of Cape Race thence on a course 10 miles South of the Great Circle Track until approaching Fastnet, Inishtrahull, or Bishop Rock.

Track "G".

Belle Isle Route.—From the opening of the Straits of Belle Isle to November 14th.

Westbound:—Steer from Fastnet, Inishtrahull or Bishop Rock on a course 10 miles North of the Great Circle track until approaching Belle Isle.

Eastbound:—Steer from Belle Isle on a course 10 miles South of the Great Circle track until approaching Fastnet, Inishtrahull or Bishop Rock.

General Instructions.

Vessels bound to or from U.S. Ports from or to the North of Ireland have the option of following either the U.S. or the Canadian Seasonal Tracks D, E and F, remaining on Track F during the operative dates of Track G.

On Tracks E and F vessels passing 40 miles South of Sable Island Westbound thence to position South of Nantucket and Eastbound from position 40° 10' North in 70° 00' West to position 60 miles South of Sable Island.

On Track D Westbound proceeding by rhumb line from position 43° 00' North in 50° 00' West to position South of Nantucket and Eastbound from position 40° 10' North in 70° 00' West to position 42° 00' North in 50° 00' West.

Commanders on encountering ice have permission to deviate from these tracks, and, after the end of October, to leave the Belle Isle for the more southerly route at their discretion, according to weather conditions. Should vessels on Track "C" bound to or from United States be deviated to Track "B" on account of ice, Canadian vessels will remain on Track "D" for the period prescribed, but will have the above option of deviating as necessary in the vicinity of ice areas.

The Lines have the option of continuing the use of the Belle Isle Route after November 14th should they wish to do so.

Summary of Ice Conditions during 1930.

The following monthly summary of ice conditions in the Western North Atlantic during 1930 is compiled from Ice reports returned by ships of the Voluntary Observing Fleet using Trans-North Atlantic routes, from the Bulletins issued by the International Ice Patrol service, and from reports received through other sources.

January.—In the Western North Atlantic no ice of any description was reported during the first half of the month. From the 15th of the month onwards both light field ice and bergs were met with over that portion of the Great Bank north of the 46th parallel between the 47th meridian and the East Coast of Newfoundland. The most southernmost ice observed during the month was a light field extending nine miles east from Latitude 46° 00' N., Longitude 47° 24' W. reported on the 30th.

February.—A large field of ice was reported on the 9th to the North of Sable Island on the Misaine Bank between the 60th and 63rd meridians. In the vicinity of the Great Bank extensive fields of ice were reported throughout the month North of the 47th parallel between the 47th meridian and the East coast of Newfoundland.

On February 7th a berg was reported in Latitude 43° 30' N., Longitude 48° 50' W., and owing to this early movement of the ice South, the United States Coast Guard Service despatched a cutter to investigate the ice conditions and commence the 1930 Patrol. At the same time the Cunard Company acting on behalf of the Lines party to the North Atlantic Track Agreement, issued instructions for Track C., which was then in force, to be discontinued and Track B. brought into force from the 15th of the month.

During the month numerous bergs and growlers were reported within the area bounded by the 43rd and 49th parallels and the 43rd and 50th meridians, most of the ice drifting down the Eastern side of the Great Bank. Bergs were also reported within the straits of Belle Isle.

March.—During the first half of the month extensive fields of heavy ice containing numerous bergs were reported North of the 47th parallel between the meridians of 48° and 51° West. Small fields were also reported in the vicinity of Cape Race and off the East coast of Newfoundland.

Throughout the month, numerous bergs were reported between the 43rd and 47th parallels and the 45th and 50th meridians, the majority of bergs drifting down the Eastern edge of the Great Bank. On the 28th of the month three bergs were reported between the 43rd and 46th parallels and the 39th and 41st meridians. The Southernmost berg reported during the month was on the 23rd in Latitude 42° 10' N., Longitude 49° 30' W.

On March 31st the Danish Meteorological Institute reported "Ice belt 40 miles wide Cape Farewell to Arsuk."

April.—Within the Gulf of St. Lawrence, the channel from Montreal to Quebec was reported free of ice on April 15th when navigation was reopened for the season by the arrival at Montreal of the first coasting vessel.

On April 21st the British S.S. *Wentworth* arrived at Montreal, her master Captain D. M. ARCHESON receiving the gold mounted stick which is presented each year to the master of the first ocean going vessel arriving at the port after the close season.

On the 11th heavy and light broken ice was reported to extend from Cape Ray to Latitude 48° 30' N., Longitude 61° 11' W., and thence light broken ice to Latitude 48° 48' N., Longitude 61° 32' W. On the 30th well broken and open ice extending 5 miles south-west and about 8 miles east from Latitude 47° 40' N., Longitude 59° 52' W., also a small field in Latitude 47° 42' N., Longitude 60° 02' W. were reported. Fields of well broken ice between St. Paul Island and Cape North and in Latitude 47° 20' N., Longitude 60° 04' W. and Latitude 47° 26' N., Longitude 59° 46' W. were also observed.

On April 22nd the Danish Meteorological Institute reported, "Free of ice 75 miles off Cape Farewell," and on the 24th "Off Frederikshaab the western edge of the ice two miles distant from the shore. Northern edge of ice cannot be stated. No Storis found. The belt of ice to be regarded at present as impenetrable."

In the vicinity of the Great Bank numerous reports of bergs were received throughout the month within an area bounded by the 42nd and 50th parallels and the 42nd and 53rd meridians. The southernmost berg was reported in Latitude 42° 06' N., Longitude 50° 08' W. on the 29th drifting southward at the rate of 18 miles daily.

On the 7th of the month a small berg was reported in Latitude 42° 24' N., Longitude 34° 22' W. This position is well outside the limits within which ice is normally observed.

May.—Within the Gulf of St. Lawrence, from Cape St. George, Newfoundland across to Table Head, Anticosti open ice, but close packed at some points was reported on the 12th. Heavy open and close packed ice with numerous bergs and growlers was observed everywhere within the Straits of Belle Isle throughout the month.

The Danish Meteorological Institute reported on the 10th, "Free of ice 75 miles off Cape Farewell," and on the 13th "Off Arsuk ice extends from 4 miles to 56 miles off shore. Northward limit beyond the range of sight."

Within the area bounded by the 40th and 50th parallels and the 42nd and 53rd meridians, reports of bergs were numerous, especially in the vicinity of the East Coast of Newfoundland and over the Northern half of the Great Bank, but towards the end of the month few reports of ice south of the 45th parallel were received. The southernmost ice was reported on the 7th in Latitude 40° 33' N., Longitude 47° 12' W. On May 27th a small berg was reported in Latitude 40° 37' N., Longitude 37° 50' W., which is outside the normal ice limits.

June.—No ice was observed within the Gulf of St. Lawrence other than within the Straits of Belle Isle. On June 11th the Straits were reported clear of field ice but contained many bergs and growlers. On June 21st S.S. *Ascania* when passing through the Straits observed 50 bergs between the south-west point of Belle Isle and Cape Norman and 11 bergs and 3 growlers north and south of the track to Point Amour.

The Danish Meteorological Institute reported on June 22nd, "Ice edge 50 miles off Cape Farewell, compact ice. About 20 bergs sighted between Cape Farewell and Arsuk."

Ships using the Belle Isle routes reported large number of bergs both north and south of the Tracks when west of the 54th meridian. On the Cape Race Tracks ice was reported between the 46th and 49th parallels and the 40th and 53rd meridians. Most of the ice was

in the vicinity of the S.E. coast of Newfoundland where many bergs were observed to be aground.

Throughout the month, no ice was reported south of the 46th parallel, and on June 10th, the Ice Patrol service carried out by the United States coastguard cutters was discontinued for the season.

July.—On July 1st the Danish Meteorological Institute reported "Storis very open 40 miles off Arsuk, the northern edge, extending to Nunarssuit and consisting of open ice unimpeding navigation. Twenty bergs sighted between Cape Farewell and Arsuk."

Throughout the month numerous bergs and growlers were reported within the Straits of Belle Isle and Eastward on the tracks to the 49th meridian. South of Latitude 51° N. two bergs were reported on the 2nd on the Cape Race track between Cape Race and the 51st meridian.

August.—On August 20th the Danish Meteorological Institute reported "Open ice 15 miles off Cape Farewell. About 50 bergs met with between Cape Farewell and Arsuk."

During the month several bergs were reported within the Straits of Belle Isle and on the tracks eastward to the 51st meridian. Ice was reported on the 6th in Latitude 49° 13' N., Longitude 49° 24' W.,

and on the 9th in Latitude 48° 30' N., Longitude 48° 52' W. These were the only two reports received of ice south of the 51st parallel.

September.—The Danish Meteorological Institute reported on the 15th "Ice edge 20 miles off Cape Farewell, the ice is very open. Icebergs met with in Latitude 59° N. In the strait the ice extends northward to Ivigtut."

A few bergs were reported within Belle Isle Strait but no other reports of ice in the Western North Atlantic were received during the month.

October.—Other than the observation of one berg in the vicinity of Belle Isle no reports of ice in the Western North Atlantic were received.

November.—The Canadian Signal service reported on the 12th within the Gulf of St. Lawrence "All points no ice in sight."

No ice was reported in the Western North Atlantic during the month.

December.—The Canadian Signal Service reported on the 12th "Montreal to Three Rivers, no ice in sight, eastward to Murray River, light open ice everywhere, other points no ice in sight."

No reports of ice in the Western North Atlantic were received during the month.

SOUTHERN ICE REPORTS.

During the Years 1929 and 1930.

April.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1929	16	46° 58' S. (Approximately)	37° 20' E.	2 bergs	One bore W.S.W. distance about 20 miles; about 100 feet high. The other bore S. about 15 miles and was approximately 120 to 150 ft. high. Distance between bergs roughly 20 miles.	S.S. <i>Deucalion</i> .
	17	46° 44' S.	37° 53' E.	1 berg	The larger of the two bergs observed yesterday, about 15-20 miles away and bearing from ship S. by E.	do.
	20	46° 03' S.	49° 30' E.	1 large berg	Bearing South 2½ miles, about 300-400 ft. high and 1,000 ft. long.	do.
	20	Vicinity of Hog Island		Several large growlers		do.
	20	46° 20' S.	50° 20' E.	1 large berg	Bearing South 8 miles. It appeared as two distinct portions probably joined under water. About 200 ft. high, 600 ft. long.	do.
	22	46° 37' S.	51° 55' E.	1 large berg	500-600 ft. high and about 1,000 ft. long, bearing N.E. 4 miles	do.
	22	1½ miles North of East Island N.E. Point.		1 berg and growlers	About 40 ft. high and 200 ft. long aground, ½ mile off Point. 2 growlers about 30 ft. high and 40 ft. long were ashore closer to the beach, probably remains of larger berg.	do.
	22	46° 35' S. (Approximately)	52° 20' E.	1 berg	About 250 ft. high, 1,000 ft. long	do.
	22	5 miles W.S.W. of East Island		1 berg	About 100 ft. high, 150 ft. long	do.
	14	54° 12' S.	37° 37' W.	1 berg .. .. .	.. .. .	R.R.S. <i>William Scoresby</i> .
	14	54° 20' S.	37° 25' W.	1 berg .. .. .	.. .. .	do.
	11	55° 15' S.	36° 42' W.	1 berg .. .. .	.. .. .	do.
	2	At Grytviken		Small ice	Floating into harbour	do.
	6	At Grytviken		Thin ice	In harbour	do.
1930	7-9	At Grytviken		Small ice	In harbour	do.
	10	At Grytviken		Ice	In harbour	do.
	11	55° 12' S.	36° 26' W.	1 berg .. .. .	.. .. .	do.
	13	62° 08' S.	60° 34' W.	1 berg	Square tabular. Tilted diagonally; estimated 150 ft. high, 500 ft. square; visibility 8.	R.R.S. <i>Discovery II</i> .
	13	62° 10' S.	60° 16' W.	2 bergs	Small and irregular—much weathered—one with small green end. Visibility 8. Estimated 50 ft. high, 200 ft. long.	do.
	13	62° 08' S.	59° 38' W.	16 bergs	Within a 12 mile radius, mainly to N. and N.E. 5 moderate size, 11 small, all weathered. Visibility 7.	do.
	12	From 62° 30' S. to 62° 53' S.	59° 12' W. to 58° 52' W.	22 bergs	Most were much weathered and rounded or conical; about 4 were long, low and tabular, and one of a clear green colour streaked and specked with blue. Visibility 6.	do.
	11	62° 00' S.	59° 08' W.	11 bergs	Stranded off North Shore of King George Island, within a 10 mile radius of position. 2 tabular but weathered, very high, 250-300 ft.; 4 large and irregular, 5 small and weathered. Visibility 8.	do.
	12	62° 53' S.	58° 52' W.	Pack ice	Extending N.E. and S.W. Unexamined, but apparently fairly light and loose, at all events at the border. Evidently extending fairly solid to the S.E. Visibility 6.	do.
	9	61° 00' S.	54° 40' W.	2 bergs	Tabular, of recent appearance, 1 heavily tilted: Estimated height 150-200 ft., length 500-700 ft. Visibility 8.	do.
	9	61° 00' S.	54° 20' W.	7 bergs	3 moderate size, 4 small; all weathered; 1 clear blue. Visibility 7.	do.

SOUTHERN ICE REPORTS (continued)

Year.	Day.	Position of Ice.		Description	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
	9	60° 52' S.	53° 50' W.	4 bergs	Large tabular. Stranded off North shore of Clarence Island. Visibility 8.	R.R.S. <i>Discovery II</i> .
	9	61° 00' S.	53° 30' W.	Pack ice	Line of fairly heavy pack running E.N.E. from Clarence Island, apparently Solid to Southward. Several small weathered bergs embedded in pack.	do.
	8	60° 05' S.	52° 02' W.	1 berg	Low and much water-worn, evidently capsized. Estimated height 60 ft., length 300 ft. Visibility 6.	do.
	8	60° 04' S.	49° 38' W.	1 berg	Irregular with two rounded peaks. Estimated height 150 ft., length 400 ft. Visibility 3.	do.
	7	60° 39' S.	48° 52' W.	Drift ice	A collection of heavy drift ice, in irregular streams composed of brash floebergs, and old rafted pack, within a 10 mile radius of position. Several large tabular bergs and heavy pack edge observed to Southward.	do.
	7 6	From 61° 22' S. to 61° 44' S.	44° 30' W. 45° 10' W.	Pack, loose pack and drift ice	Heavy loose pack ice, consisting of large broken floes of 10-20 ft. thick. Several large bergs embedded in the pack. In the offing the sea was generally studded with brash floebergs and other isolated pieces of ice.	do.
	6	61° 42' S.	45° 05' W.	Drift ice	Belt of loose drift ice about 12 miles wide, extending N. and S. and consisting of small floes, fragment and brash. Visibility 4.	do.
	5	61° 40' S.	44° 58' W.	1 berg	Large level tabular berg. Estimated height 120 ft., length 2,000-3,000 ft. Visibility 5.	do.
	5	61° 27' S.	44° 14' W.	2 bergs	Much weathered and small. Estimated height 50 ft., length 150 ft. Visibility 5.	do.
	5	61° 13' S.	43° 29' W.	12 bergs	2 large and tabular, 10 of moderate size and weathered, within a 10 mile radius. Visibility 7.	do.
	3 2 3	From 57° 40' S. to 57° 37' S. 57° 51' S.	42° 35' W. 42° 00' W. 42° 28' W.	20 bergs 8 bergs	All of moderate size and within 2 miles either side of course. Visibility 5.	do.
	4	59° 53' S.	42° 27' W.	1 growler	All of moderate size and weathered. Within a 6 mile radius. Visibility 6.	do.
	4	59° 51' S.	42° 26' W.	1 berg	Low bottle-green base with square white peak: estimated height 20 ft., length 90 ft. Visibility 5.	do.
	5	58° 05' S.	42° 18' W.	18 bergs	Halved vertically in colour with sharp line of demarcation: weathered with 3 rounded peaks. Estimated height 60 ft., length 300 ft. Visibility 5.	do.
	5	60° 57' S.	42° 11' W.	4 bergs	Moderate size much weathered, within a 10 mile radius. 4 bergs partly white and green. Visibility 7.	do.
	4	59° 24' S.	42° 11' W.	17 bergs	All of moderate size, much weathered. Within a 3 mile radius. Visibility 6.	do.
	2 2 2	57° 15' S. 57° 12' S. 57° 12' S.	42° 08' W. 42° 08' W. 42° 08' W.	1 growler and 2 large bergy bits 1 growler 1 berg	Within a 12 mile radius, mainly to Westward, 3 small and dark green, 2 small green and white, remainder all white and of moderate size. Visibility 8.	do. do. do.
	2	57° 04' S.	42° 06' W.	1 berg	Half white, half bottle green. Several large fragments in vicinity. Visibility 5-6.	do.
	5	60° 53' S.	42° 03' W.	1 berg	Low white extremities. Centre square and bottle green. Weathered. Estimated height 120 ft., length 500 ft. Visibility 5-6.	do.
	3	58° 17' S.	42° 03' W.	1 berg	Long with jagged top. Estimated height 80 ft., length 700 ft. Visibility 4-5.	do.
	3	58° 17' S.	42° 03' W.	42 bergs	Large Tabular, with low projecting foot to Northward. New appearance. Crevassed round top. Estimated 200 ft. high, area 1,500 by 3,000 ft. Visibility 6.	do.
	5	60° 48' S.	42° 02' W.	3 bergs	Large tilted Tabular with broad low base; estimated 250 ft. high, area 1,000 ft. square. Visibility 8.	do.
	4	59° 04' S.	42° 00' W.	12 bergs	All of moderate size and weathered and distributed fairly evenly in all directions within a 12 mile radius. 4 totally green, several variegated. Growlers, bergy bits and brash in profusion. Visibility 8.	do.
	2	57° 37' S.	42° 00' W.	14 bergs	Large tabular and of well preserved appearance. Estimated height 150-180 ft., length 600-1,000 ft. Visibility 6.	do.
	4	58° 45' S.	41° 52' W.	21 bergs	Within a 12 mile radius, mainly to Westward, all of moderate size, 2 partly green and white, 4 tabular, remainder weathered. Visibility 8.	do.
	20	53° 55' S.	39° 56' W.	1 berg	Collection of bergs, all of moderate size and weathered, within a 2 mile radius of position. Visibility 6.	do.
	9 20	53° 45' S. 53° 45' S.	38° 30' W. 38° 25' W.	1 berg 3 bergs	10 of moderate size, 11 small, generally distributed within a 10 mile radius, all weathered, peaked and rounded: 3 variegated with parts of dark green. Visibility 8.	do.
	17 16 16	West Coast of South Georgia Off Cooper Island, East of Clarke Rocks	South Georgia South Georgia	20 bergs 14 bergs and many growlers 6 bergs and 4 growlers	Weathered with steep peak in middle sloping on all sides to low base estimated height 150 ft., length 800 ft. Visibility 4.	do.
					Large Tabular	R.R.S. <i>William Scoresby</i> .
					Within a 3 mile radius. Two large tabular, one small and very much weathered. Visibility 5.	R.R.S. <i>Discovery II</i> .
					Small moderate weathered. Apparently local	R.R.S. <i>William Scoresby</i> .
					All weathered and moderate. Scattered growlers out to Clarke Rocks.	do.
					All weathered and small	do.

Reports of ice previous to April, 1929, will be found in The Marine Observer, Vol. VI, No. 64, p. 91.

NOTE.—Plates produced by Lithographic process, including Charts and other large diagrams, will be found in each number after "Weather Signals."

WEATHER SIGNALS.

I.—SHIPS' WIRELESS WEATHER SIGNALS.

Urgent Meteorological reports should be made at any time. Any ship at any time encountering a tropical revolving storm should report to all ships and the appropriate station, continuing to report at intervals of three hours so long as the ship remains under the influence of the storm.

Ships experiencing gales in which the wind reaches Force 10 or above in the Beaufort Scale should inform all ships within range.

Ships encountering Ice or other navigational dangers should report immediately to all ships and the appropriate station; see instructions for Danger to Navigation Signals for all ships, pages 31 and 32, Vol. VIII, No. 85.

For full particulars of "Selected Ships" Routine Meteorological Reports with Schedule for Communication, see pages 16 to 19, Vol. VIII, No. 85.

See List of W/T Stations detailed to receive reports from **A Selected Ships** with particulars up to date below, also on Chart V.

In parts of the world where such stations and particulars are not given, British **A Selected Ships** should make their reports to **CQ**

on 2100 metres (143 kc/s) as stated on page 18 Vol. VIII, No. 85 (January, 1931, MARINE OBSERVER).

B Selected Ships broadcast their report to C.Q. on 600 m. spark, and these may be intercepted by the stations ringed in on Chart V. In making these reports to C.Q. "B Selected Ships" should make special endeavour to ensure that the report is received at these shore stations. With a view to assisting Meteorological Services who have provided information and to ensuring that routine reports from all "Selected Ships" within range of certain coast stations may be received by those services a list of stations specially detailed to receive reports from "B Selected Ships" is also given on pages 93 and 94. The procedure given on pages 16 to 19, Vol. VIII, No. 85, should be adhered to as far as possible.

According to agreement reached by the International Meteorological Conference, 1929, all arrangements for the co-operation of shipping in Voluntary Marine Meteorological work are to be made through the Meteorological Services of the different countries in which the ships are registered, in accordance with the agreed upon International plan for all parts of the World, following the International Convention for Safety of Life at Sea, 1929.

WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM "A SELECTED SHIPS."

Request for Information.

THE ATTENTION OF METEOROLOGICAL SERVICES IS INVITED TO THE INVITATION GIVEN ON PAGE 16 OF VOL. VIII, NO. 85, JANUARY MARINE OBSERVER.

Ocean.	Station.	Position.	Call Sign.	Frequency and Wave Length.		Area and limits covered by Station.	Telegraphic address of Meteorological Centre.	Information required—Limit of Groups.	Notes.
				For Station to call up "Selected Ships."	For "Selected Ships" to report to Station.				
North Atlantic and North Sea.	Portishead.	Lat. 51° 28' 41" N. Long. 2° 47' 30" W.	GPU.	149 kc/s. (2013 metres).	143 kc/s. (2100 metres).	North Sea and Eastern North Atlantic East of Longitude 40° W. and North of Latitude 38° N., but not within 300 miles of station. (see Chart V).	Weather London.	Weather only, up to seven groups, preferably No. 3 Supplementary Groups.	Control system. "Selected Ships" chosen to report in given order notified by station daily at 2230, 0330, and 1030 G.M.T. Roll call thus—Weather begins—Call signs of chosen "Selected Ships"—Weather ends.
	Chatham Mass.	Lat. 41° 42' N. Long. 70° 00' W.	WCC.		142.9 kc/s. (2098 metres).	North Atlantic West of Longitude 40° W.	Observer Washington.	Weather only. First four groups of observations taken at 0000 and 1200 G.M.T. only required.	No control. All British "A Selected Ships" within area to address their 0000 and 1200 G.M.T. observations to Observer Washington and their 1800 G.M.T. observations to CQ in accordance with schedule.
	Horta, Azores.	Lat. 38° 32' N. Long. 28° 38' W.	CTH.		125 kc/s. (2400 metres).	North Atlantic South of Latitude 38° N. and East of Longitude 40° W.	Radio Horta.	Weather only, up to seven groups, preferably No. 3 Supplementary Groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule.

(Continued.)

[illegible]

**WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM
"B SELECTED SHIPS."**

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteoro- logical Centre desiring information.	Information desired.	Notes.
North Atlantic.	Horta, Azores.	Lat. 38° 32' N. Long. 28° 38' W.	CTH.	Radio Horta	Weather only, up to 7 groups, preferably No. 3 Supplementary Groups.	
Indian Ocean.	Calcutta.	Lat. 22° 33' 31" N. Long. 88° 20' 16" E.	VWC.	Weather.	Weather only up to 6 groups, No. 6 Supplement- ary Groups preferred.	
	Rangoon.	Lat. 16° 45' 57" N. Long. 96° 11' 51" E.	VTR.			
	Madras.	Lat. 12° 59' 17" N. Long. 80° 10' 56" E.	VWM.			
	Bombay.	Lat. 19° 04' 55" N. Long. 72° 49' 54" E.	VWB.			
	Karachi.	Lat. 24° 51' 05" N. Long. 67° 02' 32" E.	VWK.			
	Matara.	Lat. 6° 01' 07" N. Long. 80° 35' 39" E.	GZP.			
	Mauritius.	Lat. 20° 23' S. Long. 57° 35' E.	VRS.	Observatory Mauritius.	Weather 4 universal groups and first of No. 6 Supplementary Groups.	

WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM
"B SELECTED SHIPS."

(Continued.)

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 19" E.	VPS.	Royal Observatory.	Weather only, preferably No. 6 Supplementary Groups.	
South Pacific.	Auckland.	Lat. 36° 50' 36" S. Long. 174° 46' 08" E.	ZLD.	Weather Wellington.	Weather only, up to 7 groups.	Apia, Rarotonga and Chatham Island relay to New Zealand. Rarotonga keeps watch 0630 to 1330 G.M.T. Chatham Island 0430 to 1230 G.M.T. Remainder cover schedule. Reports desired through nearest station when "B Selected Ships" are within 1,000 miles of New Zealand.
	Wellington.	Lat. 41° 16' 26" S. Long. 174° 01' 00" E.	ZLW.			
	Awarua.	Lat. 46° 30' 27" S. Long. 168° 22' 21" E.	ZLB.			
	Chatham Island.	Lat. 43° 57' 02" S. Long. 176° 31' 04" W.	ZLC.			
	Rarotonga.	Lat. 21° 11' 54" S. Long. 159° 48' 51" W.	ZKR.			
	Apia.	Lat. 13° 15' 17" S. Long. 170° 49' 42" W.	ZMA.			

II.—WIRELESS WEATHER SIGNALS.

WIRELESS WEATHER BULLETINS.

FRANCE.

R/T Issue.

Eiffel Tower W/T station, Latitude 48° 51' N., Longitude 2° 18' E. (approx.), call sign **FLE** broadcasts meteorological reports and forecasts by word of mouth in French on a wavelength of 1445 m. R/T at 1200 G.M.T. daily.

The report is divided into eight parts—

Part I contains 0700 G.M.T. observations of Wind direction and force, visibility and state of the sea at several coast stations in the English Channel, Bay of Biscay, etc.

Part VI gives a forecast of wind direction and force for the following French coastal areas—

"Manche" ...	Belgian frontier to and including Carteret.
"Bretagne" ...	From and including Cherbourg to estuary of Loire.
"Océan" ...	From and including Lorient to the Gironde.
"Gascogne" ...	From and including Île de Ré to Spanish frontier.
"Roussillon" ...	From Spanish frontier to and including Cette.
"Rhône" ...	From and including Cette to Camarat.
"Provence" ...	From and including Camarat to Italian frontier.
"Corse" ...	All the coasts of Corsica.

WIRELESS STORM WARNINGS.

HOLLAND.

North Sea.

I.C.W. Issues.

Scheveningen W/T station, Latitude 52° 06' N., Longitude 4° 16' E. (approx.), call sign **PCH**, transmits storm warnings on receipt and following the end of the next compulsory silent period, both in Dutch and English, and also at 1230 and 2030 G.M.T. Wavelength used is 600 metres (I.C.W.).

The warnings are transmitted, first at the rate of 15 words per minute, and then repeated twice, quickly.

NOTE.—If the storm warning is sent on request a charge will be debited to the ship concerned.

FRANCE.

Spark Issues.

The following W/T stations broadcast storm warnings concerning the areas "Manche," "Bretagne," "Océan," and "Gascogne":—

Cherbourg - Rouges Terres ...	Approximate Latitude 49° 37' N., Longitude 1° 36' W., call sign FUC .
Brest-Mengam ...	Approximate Latitude 48° 22' N., Longitude 4° 34' W., call sign FUE .
Lorient (Pen-Mané) ...	Approximate Latitude 47° 44' N., Longitude 3° 21' W., call sign FUN .
Rochefort ...	Approximate Latitude 45° 55' N., Longitude 0° 57' W., call sign FUR .

The following W/T stations broadcast storm warnings concerning the areas "Roussillon," "Provence," "Rhône," and "Corse":—

Porquerolles ...	Approximate Latitude 42° 59' N., Longitude 6° 12' E., call sign FUQ .
Ajaccio ...	Approximate Latitude 41° 56' N., Longitude 8° 46' E., call sign FUI .

The W/T stations transmit the warning on the 600 metre wave length as soon as it is received. The International Safety Signal — — — (TTT) is first sent out, followed by D.E. and station call sign. This transmission commences towards the end of one of the international three-minute silent periods and the nature of the warning is sent immediately after the end of the silent period. The message is repeated after several minutes.

When the time of sending falls outside a single operator watch on board ship the message is repeated at the commencement of the succeeding watch.

C.W. Issues.

Eiffel Tower W/T Station, call sign **FLE**, broadcasts wireless storm warnings immediately after the daily weather bulletins at 0220 G.M.T. on a wavelength of 1,446 m. C.W. and at 0820 G.M.T. on a wavelength of 7,200 m. C.W.

St. Pierre des Corps W/T Station, call sign **FYG.**, also broadcasts wireless storm warnings immediately after the daily weather bulletin at 1920 G.M.T. on a wavelength of 6,000 m. C.W.

The warnings are broadcast if the forecasts indicate that the wind force is likely to exceed force 7 on the Beaufort scale.

The signals refer to the following French coastal areas:—

Manche, Bretagne, Océan, Gascogne, Roussillon, Rhône, Province, Corse.

(For limits of these areas see under Wireless Weather Bulletins, France.)

Form of Message.

The warnings are sent *en clair*, and are valid for 24 hours from the time indicated in the message.

They commence with the name of the day of the week, the time from which the validity of the warning is reckoned, the name of area threatened followed by the word "Tempête" and the probable direction from which the gale may be expected.

Example.

"Jeudi 15 heures Manche tempête, Nord-Ouest (N.W.)."

Explanation.

Storms or gales are predicted (or will continue) from now until 1500 to-morrow in the area and from the direction mentioned.

WIRELESS ICE WARNINGS.

DENMARK.

Danish Waters.

Spark Issues.

The following W/T stations broadcast a summary of ice conditions in Danish waters, *en clair* (English). Wavelength 600 metres, spark.

Blaavand W/T station, approximate Latitude 55° 33' N., Longitude 8° 05' E., call sign **AXB**, at 0100 and 1300 G.M.T.

Copenhagen W/T station, approximate Latitude 55° 41' N., Longitude 12° 37' E., call sign **OXA** at 1100 and 2300 G.M.T.

HOLLAND.

I.C.W. Issues.

Scheveningen W/T station, call sign **PCH**, broadcasts, when necessary, data concerning ice conditions in certain Dutch harbours and approaches, daily as follows:—

at 1230 and 2030 G.M.T. after the Storm Warning (if issued).

Wavelength 600 metres (I.C.W.).

The ice report is broadcast in a local code and will contain the ice conditions for the following harbours:—

Delfzijl (Ems).	Helder (Zuider Zee).
Harlingen (Zuider Zee).	Rotterdam (Waterway).
Amsterdam (North Sea Canal).	Dordrecht (North).
Zaandam (Voorzaan).	Dordrecht (Mallegat).

The report commences with the word "Ijsbericht, Ice report."

The broadcast of the ice reports will begin when navigation is closed to small steamers and seagoing motor vessels at any of the harbours mentioned in the list, and will cease when navigation is re-opened.

Ice reports are transmitted twice: first at the rate of 15 words per minute, and then quickly.

III.—WIRELESS TIME SIGNALS.

FRANCE.

C.W. Issues.

Time signals in accordance with the New International System of W/T Time Signals proposed by the International Time Commission, held at Cambridge in July, 1925, are now broadcast from wireless stations in France, as follows:—

Paris—Eiffel Tower W/T Station.

Position, Latitude 48° 51' 30" N., Longitude 2° 17' 43" E.

Call Sign **FLE**. Wavelengths 32.5 m. (C.W.) and 2,650 m. (I.C.W.).

New International Time-Signals.

W/T Time-Signals are transmitted automatically from the Standard Clock at Paris Observatory, Latitude 48° 50' 11" N., Longitude 2° 20' 14" E., in accordance with the New International System of W/T Time-Signals as follows:—

	h.	m.	s.	h.	m.	s.	
(1) From	7	56	00	to	8	00	00 on 32.5 metres. (C.W.)
(2) „	9	26	00	„	9	30	00 „ 2,650 „ (I.C.W.)
(3) „	19	56	00	„	20	00	00 „ 32.5 „ (C.W.)
(4) „	22	26	00	„	22	30	00 „ 2,650 „ (I.C.W.)

The transmission of each series of signals is similar in every respect, the procedure as regards (1) being:—

G.M.T.				Signal.			
h.	m.	s.	h.	m.	s.		
7	55	30				Call (— — — — —) followed by initials of the Bureau International de l'Heure (— — — — —) and two groups of three one-second (— — — — —).	
7	56	05 to 7 56 50				— — — — — every 10 sec., except that the third series from 25 sec. to 30 sec. consists of a single dash prolonged for 5 sec.	
57	00	„	57	50		— — — — — etc.	
57	55	„	58	00		{ 55 56 57 58 59 60 ■ ■ ■ ■ ■	Time signal.
58	08	„	58	10		— —	
58	18	„	58	20		— —	
58	28	„	58	30		— —	
58	38	„	58	40		— —	
58	48	„	58	50		— —	
58	55	„	59	00		{ 55 56 57 58 59 60 — — — — —	Time signal.
59	06	„	59	10		— — — —	
59	16	„	59	20		— — — —	
59	26	„	59	30		— — — —	
59	36	„	59	40		— — — —	
59	46	„	59	50		— — — —	
7	59	55 „ 8 00 00				{ 55 56 57 58 59 60 ■ ■ ■ ■ ■	Time signal.
— = 1 sec.; ■ = 0.2 sec.							

Croix d'Hins W/T Station.

Position, Latitude 44° 42' 22" N., Longitude 0° 48' 30" W.

Call Sign **FYL**. Wavelength 18,900 m. (C.W.).

New International Time-Signals.

Time-Signals in accordance with the New International System of W/T Time-signals are broadcast twice daily, at 8^h. 00^m. 00^s. G.M.T. and 20^h. 00^m. 00^s. G.M.T. The signals are transmitted automatically by the Standard Clock at Paris Observatory. For procedure, see Eiffel Tower New International System of W/T Time-Signals above.

IV.—VISUAL GALE WARNINGS.





DENMARK.

The system of day gale warning signals in force at Danish ports is the same as that explained for Norway.* By night a red light is hoisted in place of any of the day gale warning signals.

Additional Gale Signals.

When a gale is blowing at Blaavands Huk, Hanstholm, the Skaw, Fornæs, Gjedser or Hammeren, the signals below are displayed at Aalborg, Tuborg and Copenhagen. The place and force of the wind, according to the Beaufort scale, are indicated by coloured flags, as follows:—

Place.	Force of the Wind.	
	7-9.	10-12.
Blaavands Huk		
Hanstholm		
The Skaw		
Fornæs		
Gjedser		
Hammeren		

 Yellow.
 Red.
 Black.
 White.

These signals are usually made between 0900 and sunset.

HOLLAND.

The system of day gale warning signals in force at places on the coasts of Holland is the same as that explained for Norway.* Night gale warning signals are similar to those used by Germany† with the exception of the red light, which indicates "Atmospheric disturbance, be alert, and look out for further information."

BELGIUM.

The system of day gale warning signals in force at Belgian ports is the same as that explained for Norway.*

Night Signals.

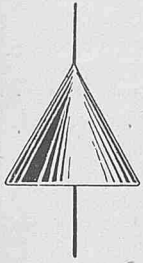
At Ostende, Nieuport, Blankenberghe and Zeebrugge, night gale warning signals are made by red lights as follows:—

Signal	Meaning.
A triangle of red lights	Gale probable from N.W.
One red light over a triangle of red lights.	Gale probable from N.E.
An inverted triangle of red lights	Gale probable from S.W.
One red light below an inverted triangle of red lights.	Gale probable from S.E.
One red light over an inverted triangle of red lights.	Gale probable, direction uncertain.

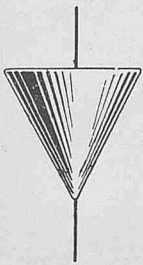
* See March 1931 Marine Observer, p. 73.

† See March 1931 Marine Observer, p. 74.

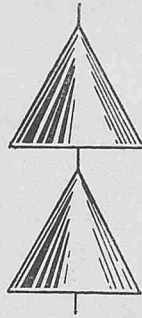
FRANCE.
Day Signals.



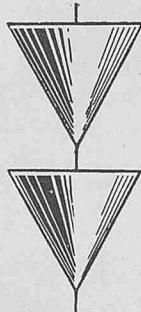
Hoisted when a gale is probable
from N.W.



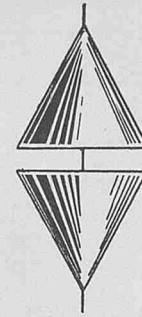
Hoisted when a gale is probable
from S.W.



Hoisted when a gale is probable
from N.E.



Hoisted when a gale is probable
from S.E.



Hoisted when gales of hurricane
force are probable.

Any of these signals indicate that there is an atmospheric disturbance in existence, which will probably cause a gale from the quarter indicated by the signal used within a distance of about 50 miles of the place where the signal is hoisted, and the knowledge of which is likely to be of use to seamen. Its meaning is simply "Look out! Bad weather as indicated is probably approaching you."

The signals are hoisted when necessary at the semaphore stations and port offices on the coast of France, and remain hoisted 48 hours from the time of receiving notice from the Ministry of Marine.

Special Notices Regarding Personnel.

The Marine Superintendent will be glad to receive information of special distinctions gained and retirements, &c., of Marine Observers.

EX-100
New Orleans

Enclosed for the Bureau are
two copies of the report of the

investigation conducted by the
New Orleans office on the
subject of the alleged
violation of the
Federal Food and Drug
Administration laws
by the New Orleans
branch of the
American Medical
Association.

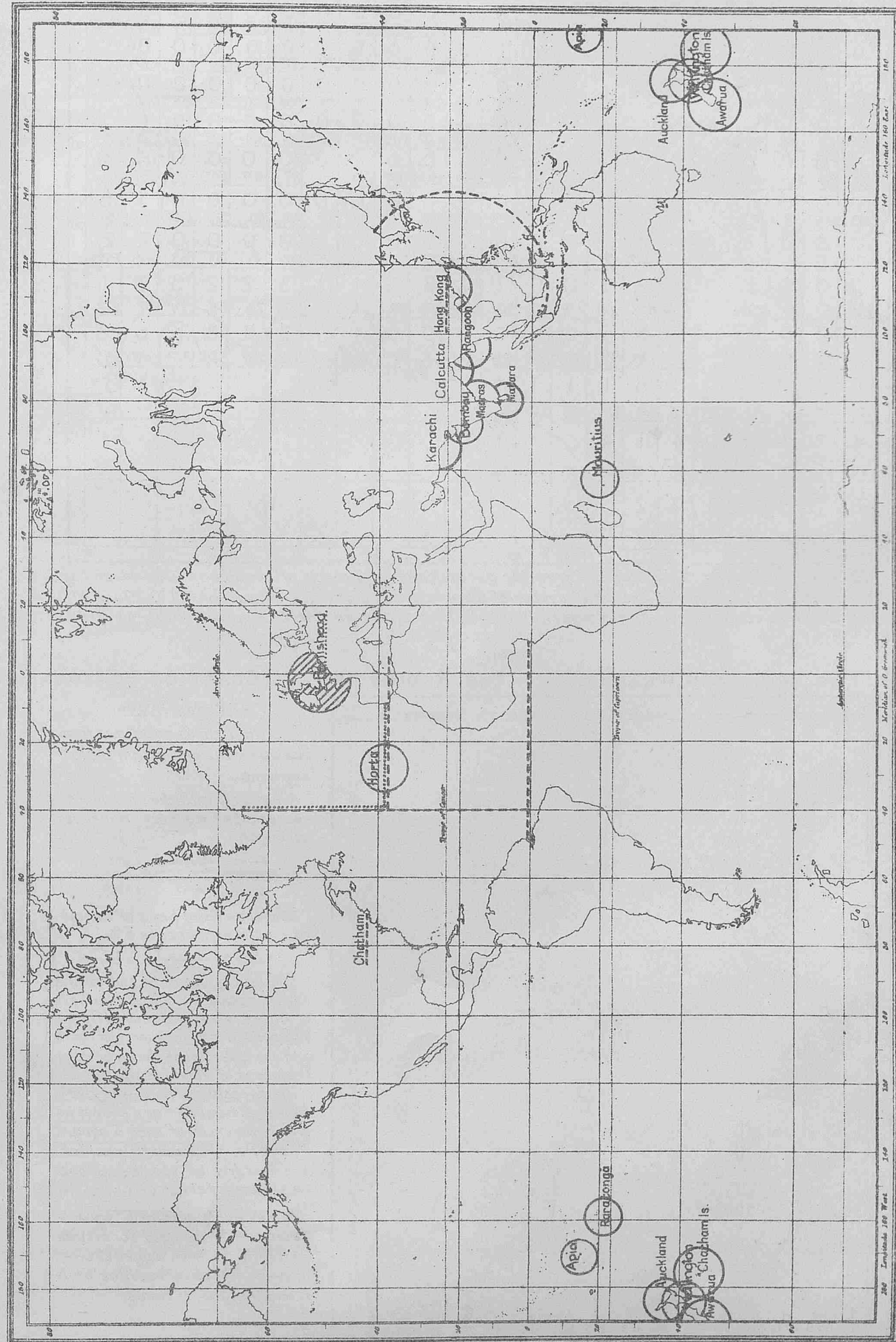
Very respectfully,
Special Agent in Charge

Enclosed for the Bureau are
two copies of the report of the

Special Agent in Charge

The Bureau representative will be glad to receive information of any
of interest.

Stations for Reception of Routine Wireless Weather Reports from "Selected Ships."



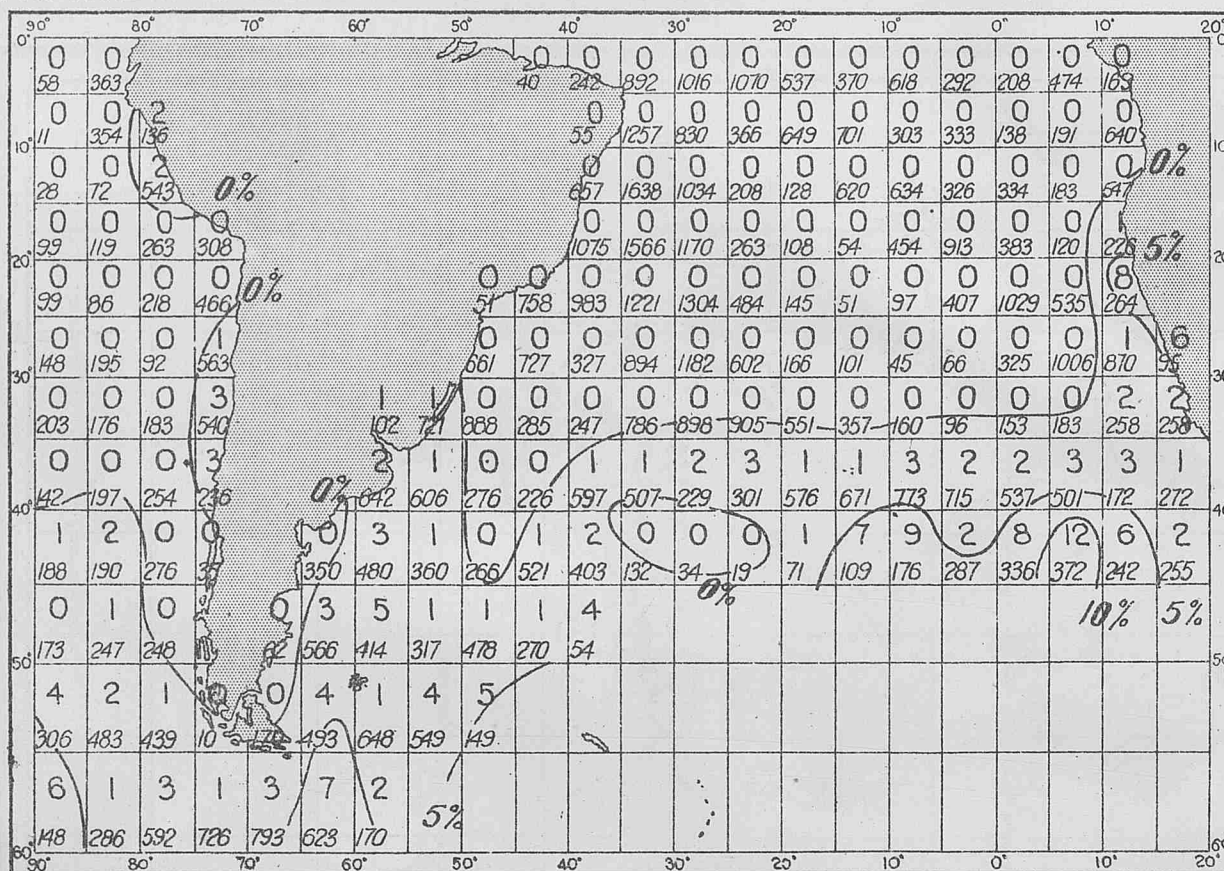
The dotted line indicates the area in which British "A" Selected Ships report under control to Portishead. The small shaded circle indicates the area from which reports are prohibited to Portishead.

A pecked line indicates the reporting area round stations in other countries to which British "A" Selected Ships should report. The names of such stations being also underlined with a pecked line.

The full-line circles indicate the areas round islands and coast stations which could receive spark Selected Ships reports to C.Q.

APRIL.

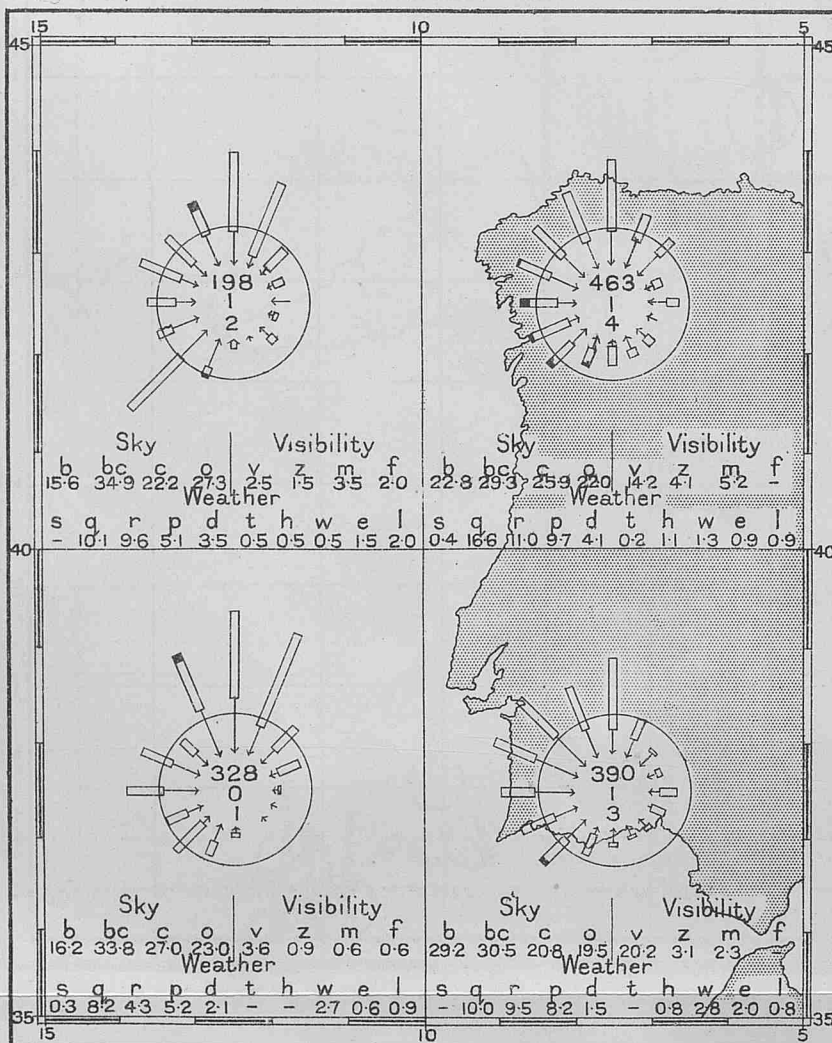
FOG IN THE SOUTH ATLANTIC AND VICINITY OF WEST COAST OF SOUTH AMERICA, PERCENTAGE FREQUENCY.



The upper figures in the 5° squares give the percentage frequency of occasions upon which Fog was logged, the lower figures the total number of observations. Lines are drawn for 0, 5, 10, 20 and 30%. The chart is compiled from observations from British Ships for the period 1855 to 1899.

APRIL.

WIND, FOG, MIST AND WEATHER FOR THE REGION OFF THE COAST OF PORTUGAL.



EXPLANATION.

The Wind roses are drawn from Sea observations within the 5° squares.

Arrows fly with the wind, length represents frequency, thickness strength.

Gales. Moderate. Light.

8-12 4-7 1-3

Distance from head of arrow to circle represents 5%,

Scale: 0 10 20%

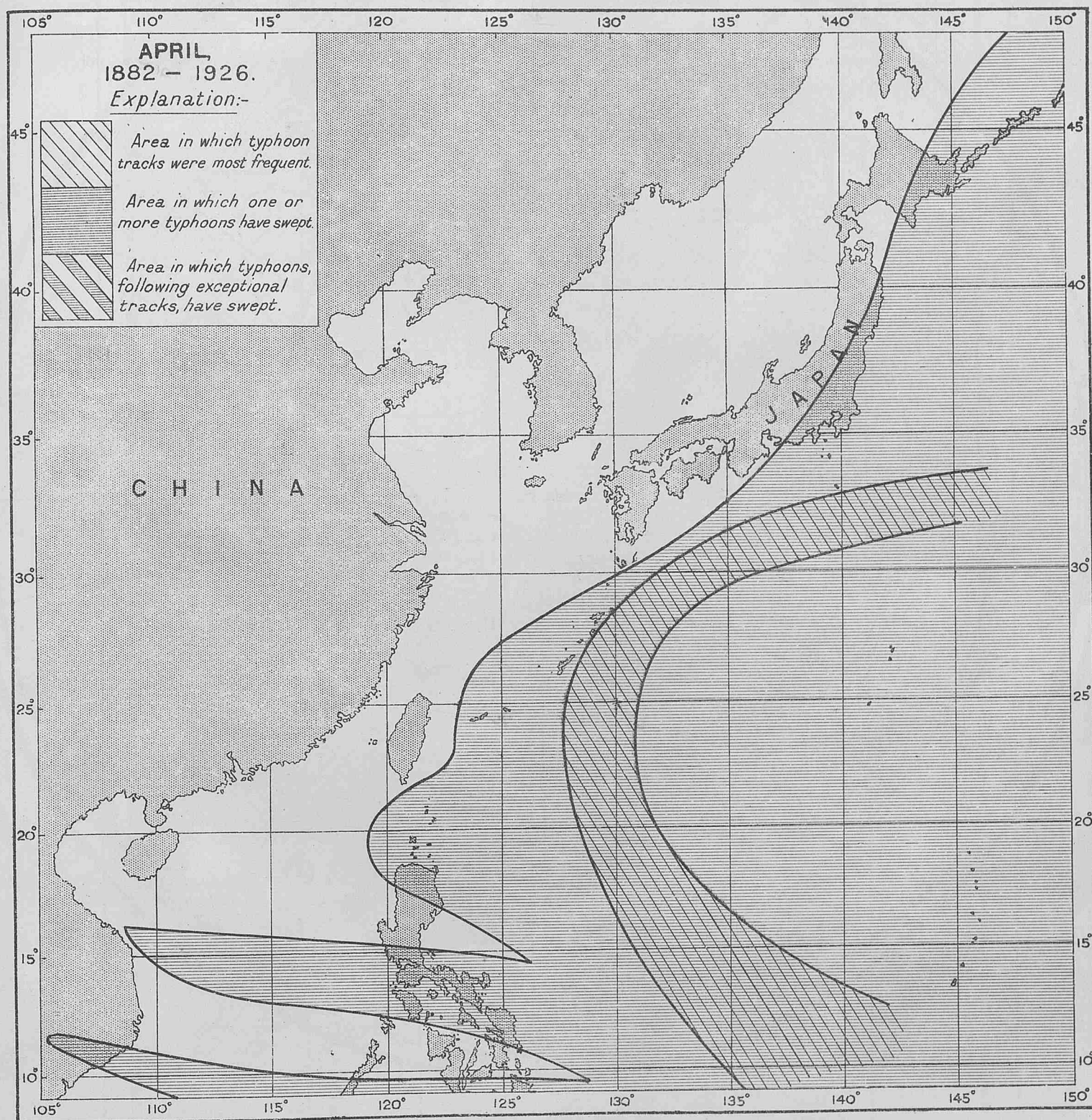
The upper figure in the centre of the rose gives total number of observations, the middle figure the percentage frequency of calms and the lower figure the percentage frequency of variable winds.

The percentage frequency of types of weather are shown in the lower half of each 5° square by the figures beneath each of the letters of the Beaufort weather notation.

For example, in the 5° square Latitude 40° to 45°N. Longitude 5° to 10°W. o. was logged 22 times in every 100 observations while r. was logged 11 times.

Compiled from observations of British Ships received since the adoption of the Hollerith system of extraction, covering the years 1921-1928.

TYPHOONS IN THE FAR EAST DURING 45 YEARS.

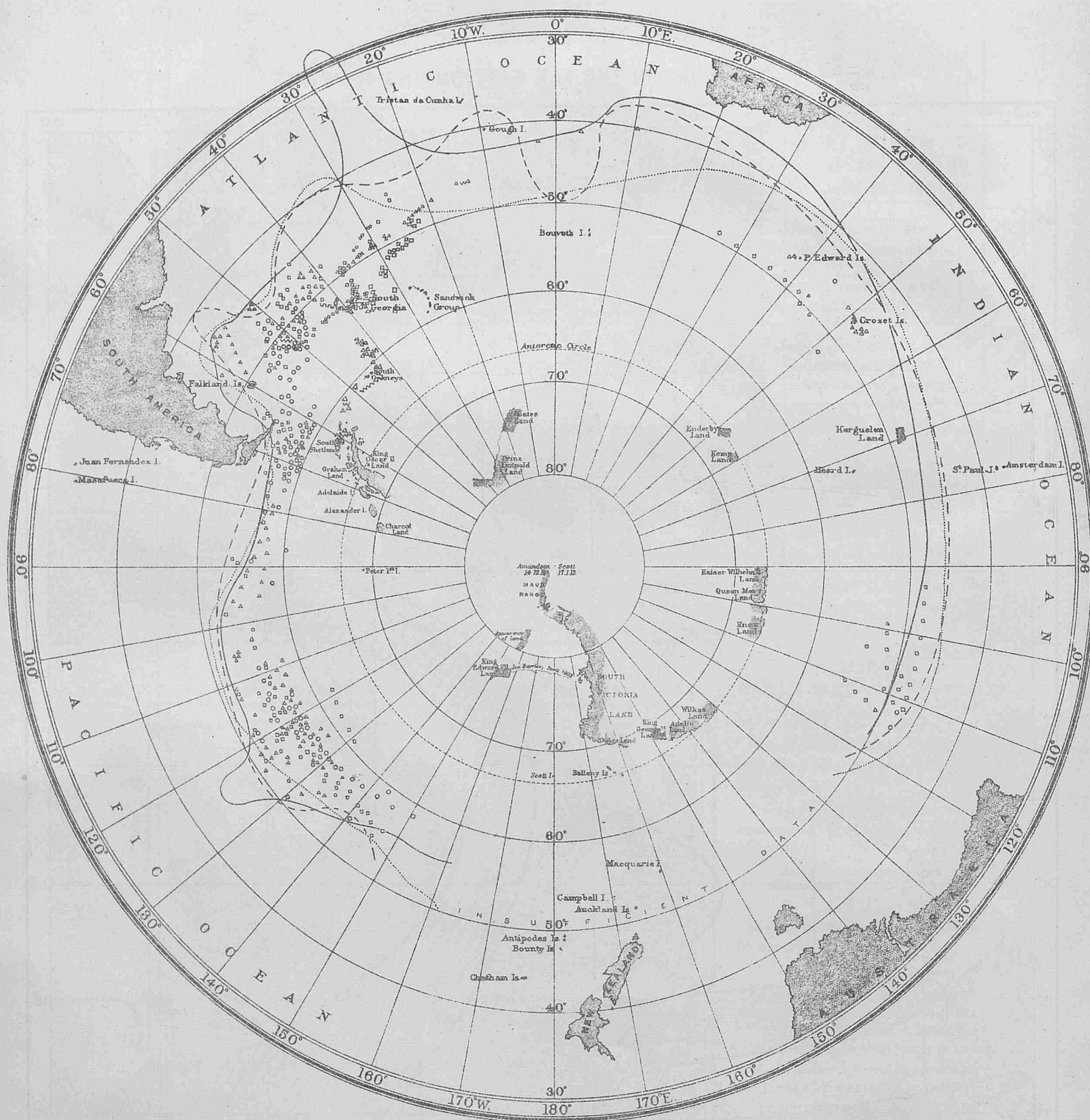
**APRIL** - Single chart: 18 observations of Typhoons.

Principal Track. - restricted between Honshiu and the Bonin Islands, but nearer to the latter in rare instances across the centre and South of the South China Sea.

Starting Point. - chiefly near and below Yap.

On the coast of China fog in the South, in the Formosa Straits and near Shanghai. Continental depressions less marked, but accompanied by much fog. Direction E., E.N.E. or N.E.

(From "Atlas of the Typhoons of the China Seas 1882 to 1926", by the Rev. P.E. Gherzi S.J., Director Zi-ka-wei Observatory, near Shanghai China).



ICE CHART OF THE SOUTHERN HEMISPHERE, 1902-1930. APRIL, MAY and JUNE.

EXPLANATION.

The symbols used to distinguish the records of each of the three months represented during the period 1902-1930 are as follows:— April, bergs Δ , pack ice, $\sim\sim\sim\sim$; May, bergs \square , pack ice, $\sim\sim\sim\sim$; June, bergs \circ , pack ice $\circ-\circ-\circ-\circ$. Extreme limits are given thus:— April ————; May ————; June ————; these include ice reported since 1772.

A list of Southern Ice Reports during the years 1917-1928 for the month of April will be found on p. 89 of this Number.

Similar lists for the months of May and June will be published in the appropriate issues, Numbers 89 and 90 of this Volume.

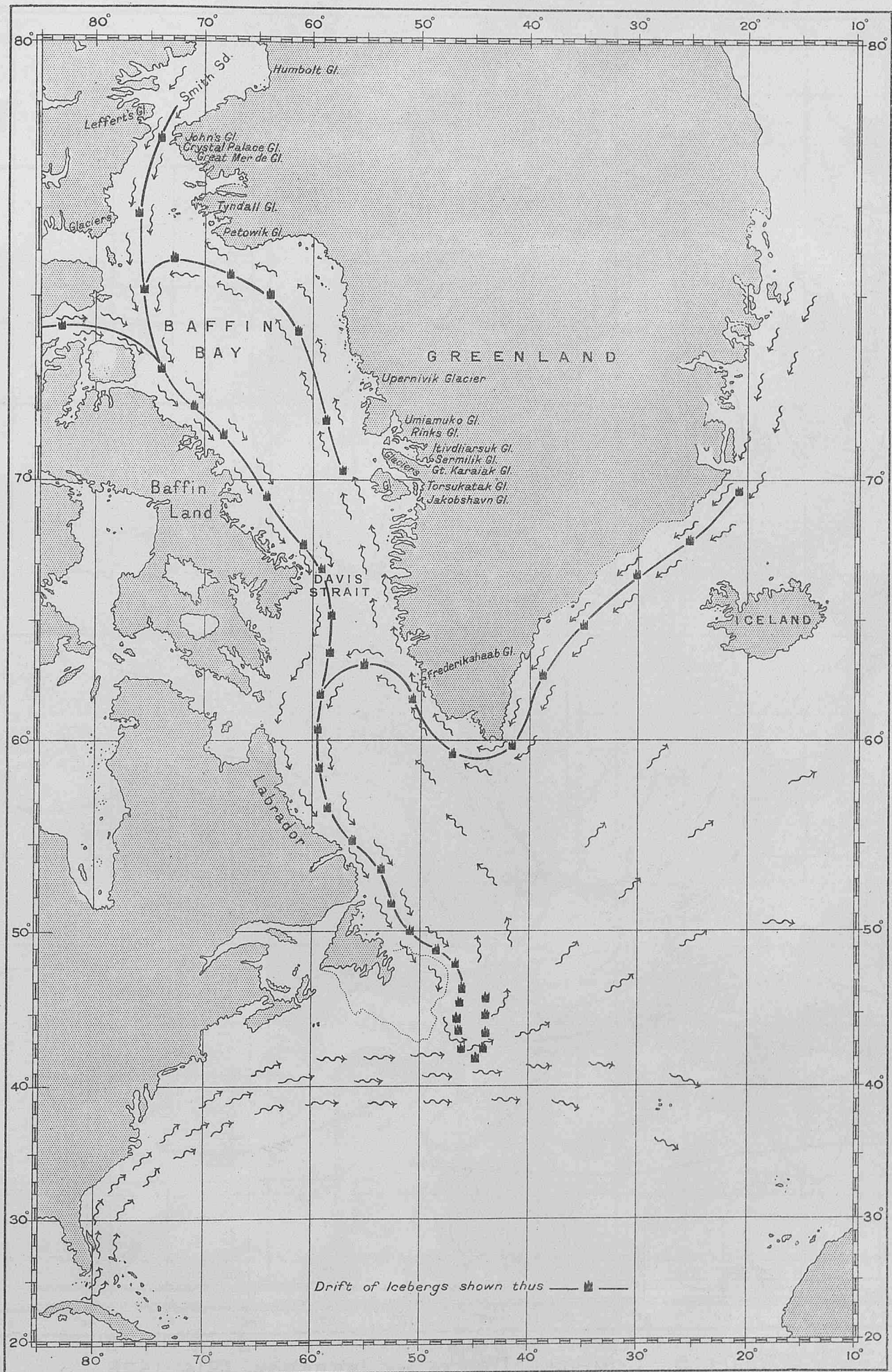


Chart A.—GENERAL DRIFT OF ICEBERGS.

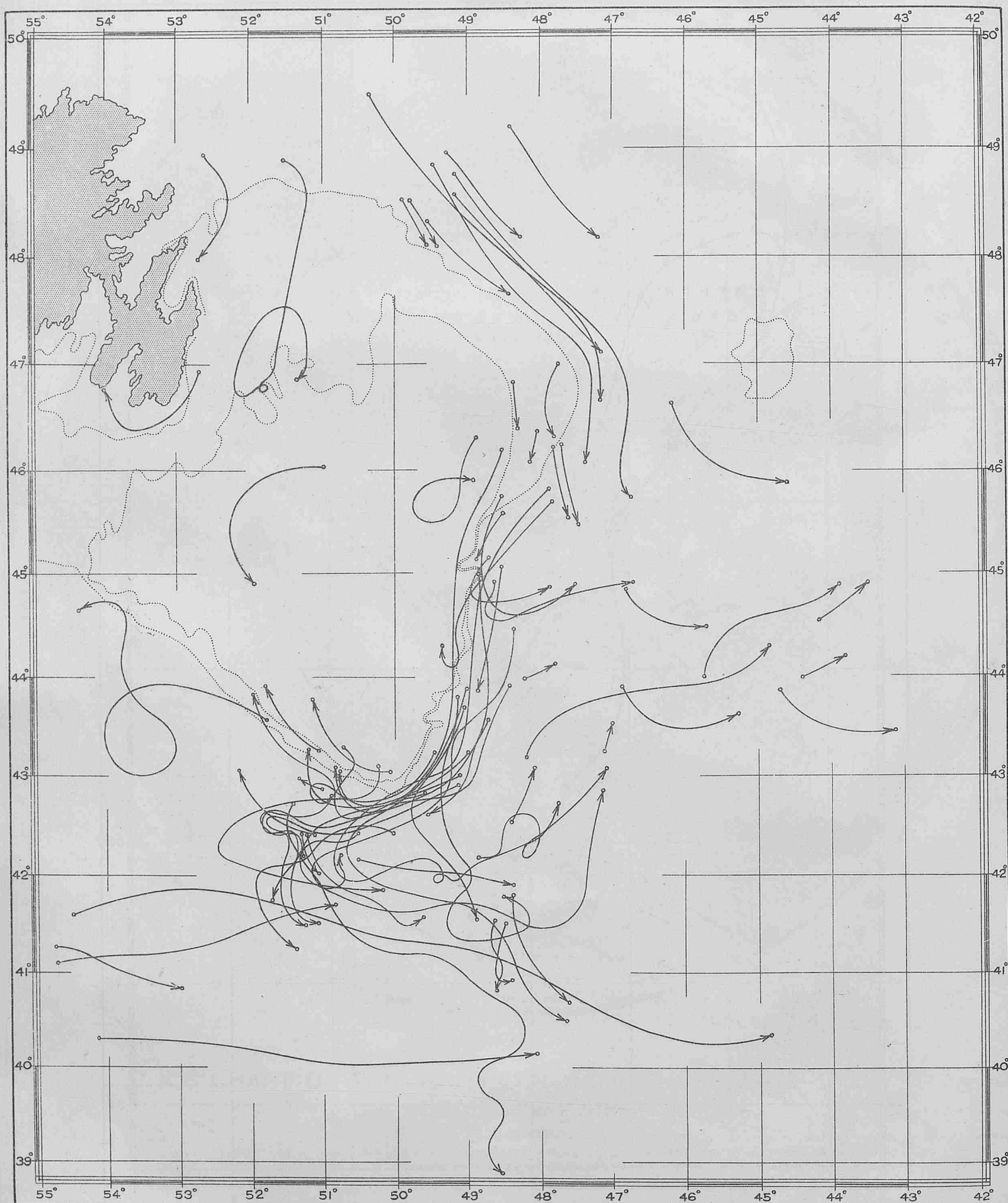


Chart B.—COMPILED DRIFTS OF ICEBERGS, 1914-1926.

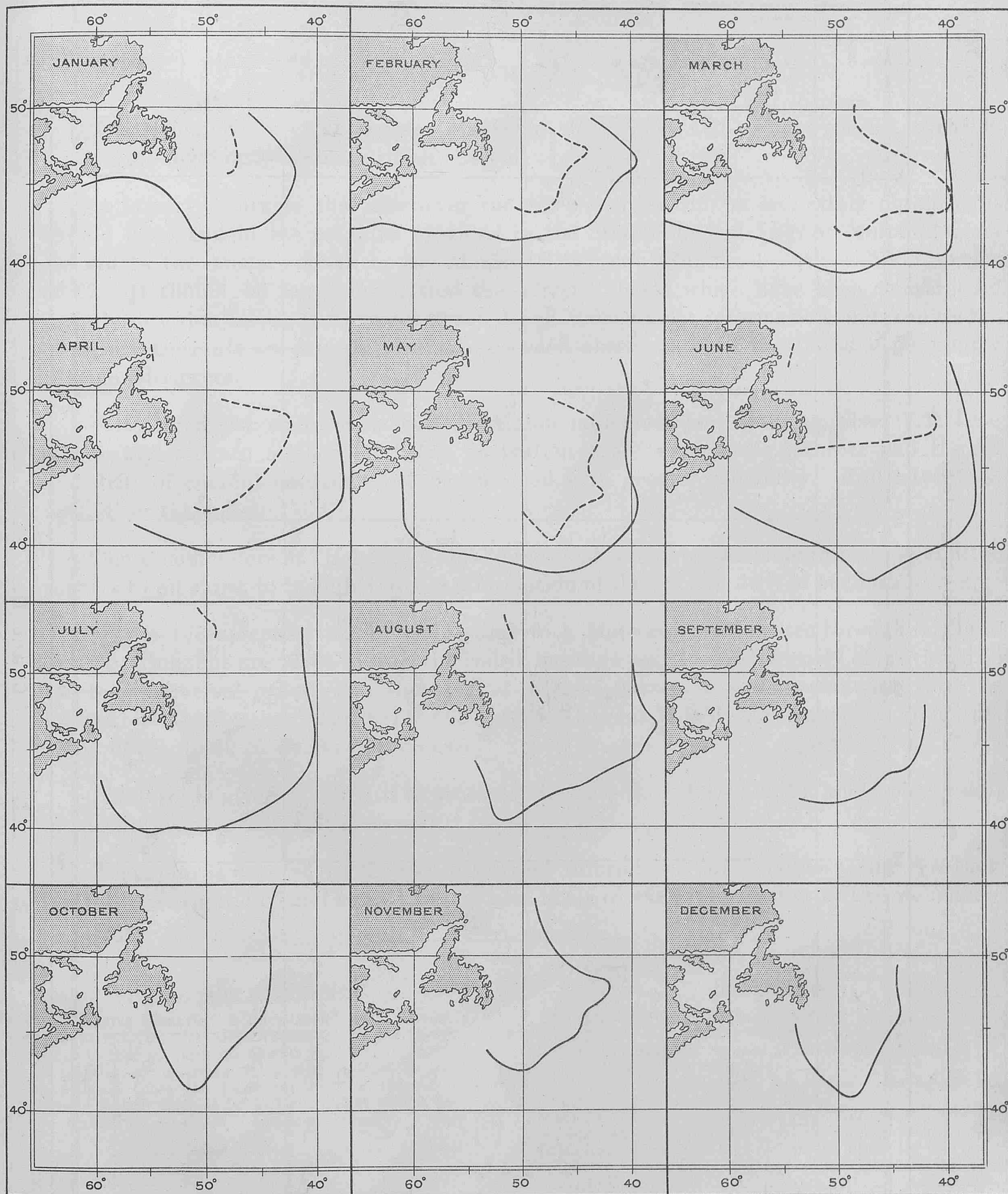


Chart C.—LIMITS OF ICE, WESTERN NORTH ATLANTIC.

Limit from 1901 to 1930 shown thus —————

Limit for 1930 shown thus - - - - -

PHENOMENAL POSITIONS OF ICE.

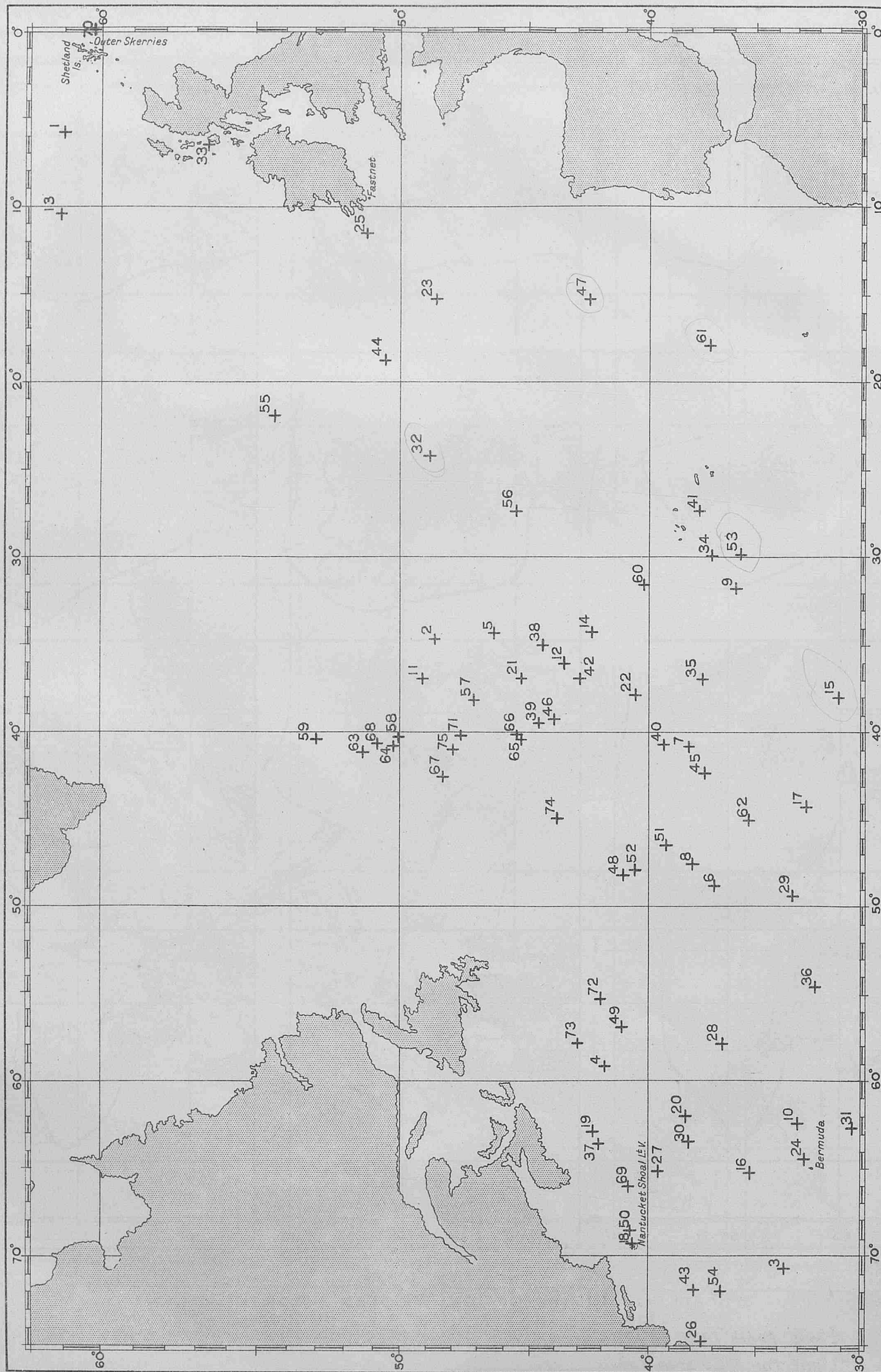


Chart D.

NOTICES.

OCEAN CURRENTS.

OBSERVATION OF SET AND DRIFT.

The Commanders of all regular observing ships are asked to have special attention paid to the logging of set and drift of current.

It is very desirable that whenever the set and drift can be accurately obtained, it should be logged in the columns provided in the Meteorological Log or Meteorological Record in the manner given in the Marine Observer's Handbook—5th Edition, pages 86-87. It should be remembered that the current charts which have been constructed and those which have yet to be constructed and indeed most information and knowledge of Ocean Currents are derived from the recorded observations of the Corps of Voluntary Marine Observers.

With improved compasses, logs, revolution indicators and steering, also W.T. time signals and modern methods of fixing, navigation is becoming more accurate and the set and drift of current can therefore be obtained with greater reliability. Full advantage should be taken.

The Commanders of "Selected Ships" are asked, whenever possible in making routine reports to all ships, to include reliable information of the set and drift of current.

Where these reports are not addressed to a Meteorological centre through a Shore W.T. Station, but are made to C.Q. the coded message may be conveniently abbreviated to the four universal groups and the set and drift of current added in standard form as follows:—C.Q. Weather 50307 61713 06302 19873 Current W.S.W. three quarters knot from 28 N. 65 W. to 30 N. 61 W. Christales.

If the set is given in miles, it is necessary to state the interval, but a knot being a unit of speed, the interval is not necessary.

A chapter is devoted to the use of current information in "Wireless and Weather, an aid to Navigation" and remarks upon uses made of such information will be welcome.

POSTAL ARRANGEMENTS.

THE MARINE OBSERVER is published, when circumstances permit, on the first Wednesday of the month previous to that to which the number refers.

If captains of observing ships will forward to the Meteorological Office the particulars required hereunder, endeavour will be made as far as mails permit to post the latest number for use on their homeward passage.

S.S. Captain

Port of Call.

Date of Homeward Departure

Postal Address

When this information is not given THE MARINE OBSERVER is addressed to the Commanding Officer, s.s., c/o the owners, and captains are requested to make their own arrangements for forwarding.

ICE REPORTS.

Commanders of ships in the Trans-North Atlantic and Southern Ocean Trades are earnestly requested to have the Ice Report Form 912 completed and returned at the end of each passage. A nil return is desired if no ice is seen.

These forms are supplied with THE MARINE OBSERVER each month to regular observing ships in these Trades.

"Selected Ships" on the Trade Routes of the Southern Ocean are requested to add to their routine Wireless Weather reports information of floating ice seen or reported within the last 24 hours so that this information may be disseminated to the utmost advantage of all concerned.

ICE CHART.

WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

NOTE.—In case of necessity owing to extreme southerly drift of ice, operative dates will be fixed for Track A.

- (B) From 1st April to 31st August, inclusive.
- (D) From 15th February to 10th April, inclusive.
- (E) From 11th April to 15th May, or until the Cape Race route clear of ice.

These routes are liable to alteration when, owing to abnormal ice conditions, it is considered advisable by the steamship lines who are parties to the Track agreement.

ROUTE NOTICES.

For latest information re Tracks see pages 87 and 88 of this Number.

SYMBOLS USED ON THE CHART

- Iceberg.
- Floeberg.
- Growler.
- Field Ice, Floe Ice, Pack Ice.
- Hummocky Ice, Bay Ice.
- Drift Ice, Brash Ice, Sludge Ice.
- Pancake Ice.
- Indicates W/T Ice Warning Station.

PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position. Lat. Long.	Remarks.
April 6, 1909	S.S. Trafalgar ...	35°54'N. 31°47'W.	2 pieces 18 in. in diameter.
" 11, 1914	S.S. Erodiade ...	32°55'N. 62°11'W.	Apparently river ice about the size of a lifeboat.
" 24, 1916	S.S. Communipaw...	49°05'N. 36°48'W.	4 ft. high 50 ft. wide, and 100 ft. long.
" 4, 1921	S.S. Hollandia ...	43°35'N. 35°57'W.	Large berg.
" 16, 1926	Trawler Orizaba ...	61°03'N. 10°30'W.	Floating ice, about 40 ft. long, and 3 ft. high.
" 7, 1930	S.S. La Cresenta ...	42°24'N. 34°22'W.	Small berg, about 20 ft. diameter.

No Reports of Ice, sighted during the month of February, 1931, have been received at the Meteorological Office.

Limit of Ice reported to Meteorological Office April 1901-1930.

CO-OPERATION OF SHIPOWNERS, MASTERS AND MATES.

Captains and officers who wish to co-operate regularly with the Meteorological Office should apply to the appropriate Port Meteorological Officers or Agents, a list of these gentlemen with addresses is given below. A general description of Marine Meteorological Work, including the particulars desired from intending Marine Observers, is given in Chapter I of THE MARINE OBSERVER'S HANDBOOK, 5TH EDITION, which may be obtained from H.M. Stationery Office direct, or through any booksellers, price 2s. 6d.

The names of vessels regularly observing for the Meteorological Office, London, together with their Commanders and Observing Officers, are given monthly in THE MARINE OBSERVER, which may be obtained from H.M. Stationery Office, price 2s., 2s. 2d. post free.

The Captains and Officers of regular observing ships constitute the Corps of Voluntary Marine Observers. For certain branches of this work tested instruments are lent to the Captains of British ships registered at ports in Great Britain. A certain number of Regular Observing ships are detailed as "Selected Ships" for the purpose of the World Wide Scheme of Routine Ships' Wireless Weather Telegraphy Reporting. These "Selected Ships" are indicated monthly in the "Fleet List" in THE MARINE OBSERVER by a number.

To decode "Selected Ships" reports the pamphlet M.O. 329, price 3d. may be obtained from H.M. Stationery Office.

Only ships registered at Ports in Great Britain will, in future, be included in the Meteorological Office, London, "Fleet List."

Marine Observers are asked to send in their Meteorological Log through the appropriate Port Meteorological Officer or Agent (accompanied by Form 138 in the case of "Selected Ships") at intervals of not more than six months. The Meteorological Record Form 911 (accompanied by Form 138 in the case of "Selected Ships") should be posted direct to the Meteorological Office, London, at the end of each voyage.

When sending in the Meteorological Log or Record, Regular Observing ships will render great assistance if they will notify the Port Meteorological Officer or Agent of their requirements.

The Port Meteorological Officers and Agents inspect official instruments at regular intervals, replacing those which are defective.

Where ships' instruments are found by comparison to be reliable they may be used for the work of "Selected Ships." A reliable mercurial barometer is essential as part of the equipment of a "Selected Ship."

A copy of THE MARINE OBSERVER is sent monthly to the Captain of every observing ship for the information and guidance of the officers doing this work. He is also supplied with THE MARINE OBSERVER'S HANDBOOK and such charts and atlases as are considered necessary as Meteorological equipment for The Work of a Regular Observing ship in a particular trade.

WIRELESS AND WEATHER AN AID TO NAVIGATION, published by H.M. Stationery Office, which affords information and guidance for the practical application of Marine Meteorology to Navigation, may be purchased through any bookseller, price 5s.

Returns made by Regular Observing ships are acknowledged monthly in THE MARINE OBSERVER, and a list of those Commanders and Officers who have performed specially fine work is published yearly in THE MARINE OBSERVER and Excellent Awards are made to them.

The work done by Regular Observing Ships in making written returns, and by "Selected Ships" in broadcasting routine information by W/T, together with "Weather Shipping" Bulletins broadcast from the shore, conforming with the recommendations of the International Convention of Safety of Life at Sea, 1929, provide the necessary information for the use of all shipping. Thus by shipowners encouraging the specialist work in those of their ships whose names appear in THE MARINE OBSERVER, this Voluntary Work under the supervision of the Meteorological Office provides a service to all shipping at minimum cost to the National funds.

Shipowners are asked to facilitate the forwarding of postal matter from the Air Ministry addressed to the Captains of their ships.

LATE PRESS.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
4.2.31	57°32'N.	1°02'W.	Floating wreckage.
ENGLISH CHANNEL.			
1.2.31	50°28'N.	1°04'W.	Broken mast above water. Apparently attached to submerged wreckage,
7.2.31	49°49'N.	5°57'W.	Round drifting buoy, apparently a mooring buoy, 8 ft. diameter, eye on each side, rusty on top.
9.2.31	49°19'N.	2°13'W.	Motor vessel abandoned in sinking condition.
19.2.31	2' North of Wolf Rock.		Ship's lifeboat, bottom up.
IRISH SEA.			
17.2.31	10' N.W. of Bar Lt. Vessel.		Mizzen mast and boom lost through heavy weather. May be danger to navigation.
MEDITERRANEAN.			
3.2.31	31°39'N.	30°30'E.	Long boat, drifting.
11.2.31	37°52'N.	3°16'E.	Wreckage, danger to navigation. Ship and wood 41 metres.
NORTH ATLANTIC.			
4.2.31	47°22'N.	48°18'W.	Large cylindrical tank, about 20 ft. long, 5 ft. diameter, with wreckage attached.
4.2.31	13' East of Delray, Florida.		Motor boat, No. 41,870 abandoned.
8.2.31	49°59'N.	36°10'W.	Wreck of sailing vessel, bottom up. Danger to navigation.
8.2.31	30°17'N.	79°39'W.	Log about 30 ft. long, 3 ft. diameter.
9.2.31	43°09'N.	66°01'W.	Two spars, apparently masts of a schooner, projecting about 10 ft. above water. Apparently attached to submerged wreckage.
GULF OF MEXICO.			
2.2.31	22°20'N.	85°08'W.	Log about 20 ft. long, 4 ft. diameter.
2.2.31	24°47'N.	83°52'W.	Derelict heavy boat, about 30 ft. long, awash stem and stern, other wreckage nearby.
NORTH PACIFIC.			
1.2.31	42°15'N.	124°41'W.	Large pile or spar floating upright. Apparently attached to submerged wreckage.

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, AIR MINISTRY.

LONDON ...	..	Captain L. A. BROOKE SMITH, R.D., R.N.R., Marine Superintendent. Commander J. HENNESSY, R.D., R.N.R., Senior Nautical Assistant. Room 319, Adastral House, Kingsway, W.C.2. (Telephone No.: Holborn 3434 Extension 421). Nearest station Temple, District Railway.
THAMES ...	...	Lieut. C. H. WILLIAMS, R.N.R., Port Meteorological Officer, Royal Albert Docks, London, E.16. (Telephone No.: Albert Docks 2659. Telegraphic Address: Barometric Aldock, London).
MERSEY ...	...	Lieut. Commander M. CRESSWELL, R.N.R., Port Meteorological Officer, Dock Office, Liverpool. (Telephone No.: Bank 8959. Telegraphic Address: Meteorite, Liverpool).

Agents.

BELFAST ...	...	Captain J. MCINTYRE, Harbour Master, Harbour Office. (Telephone No.: Belfast 4090).
BRISTOL CHANNEL		Captain T. JOHNSTON, Technical College, Cathays Park, Cardiff. (Telephone No.: Cardiff 6813).
CLYDE ...	...	Mr. ROBERT CLEARY, Master Mariner, The Clutha Stevedoring Co., Ltd., Princes Dock, Glasgow. (Telephone No.: 513 Ibrox).
FREMANTLE ...	...	Captain J. J. AIREY, Deputy Director of Navigation, Customs House. (Telephone No.: B 1391).

Agents (contd.).

HONG KONG, China.		Lieut. Commander G.B.R. RUDYERD-HELPMAN, R.N., Superintendent, Admiralty Chart and Chronometer Depot, H.M. Dockyard. (Telephone No.: 108 Dockyard).
HUMBER ...	...	Captain A. M. BROWN, Ellerman Wilson Line Office, Hull. (Telephone No.: Central 2180).
FORTH ...	...	Captains G. BLACK and C. G. BONNER, V.C., D.S.C., Leith Salvage and Towage Co., Ltd., 2, Commercial Street, Leith.
SOUTHAMPTON		Mr. R. I. T. McEWAN, Master Mariner, Gilchrist Navigation School, 5, Union Bank Chambers, 1, Bernard Street. (Telephone No. Southampton 4277).
SYDNEY, New South Wales.		Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R., Deputy Director of Navigation. Captain C. LINDBERGH. Customs House. (Telephone No.: B6421).
TYNE ...	...	Captain J. J. McEWAN, Marine School, South Shields.
VANCOUVER, British Columbia.		Mr. T. S. H. SHEARMAN, 61, Leigh Spencer Building, 553, Granville Street. (Telephone No.: Seymour 3309).

LIST OF VOLUNTARY OBSERVING SHIPS

i

FLEET LIST.

The following is a complete list of ships regularly contributing observations to the Meteorological Office.

The names of the Captains and Officers, as ascertained from logs and records received, are given with the date and description of last log, register or record received up to the time of going to press.

Marine Observers are requested to take this as complete and grateful acknowledgment for the work they have contributed, as it has been found necessary to reduce as far as possible the correspondence of the Marine Superintendent, which was largely composed of letters acknowledging logs and reports, in order that more time may be devoted to obtaining results from the data received.

Only in special cases will individual letters be sent.

Excellent awards will be made at the end of the financial year. The names of Commanders and Officers gaining these awards will be published in a special list in THE MARINE OBSERVER.

Ships not contributing logs or records within a reasonable period will automatically be removed from the list and the free issue of THE MARINE OBSERVER discontinued; it is, therefore, earnestly requested that changes of service, probable periods of lay up or transfer of Commanders may be notified whenever possible.

A waiting list is kept of the names of vessels whose Commanders have offered to regularly co-operate.

The number of voluntary observing ships is limited to a maximum total of 500.

Commanders are requested to point out any errors which may occur in the list.

Explanation of Abbreviations.

Unless otherwise stated, vessels on the following list are s.s.—M.V. indicates Motor Vessel.

M.L. = Equipped with tested Instruments lent by the Meteorological Office for keeping Meteorological Logs.

W.T. = Equipped wholly or partly with tested Instruments lent by the Meteorological Office for reporting in code by W/T in the International Selected Ship system.

No. = No Meteorological Office instrumental equipment on board.

M = Ship's barometer *mercurial*.

A = Ship's barometer *aneroid*.

C.C. = Equipped with tested Instruments lent by the Meteorological Office for making Cross Channel Telegraphic Reports to Weather, London.

To indicate the nature of the wireless apparatus of Selected Ships—

†† preceding ship's name indicates fitted for long range continuous wave transmission and reception.

*† = Short range transmission and long range continuous wave reception.

** = Short range transmission and reception.

The numbers preceding the names of ships are for identification purposes, when observations are re-transmitted in synoptic messages by wireless or cable, and are not intended for use at sea.

Selected Ships.

Those ships in this list which have a number and symbols indicating W/T apparatus before their names are "Selected Ships" invited to make by W/T, reports of observations taken at arranged G.M. Times to "All Ships."

Name of Vessel.	Captain.	Observing Officers.	Meteorological Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 13.231.	Date Received.
233 †† <i>Aba</i> , M.V. ...	Williams, T. E. ...	J. D. Townson, R. A. Cherry	W.T.	Elder Dempster ...	Forms 911 & 138 19.12.30 to 19.1.31	23.1.31
121 †† <i>Abnisi</i> ...	Sola, P. ...	G. H. Worsley, J. J. Smith.	W.T.M.	" " ...	" " 25.12.30 to 29.1.31	3.2.31
122 †† <i>Acera</i> ...	Toft, J. T. ...	R. B. Ellis ...	M.L.	A. Holt " ...	" " 3.12.30 to 8.1.31	15.1.31
155 *† <i>Achilles</i> ...	Williams, D. T. ...	C. Broad, R. E. Agar, J. C. Stratford.	M.L.	" " ...	Form 915 1.5.30 to 31.8.30	3.9.30
055 *† <i>Actor</i> ...	Whyte, D. L. ...	G. Penston, E. Pearce, G. Howard.	No. M.	Harrison ...	Forms 911 & 138 14.11.30 to 24.1.31	23.1.31
123 †† <i>Adda</i> , M.V. ...	Shooter, J. C. ...	J. Boyd, F. C. Langton ...	W.T.M.	Elder Dempster ...	" " 1.1.31 to 2.2.31	5.2.31
050 †† <i>Adriatic</i> ...	Kearney, J. ...	O. V. Lucas, E. P. Hughes, H. R. Wilkinson.	W.T.	White Star ...	" " 23.11.30 to 14.12.30	17.12.30
<i>Aeneas</i> ...	Wallace, W. K. ...	A. McL. Pileher ...	No. A.	A. Holt ...	Form 911 24.1.31 to 28.1.31	2.2.31
166 *† <i>Agamemnon</i> ...	Beswick, W., D.S.O., Commr., R.N.R.	C. Mackinnon ...	W.T.	" " ...	Forms 911 & 138 17.11.30 to 22.1.31	29.1.31
<i>Aidan</i> ...	Reynolds, W. H. B. ...	A. A. Gerrard ...	No. A.	Booth ...	Form 911 13.12.30 to 25.12.30	21.1.31
<i>Alaunia</i> ...	Prothero, M. ...	T. O. Ellis ...	" A.	Cunard ...	" 18.11.30 to 6.12.30	8.12.30
<i>Alban</i> ...	Evans, L. ...	J. G. Tippet ...	" A.	Booth ...	" 16.8.30 to 7.10.30	27.10.30
310 †† <i>Alcantara</i> , M.V. ...	Wakeman, E. C. ...	W. L. Dobbin ...	W.T.	R.M.S.P. ...	" 19.12.30 to 27.1.31	2.2.31
178 *† <i>Alipore</i> ...	Lyndon, E. P. ...	P. M. Burrell, C. K. Brown	No. M.	P. & O. ...	" 7.12.30 to 27.12.30	19.1.31
175 †† <i>Almanzora</i> ...	Hannam, F. S. ...	E. K. Watkins, H. Metcalf, C. Potts, E. Russell.	W.T.	R.M.S.P. ...	" 6.12.30 to 17.1.31	22.1.31
012 †† <i>Almeda Star</i> ...	Turner Russell, W. ...	G. Hamilton, E. W. Thomas	No. M.	Blue Star ...	Forms 911 & 138 30.11.30 to 14.1.31	21.1.31
<i>Alondra</i> ...	Scott, L. S. ...	G. E. Beaton ...	" A.	Yeoward ...	Form 911 18.1.31 to 8.2.31	11.2.31
<i>Alynbank</i> ...	Robertson, J. ...	T. B. Whetherley, P. Clarke, H. Bradshaw.	" A.	A. Weir & Co. ...	" 21.11.30 to 4.12.30	29.12.30
103 †† <i>Andalucia Star</i> ...	Vernon, R. ...	E. N. Sandon, E. G. Coombe	" M.	Blue Star ...	Forms 911 & 138 19.10.30 to 2.12.30	29.12.30
<i>Anchises</i> ...	Dunlop, J. K. ...	C. F. Lock ...	" A.	A. Holt ...	Form 911 24.2.30 to 5.4.30	10.6.30
<i>Antilochus</i> ...	Dougall, W. T. ...	E. Anderson, J. Watling, R. N. Turner, D. H. Richards, H. Webster.	" A.	" " ...	" 20.11.30 to 5.12.30	1.1.31
209 †† <i>Aorangi</i> , M.V. ...	Martin, W. ...	J. R. Sergiades, V. Feeney, W. M. M. Hutchings, C. V. Evans, H. O. Forster.	M.L.	Canadian-Australasian	Form 915 1.5.30 to 15.8.30	11.12.30
120 †† <i>Apapa</i> ...	Hughes, J. ...	J. R. Sergiades, V. Feeney, W. M. M. Hutchings, C. V. Evans, H. O. Forster.	W.T.M.	Elder Dempster ...	Forms 911 & 138 21.11.30 to 22.12.30	29.12.30
129 †† <i>Appam</i> ...	Beith, A. ...	W. M. M. Hutchings, C. V. Evans, H. O. Forster.	W.T.	" " ...	" " 26.11.30 to 2.1.31	3.1.31
<i>Araby</i> ...	Lee, J. ...	H. Haigh ...	No. A.	MacIver ...	Form 911 1.9.30 to 20.11.30	23.11.30
115 †† <i>Arandora Star</i> ...	Moulton, E. W. ...	A. C. Bannister ...	" M.	Blue Star ...	" 21.12.30 to 6.1.31	15.1.31
278 *† <i>Architect</i> ...	Mowat, I. ...	D. D. Ingram, D. C. Valt, D. Hayl.	" M.	Harrison ...	Forms 911 & 138 4.10.30 to 8.12.30	15.12.30
247 *† <i>Argyllshire</i> ...	Page, W. J. ...	G. McKee, W. Ireland, M. H. Thomson, J. S. Bell.	" M.	Federal ...	Form 911 27.5.30 to 1.10.30	10.10.30
293 *† <i>Ariguani</i> ...	Scudamore, J. H. H. D.S.O., Commr., R.N.R.	N. F. Hewetson, R. W. Holdsworth.	M.L.	Elders & Fyffes ...	Form 915 9.8.30 to 7.12.30	24.12.30
<i>Ariosto</i> ...	Biggins, R. L. ...	W. Dorrell, H. V. Todd	No. A.	Ellerman Wilson ...	Form 911 22.9.30 to 27.12.30	6.1.31
144 †† <i>Arlanza</i> ...	Clarke, E., R.D., Commr., R.N.R.	W. Pace, C. Lloyd, A. H. Parry, E. T. Day.	W.T.	R.M.S.P. ...	Forms 911 & 138 7.11.30 to 20.12.30	29.12.30
091 †† <i>Armada Castle</i> ...	Whitfield, G. J. ...		M.L.	Union Castle ...	Form 915 1.8.30 to 23.11.30	26.11.30

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 13.2.31.	Date Received.
296 *† Arracan ...	Thomson, S. ...	K. Currie, B. Bain, T. B. Wilkins.	M.L.	P. Henderson ...	Form 915 26.3.30 to 5.11.30 ...	11.11.30
Arundel ...	Shaw, B. ...	M. Mahoney ...	C.C.	Southern Rly. ...	Telegraphic Report 13.2.31 ...	13.2.31
095 †† Arundel Castle ...	Morton Betts, W. ...	G. L. Clarke, O. Pitts, E. McKinley.	M.L.	Union Castle ...	Form 911 8.8.30 to 28.12.30 ...	2.1.31
280 *† Astronomer ...	Richards, J. ...	T. R. Hill ...	No. M.	Harrison ...	Forms 911 & 138 4.11.30 to 30.11.30 ...	4.12.30
065 †† Asturias M.V. ...	LeBrecht, H. A. ...	H. G. Whittle, S. J. Hill, R. S. Stevens, J. M. Phillips.	W.T.	R.M.S.P. Co. ...	Form 138 23.11.30 to 1.1.31 ...	5.1.31
156 *† Ascanius ...	Wilson, C. A. ...	R. Robinson, E. R. d'ford, R. Holdstock.	M.L.	A. Holt ...	Form 915 14.9.30 to 15.1.31 ...	23.1.31
Atlantian ...	Masters, W. ...	... ..	No. A	Leyland ...	Form 911 5.1.31 to 13.1.31 ...	2.2.31
Atreus ...	Wilcox, J. H. ...	E. A. H. Gepp ...	" A.	A. Holt ...	4.3.30 to 28.6.31 ...	2.8.30
281 *† Auditor ...	Owen, W. T. ...	L. Richardson ...	" M.	Harrison ...	Forms 911 & 138 31.8.30 to 15.11.30 ...	25.11.30
Ausonia ...	Murchie, P.A., R.D., Capt., R.N.R.	E. R. Taylor ...	" A.	Cunard ...	Form 911 13.11.30 to 7.12.30 ...	15.12.30
212 *† Australia ...	Scutt, W. ...	P. McDougal, E. H. Lidstone, A. G. Brooks.	M.L.	British India ...	Form 915 25.7.30 to 1.8.30 ...	16.8.30
010 †† Avelona Star ...	Thomas, R. J. ...	F. N. Johnson ...	No. M.	Blue Star ...	Forms 911 & 138 15.11.30 to 1.1.31 ...	8.1.31
124 †† Avila Star ...	Hopper, G.E. ...	W. J. Stratton, C. Barratt, R. C. Frazier, A. C. Abbott	" M.	" ...	" ...	" ...
Balmoral Castle ...	Gilbert, E. F. ...	H. Baty ...	" A.	Union Castle ...	" 21.3.30 to 7.5.30 ...	14.5.30
179 *† Balaunald ...	Short, C. E. ...	E. R. Physick, H. P. Mallet, G. E. Owen.	" M.	P. & O. Branch ...	Forms 911 & 138 8.1.31 to 15.1.31 ...	20.1.31
051 †† Baltic ...	Davies, E. ...	J. Law, D. W. Chamberlain, N. E. Banks.	W.T.	White Star ...	" " 5.1.31 to 21.1.31 ...	27.1.31
Bampton Castle ...	James, J. S., D.S.C.	H. R. Graham ...	No. A.	Union Castle ...	Form 911 15.10.30 to 29.11.30 ...	20.12.30
248 *† Banffshire ...	Westropp, T. G. ...	A. Banks, N. Stewart ...	" M.	Turnbull Martin ...	Forms 911 & 138 28.8.30 to 19.9.30 ...	25.9.30
180 *† Baradine ...	Elliot Smith, H. ...	C. B. Roche, A. G. Jenkins, L. A. Hill, C. F. Halliday, G. L. Farnfield.	M.L.	P. & O. Branch ...	Form 915 1.8.30 to 6.11.30 ...	11.11.30
037 *† Baronessa ...	Compton, R. W. ...	H. N. Sherwell ...	No. M.	Houlder ...	Form 911 17.11.30 to 6.1.31 ...	20.1.31
Baron Forbes ...	Cairns, W. ...	J. Maclean ...	" A.	H. Hogarth & Sons ...	1.1.31 to 24.1.31 ...	29.1.31
213 *† Barpeta ...	Partridge, H. ...	J. H. Kerr, Busby, J. D. Bardsley.	" M.	British India ...	Forms 911 & 138 4.12.30 to 1.1.31 ...	2.2.31
181 *† Barrabool ...	Sheepwash, J. S. ...	F. M. Mosey ...	" M.	P. & O. Branch ...	" " 22.9.30 to 1.1.31 ...	9.1.31
070 †† Bayano ...	Swain, F. H. ...	G. M. Binks ...	W.T.	Elders & Fyffes ...	" " 31.10.30 to 3.12.30 ...	8.12.30
Baychimo ...	Cornwell, S. A. ...	... ..	No. A.	Hudson Bay Co ...	Form 911 8.7.30 to 29.9.30 ...	6.11.30
059 †† Belgenland ...	Morehouse, W. A. ...	J. R. Loe, J. H. I. Mackie, F. Good.	W.T.	Red Star ...	Forms 911 & 138 4.1.30 to 1.12.30 ...	22.12.30
Benalder ...	Fairweather, J. J. ...	E. D. Copeman ...	No. A.	Ben Line ...	Form 911 10.3.30 to 18.4.30 ...	24.4.30
133 †† Bendigo ...	Wyatt, F. N. ...	G. C. Forrest, J. K. Krone, H. Morgan, R. S. Frost.	" M.	P. & O. Branch ...	Forms 911 & 138 10.11.30 to 5.12.30 ...	19.1.31
Bengore Head ...	Milligan, J. ...	C. J. Rea ...	" A.	Ulster S.S. Co. ...	Form 911 13.1.31 to 10.2.31 ...	12.2.31
233 *† Berwickshire ...	Evens, E. H. ...	J. O. Woodall, R. Frankish, C. Allister.	W.T.	Turnbull Martin ...	Forms 911 & 138 28.10.30 to 1.1.31 ...	6.1.31
Brenda ...	Wright, J. ...	N. Ross ...	No. A.	Scottish Fishery Bnd. ...	Form 911 4.1.31 to 30.1.31 ...	2.2.31
Brighton ...	Munton, G. ...	H. L. Smith ...	C.C.	Southern Railway ...	Telegraphic Report 6.10.30 ...	6.10.30
057 †† Britannic ...	Summers, F. F., R.D., Commr., R.N.R.	J. W. Peters, F. Patchett, A. Thompson.	W.T.	White Star ...	Forms 911 & 138 14.12.30 to 18.1.31 ...	22.1.31
269 *† British Consul ...	Putt, R. O. ...	C. Galley ...	No. M.	British Tankers ...	" " 29.11.30 to 4.1.31 ...	15.1.31
311 *† British Dominion ...	Taylor, R. J. ...	J. E. Jones, C. A. James ...	" M.	" " ...	" " 13.10.30 to 21.1.31 ...	26.1.31
067 *† British Empress ...	Penton, P. M. ...	T. Snowling, J. Dryden, D. Malcolm.	" M.	" " ...	" " 25.12.30 to 12.1.31 ...	23.1.31
308 *† Bullysses M.V. ...	Head, B. P. ...	G. P. Hansard ...	" M.	Anglo-Saxon Petroleum Co. ...	Forms 911 & 138 2.7.30 to 10.9.30 ...	22.9.30
219 *† Buteshire ...	Gibb, A. W. P. ...	P. McMillan, S. W. Brown, F. C. Doyle.	M.L.	Turnbull Martin ...	Form 915 20.4.30 to 24.8.30 ...	12.9.30
031 †† Caledonia ...	Collie, A. ...	M. J. Harvey, R. Leiper, J. McMillan.	W.T.	Anchor ...	Forms 911 & 138 11.1.31 to 19.1.31 ...	3.2.31
011 †† Calgarie ...	Frank, F. A., D.S.O., R.D. Commr., R.N.R.	" ...	"	White Star ...	" ...	" ...
139 †† California ...	Smart, R. W. ...	O. W. Ll. Jones ...	C.C.	Anchor ...	" ...	" ...
250 *† Cambria ...	Copland, C. P. ...	H. C. Fryer, F. Pover, D. H. Chadwick, H. Mackillican.	M.L.	L.M. & S. Rly ...	Telegraphic Report 31.1.31 ...	31.1.31
026 †† Cameronia ...	Gemmell, W. ...	D. C. Shedden ...	W.T.	Federal ...	Form 915 1.5.30 to 9.8.30 ...	12.8.30
295 †† Camito ...	Forrester, W. T., O.B.E.	H. H. Dunning, G. M. Roberts, C. E. Stocker, E. F. Witchell, A. H. Peacock, R. R. Taylor.	M.L.	Anchor ...	Forms 911 & 138 4.1.31 to 11.1.31 ...	27.1.31
101 *† Canonesa ...	Brodie, W. H. ...	F. E. Flint ...	No. M.	Elders & Fyffes ...	Form 915 30.5.30 to 24.9.30 ...	30.9.30
Cape of Good Hope ...	Jacobson, T. A. ...	W. R. G. Carling ...	" A.	Furness Houlder ...	Forms 911 & 138 29.10.30 to 7.1.31 ...	13.1.31
282 †† Carinthia ...	Hawkes, W. A., R.D., Commr., R.N.R.	" ...	W.T.	Lyle S.S. Co. ...	Form 911 17.9.30 to 7.11.30 ...	13.12.30
035 †† Carmania ...	Townley, J. C. ...	J. McKie, E. R. B. Freeman, N. Kingscote.	"	Cunard ...	" ...	" ...
092 †† Carnarvon Castle M.V.	Chave, Sir B., K.B.E.	L. H. Farrow, E. Clancy ...	"	" ...	Forms 911 & 138 28.12.30 to 4.1.31 ...	17.1.31
034 †† Caronia ...	Brown, F. G., R.D., Capt., R.N.R.	W. B. Tanner, D. S. Kite, R. D. McCallum.	"	Union Castle ...	" " 13.12.30 to 31.1.31 ...	9.2.31
Casanare ...	Browne, S. ...	H. Holmes ...	No. A.	Cunard ...	" " 5.1.31 to 10.1.31 ...	3.2.31
184 †† Cathay ...	Niven, J. D. ...	A. M. Askin ...	" M.	" ...	" ...	" ...
Cavina ...	Riseley, A. D. ...	B. R. Coe ...	" A.	Elders & Fyffes ...	Form 911 16.11.30 to 14.12.30 ...	20.12.30
052 †† Cedric ...	Freeman, C. P., R.D., Commr., R.N.R.	G. T. Kavanagh ...	W.T.	P. & O ...	Forms 911 & 138 5.10.30 to 1.1.31 ...	3.1.31
157 *† Centaur M.V.	Ward Hughes, J.	J. Cockburn, B. L. Brind, D. M. McAdam.	M.L.	White Star ...	Form 911 15.12.30 to 17.1.31 ...	20.1.31
056 †† Ceramic ...	Lloyd, W. ...	J. A. Webbe ...	W.T.	White Star ...	Forms 911 & 138 21.12.30 to 11.1.31 ...	14.1.31
Changutnola ...	Thorburn, R. A., R.D., Commr., R.N.R.	H. K. Houghton ...	No. A.	Elders & Fyffes ...	Form 911 26.8.30 to 9.12.30 ...	10.12.30
Chindwin ...	Paterson, G. ...	W. S. Keith ...	" A.	" ...	" " 20.10.30 to 22.11.30 ...	28.11.30
Chiripo ...	Sapsworth, S. A. ...	S. Waddington ...	" A.	Henderson ...	" " 17.2.30 to 24.4.30 ...	19.5.30
192 †† Chitral ...	Siggers, O. ...	T. D. Forbes, A. D. Dennis, A. H. Thompson.	" M.	Elders & Fyffes ...	" " 25.7.30 to 10.10.30 ...	16.10.30
265 *† City of Baroda ...	McMillan, J. ...	H. G. Williams, J. E. Jenkins, R. W. Lees, A. G. Daniells.	M.L.	P. & O ...	" " 1.11.30 to 5.1.31 ...	7.2.31
City of Benares ...	Bremner, D. M. ...	" ...	"	Ellerman ...	Form 915 13.5.30 to 19.10.30 ...	31.10.30
City of Cambridge ...	Wyper, J. ...	R. W. Kellie ...	No. A.	" ...	Form 911 5.8.30 to 15.8.30 ...	1.9.30
City of Carlisle ...	Wilson, E. G. ...	H. H. Asher ...	" A.	" ...	" " 2.10.30 to 16.11.30 ...	8.12.30
268 *† City of Chester ...	Mordue, J. A. ...	" ...	" A.	" ...	" " 24.11.30 to 28.12.30 ...	1.1.31
City of Exeter ...	Letton, F. W. ...	P. R. Winship, C. W. Nelson, W. V. Highton.	M.L.	" ...	Form 915 5.5.30 to 19.9.30 ...	11.12.30
266 †† City of Harvard ...	Nicholl, L. ...	H. Burns ...	W.T.	" ...	Forms 911 & 138 20.10.30 to 29.10.30 ...	15.12.30
	McMillan, J. ...	" ...	No. A.	" ...	" ...	" ...

LIST OF VOLUNTARY OBSERVING SHIPS

iii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Record Contributed. Received up to 13.2.31.	Date Received.
<i>City of Hong Kong</i>	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	H. Saunders	No. A.	Ellerman	Forms 911 & 138 12.12.30 to 27.12.30	19.1.31
286 †† <i>City of London</i> ...	Brown, J. G.	A. J. Barrett, E. Gillies, C. Macpherson, J. Campbell, J. W. Wother- spoon, W. Kerr.	W.T.	"	" " 16.11.30 to 9.12.30	29.12.30
274 †† <i>City of Nagpur</i> ...	Martin, D.	"	"	"	" " 29.9.30 to 19.10.30	27.11.30
275 †† <i>City of Palermo</i> ...	Pattison, J. B.	T. W. Walford	No. M.	"	Form 911 6.1.30 to 21.3.30...	24.3.30
287 †† <i>City of Paris</i> ...	MacMillan, J.	E. A. Davidson	W.T.	"	Forms 911 & 138 15.10.30 to 5.11.30	1.1.31
270 †† <i>City of Rangoon</i> ...	Jones, P.	B. H. Constable, S. A. Martyn, B. McLennan.	M.L.	"	Form 915 14.6.30 to 6.9.30...	20.9.30
271 †† <i>City of Roubaix</i> ...	Radcliffe, A. V., R.D., Lt.-Commr., R.N.R.	J. A. Williams, J. L. Robertson, A. N. G. Jones.	No. M.	"	Forms 911 & 138 14.10.30 to 3.11.30	15.12.30
272 †† <i>City of Singapore</i> ...	Kendall, J. W.	F. Wrigley	" M.	"	" " 3.12.30 to 25.12.30	12.1.31
273 †† <i>City of Valencia</i> ...	Ewing, W.	A. Travis, C. C. Duncan, C. B. P. Bradbury.	" M.	"	" " 6.9.30 to 17.11.30	19.11.30
<i>City of Yokohama</i>	Singleton, J. G.	J. Kinley, N. Dawson, H. Nish	" A.	"	Form 911 29.10.30 to 20.11.30	25.11.30
<i>Clan Alpine</i> ...	Waterhouse, J.	S. S. Stammwitz	" A.	Clan	" 17.11.30 to 5.12.30	17.12.30
<i>Clan Kenneth</i> ...	Young, A. H., R.D., Commr., R.N.R.	T. A. Pearson	" A.	"	" 17.12.30 to 22.1.31	2.2.31
<i>Clan Macalister</i> ...	Stenson, F. J., A.D.C., R.D., Capt., R.N.R.	T. M. Rees Davis	" A.	"	" 3.12.30 to 14.1.31	9.2.31
<i>Clan MacBean</i> ...	Boag, J.	G. W. Spiller	" A.	"	" 5.12.30 to 15.2.30	22.12.30
<i>Clan Macbeth</i> ...	Worthington, C. D. ...	W. R. Woodruffe, A. G. Beynon, H. J. M. Watkins.	" A.	"	" 15.10.30 to 7.11.30...	11.11.30
<i>Clan Macfadyen</i> ...	Laird, C.	W. C. Dazell	" A.	"	" 14.12.30 to 6.1.31	9.2.31
<i>Clan Macfarlane</i> ...	Redford, L. F.	W. H. Simpson, H. F. Town	" A.	"	" 22.9.30 to 12.10.40	17.10.30
<i>Clan Macgillivray</i> ...	Mackinlay, A.	S. R. J. Woods	" A.	"	" 24.10.30 to 19.1.31	5.2.31
<i>Clan MacIndoe</i> ...	Scott-Smith, H. E. G.	J. W. Thompson, J. West ...	" A.	"	" 8.10.30 to 18.10.30	17.11.30
<i>Clan Mackellar</i> ...	Lyall, A. B.	A. V. Howard	" A.	"	" 26.11.30 to 13.12.30	3.1.31
001 †† <i>Clan Macphee</i> ...	Gourlay, J. B.	E. H. Stone, T. Cornelius, A. Pollock.	M.L.	"	Form 915 6.7.30 to 3.10.30	8.11.30
004 †† <i>Clan MacNair</i> ...	Holman, W. G.	F. H. Petheridge, A. Wood- row, J. Napier.	W.T.	"	Forms 911 & 138 30.8.30 to 16.1.31	10.2.31
<i>Clan Macnaughton</i>	Clark, J.	R. C. Steel	No. A.	"	Form 911 18.5.30 to 19.6.30	28.6.30
<i>Clan Macquarrie</i> ...	West, W. F.	J. H. Thorpe	" A.	"	" 13.10.30 to 2.11.30	1.12.30
002 †† <i>Clan Macwhirter</i> ...	Low, A.	T. G. Mitchell, M. J. Lewis, L. Grant.	M.L.	"	Form 915 10.6.30 to 2.9.30	11.12.30
003 †† <i>Clan Malcolm</i> ...	George, L. S.	A. Lynch, J. W. Jones, B. Hind, W. E. Baker	"	"	" 15.8.30 to 6.11.30	16.12.30
<i>Clan Morrison</i> ...	Porterfield, W. M. Lt.-Commr., R.N.R.	R. J. Brittain	No. A.	"	Form 911 7.11.30 to 1.12.30	4.12.30
<i>Clan Murdoch</i> ...	Wynne, R. H.	P. S. Evans	" A.	"	" 20.11.30 to 19.12.30	12.1.31
<i>Clan Ranald</i> ...	Douglas, R.	J. W. Rennie	" A.	"	" 7.8.30 to 30.9.30...	13.10.30
<i>Clan Ross</i> ...	Neill, G. A.	R. H. McElligott	" A.	"	" 28.12.30 to 20.1.31	23.1.31
<i>Clan Sinclair</i> ...	Cater, H.	L. Thomson	" A.	"	" 4.9.30 to 10.12.30	17.12.30
312 †† <i>Clydehead</i> ...	Lover, J. S.	W. J. Brooks, E. Holmes ...	W.T.	Hunting & Son, Ltd.	Forms 911 & 138 26.12.30 to 4.2.31	6.2.31
185 †† <i>Comorin</i> ...	Cartwright, C. W., D.S.C.	E. J. R. Worth	No. M.	P. & O.	" 29.1.30 to 1.12.0	9.1.31
049 †† <i>Coptic, M.V.</i> ...	Williams, G.	R. E. Nicholson, T. Davies, T. Burt	W.T.	Shaw, Savill & Albion	" 8.11.30 to 9.12.30	16.12.30
040 †† <i>Corinthia</i> ...	Bowan, H.	R. Orangle, A. Mackie, E. Burt	"	White Star	" 21.6.30 to 5.10.30	10.10.30
006 †† <i>Coronado</i> ...	Martin, G. E.	W. J. Dodd, B. E. Druce, F. Heald.	W.T.	Elders & Fyffes ...	Forms 911 & 138 30.11.30 to 4.1.31	5.1.31
301 †† <i>Culebra</i> ...	Cooke, F.	B. A. Gammon, H. E. Sang, R. J. Finch.	M.L.	R.M.S.P. Co.	Form 915 31.8.30 to 7.11.30	15.11.30
251 †† <i>Cumberland</i> ...	Macmillan, D.	A. Taylor, J. Pring, J. K. Macdonald, F. R. J. Wilson.	"	Federal	" 1.6.30 to 18.10.30	24.10.30
285 †† <i>Custodian</i> ...	O'Connor, T.	J. Connors	No. M.	Harrison	Forms 911 & 138 10.3.30 to 13.6.30	16.7.30
<i>Cyclops</i> ...	Glossop, S.	R. A. Hanney	" A.	A. Holt	Form 911 8.12.30 to 5.2.31	13.2.31
<i>Dakotian</i> ...	Atkinson, W. H.	R. J. S. Pope	" A.	Leyland	" 10.11.30 to 17.12.30	24.12.30
<i>Dardanus</i> ...	Christie, W.	J. S. Ogilvie	" A.	A. Holt	" 23.8.30 to 2.10.30	22.10.30
<i>Darian</i> ...	Hannaford, W.	A. S. Holland	" A.	Leyland	" 27.9.30 to 8.10.30	14.10.30
302 †† <i>Darro</i> ...	Green, J.	G. B. Medleycott, H. Cham- berlain, W. H. Roberts.	W.T.M.	R.M.S.P. Co.	Forms 911 & 138 27.11.30 to 14.1.31	2.2.31
<i>Davisian</i> ...	Trickey, J.	P. M. Ralston	No. A.	Leyland	Form 911 29.8.30 to 22.10.30	28.10.30
053 †† <i>Delphic</i> ...	Hodgson, W. S.	J. V. Jones	" M.	White Star	" 23.2.30 to 31.3.30	11.4.30
303 †† <i>Demerara</i> ...	Matthews, G. P.	H. H. Treweekes, E. N. Gillet, F. Crankshaw.	W.T.M.	R.M.S.P. Co.	Forms 911 & 138 27.10.30 to 17.12.30	22.12.30
073 †† <i>Demosthenes</i> ...	Lloyd, W.	S. A. Fergusson	"	Aberdeen Common- wealth.	" " 29.3.30 to 12.5.30	15.5.30
003 †† <i>Denis</i> ...	Harris, F. C. P.	A. W. Hanchett	W.T.	Booth	Form 911 7.10.30 to 15.12.30	16.12.30
304 †† <i>Deseado</i> ...	Buret, J.	H. Fraser, F. Collinson ...	W.T.M.	R.M.S.P. Co.	Forms 911 & 138 11.12.30 to 27.1.31	10.2.31
117 †† <i>Desna</i> ...	Huff, G.	G. L. Elliott	"	"	" " 13.0.30 to 3.11.30	12.12.30
252 †† <i>Devon</i> ...	Kinnell, G.	G. Chaplin	No. M.	Federal	" " 5.10.0 to 10.11.30	15.2.30
<i>Dieppe</i> ...	Lidbetter, W.	E. A. Biles	C.C.	Southern Railway ...	Telegraphic Report 12.2.31	12.2.31
284 †† <i>Director</i> ...	Worthington, B.	R. W. Baldwin	No. M.	Harrison	Forms 911 & 138 29.5.30 to 29.8.30	9.9.30
080 †† <i>Discovery, Auxy. Barque.</i>	King Davis, J.	W. R. Colbeck	M.L.	Douglas Mawson Expedition	"	"
081 †† <i>Discovery II, R.R.S.</i>	Carey, W. M. Commr., R.N.	J. Irving, A. N. Nelson, R. A. B. Ardley.	"	Falkland Islands Government.	Met. Log. 15.12.29 to 8.5.30	11.9.30
214 †† <i>Domala, M.V.</i> ...	Kitson, A. G.	T. L. Sampson, A. Earl, G. Henderson, D. Cowley.	No. M.	British India	Forms 911 & 138 29.10.30 to 5.1.31	6.1.31
<i>Dominia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr., R.N.R.	W. E. Allen, A. S. Muir, W. F. Anderson.	M.L.	Telegraph Construc- tion & Maintenance.	Form 915 5.9.30 to 24.11.30	6.12.30
<i>Dominic</i> ...	Griffith, W.	F. W. Boden	No. A.	Booth	Form 911 2.4.30 to 19.4.30...	26.5.30
<i>Dorellan</i> ...	Hugan, C.	F. R. Hicken	" A.	Leyland	" 11.1.31 to 22.1.31	11.2.31
<i>Dorington Court</i> ...	Adamson, B.	G. E. C. Garrick	" A.	Haldin & Co.	Form 911 31.7.29 to 17.2.30	27.3.30
<i>Dramatist</i> ...	Meek, A. J.	I. W. Page	" M.	Harrison	"	"
<i>Dromore Castle</i> ...	Heanly, P. W.	P. Swan	" A.	Union Castle	Form 911 18.1.30 to 3.7.30	9.9.30
142 †† <i>Duchess of Atholl</i> ...	Latta, R. G.	G. H. D. Williams	W.T. M.	Canadian Pacific ...	Forms 911 & 138 6.12.30 to 22.12.30	30.12.30
152 †† <i>Duchess of Bedford</i>	Gibbons, H.	A. Mawsey	"	"	Form 911 29.12.30 to 4.1.31	17.1.31
151 †† <i>Duchess of Richmond.</i>	Freer, A., R.N.R.	F. H. Stell	"	"	Forms 911 & 138 30.11.30 to 18.12.30	22.12.30
143 †† <i>Duchess of York</i> ...	Stuart, R. N., V.C., D.S.O., Commr., R.N.R.	N. Scallan	"	"	" " 22.11.30 to 11.12.30	9.1.31
098 †† <i>Dunbar Castle, M.V.</i>	Vincent, E. S., R.D., Commr., R.N.R.	J. Daziel	W.T.	Union Castle	Forms 911 & 138 2.10.30 to 7.12.30	18.12.30
<i>Dunluce Castle</i> ...	Hutchings, A. H.	A. C. M. Black	No. A.	"	Form 911 5.9.30 to 13.11.30	19.11.30
<i>Dunrobin</i> ...	Ramsay, J. D.	W. R. Holt, J. J. Butt ...	" A.	Glen & Co.	" 8.11.30 to 13.11.30	5.12.30
102 †† <i>Duquesa</i> ...	Williams, W. E.	F. D. Jones	" M.	Furness Withy	Forms 911 & 138 3.11.30 to 7.1.31	12.1.31
215 †† <i>Durenda, M.V.</i> ...	Parkes, C. E.	J. E. Miles	" M.	British India	Form 911 2.2.30 to 10.3.30...	28.4.30
<i>Edinburgh Castle</i>	Kerby, J. H.	F. A. G. Hunter	W.T.	Union Castle	" 18.10.30 to 7.12.30	9.12.30
<i>Egrot</i> ...	Nelson, J. A.	J. T. Townson, R. A. Cherry	No. A.	Elder Dempster	" 16.9.30 to 3.10.30	6.10.30
107 †† <i>El Argentino, M.V.</i>	Ellis, F., D.S.C.	W. Findlay, J. Burch, C. G. Adlard.	" M.	Houlder	Forms 911 & 138 2.9.30 to 5.11.30	17.11.30

Name of Vessel.	Captain.	Observing Officers.	Meteoro- logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 13.2.31.	Date Received.
090 *† <i>Eldon Park</i> ...	Burns, R. ...	J. Macrae, W. Walker, H. L. Roberts.	No. M.	Denholme S.S. Co. ...	Form 911 10.10.30 to 25.12.30 ...	13.2.31
009 *† <i>Elmworth</i> , M.V. ...	Wilson, T. P. ...	J. Whyte ...	" M.	R. S. Dalgleish ...	Met. Log. 17.11.30 to 10.12.30 ...	31.12.30
158 *† <i>Elpenor</i> ...	Wilson, R. J. ...	E. Roberts, H. Skinns, A. Pope	" M.L.	A. Holt ...	27.10.29 to 3.3.30 ...	11.3.30
108 *† <i>Elstree Grange</i> ...	Owen, R. ...	P. A. Hawkesworth ...	No. M.	Houlder ...	Forms 911 & 138 9.9.30 to 24.11.30	13.12.30
109 *† <i>El Paraguayo</i> ...	Frost, C. R. ...	W. Palmer. ...	" M.	" ...	" " 23.8.30 to 17.10.30	21.10.30
110 *† <i>El Uruguayo</i> ...	McNamara, T. ...	F. E. Hailstone ...	" M.	" ...	" " 20.10.30 to 23.12.30	30.12.30
027 *† <i>Elysia</i> ...	Henderson, F. M. ...	C. Mitchell, J. Herbert W. A. Beveridge.	M.L.	Anchor ...	Form 915 13.9.30 to 4.1.31 ...	26.1.31
066 †† <i>Empress of Australia</i>	Griffiths, E. ...	" " " " " "	W.T.	Canadian Pacific ...	Form 911 16.11.30 to 11.12.30 ...	23.12.30
154 †† <i>Empress of Canada</i>	Hailey, A. J., Lieut.- Commr., R.N.R.	C. W. G. Patterson, G. M. Fawcett, A. M. Barff, A. C. Jones.	M.L.	" " ...	Form 915 7.8.30 to 14.11.30 ...	24.12.30
061 †† <i>Empress of France</i>	Stuart, R. N., V.O., D.S.O., Commr., R.N.R.	" " " " " "	"	" " " " " "	" " " " " "	"
153 †† <i>Empress of Japan</i>	Latta, R. G. ...	" " " " " "	"	" " " " " "	" " " " " "	"
306 *† <i>Essequibo</i> ...	Morgan, D. R. ...	L. Marsland ...	No. M.	R.M.S.P. Co. ...	Forms 911 & 138 20.8.30 to 29.8.30	9.9.30
<i>Eumaeus</i> ...	Hodgson, R. N. ...	R. T. Dryden ...	" A.	A. Holt ...	Form 911 4.11.30 to 1.12.30	5.12.30
078 †† <i>Euripides</i> ...	Cole, N. ...	C. C. Beal, J. Colling, A. Sheridan, R. Morrison, J. Smallwood.	W.T.M.	Aberdeen Common- wealth	Forms 911 & 138 23.5.30 to 24.9.30	7.10.30
<i>Euryades</i> ...	Ewan, W. B. ...	D. S. Bruce ...	No. A.	A. Holt ...	Form 911 2.1.31 to 18.1.31	28.1.31
<i>Explorer</i> ...	Allan, J. ...	A. Stout ...	" A.	Scottish Fishery Brd.	" " 1.11.30 to 28.11.30	2.12.30
<i>Ferndale</i> ...	Beighton, J. N. ...	" " " " " "	" M.	Aberdeen Common- wealth.	" " " " " "	"
074 *† <i>Fordsdale</i> ...	Thompson, W. J. ...	F. Vaughan, M. Harris, M. Newton.	" M.	Aberdeen Common- wealth	Forms 911 & 138 12.10.30 to 7.11.30	17.11.30
<i>Francisco</i> ...	Scales, H. ...	B. Scholefield ...	" A.	Ellerman Wilson ...	Form 911 27.4.30 to 3.6.30...	11.6.30
030 †† <i>Franconia</i> ...	Irving, R. B. ...	W. M. Stewart, J. H. Ken- worthy, R. Pollitt.	W.T.	Cunard ...	" " 11.1.31 to 20.1.31	23.1.31
<i>Freya</i> ...	Lamont, A. ...	W. Pirrie ...	No. A.	Scottish Fishery Brd.	" " 15.1.31 to 2.2.31	6.2.31
159 ** <i>Gascoyne</i> ...	Johnson, L. ...	J. S. Macbryde, C. O. Melson, Macphedran ...	M.L.	A. Holt & Co. ...	Form 915 2.5.30 to 22.9.30	13.1.31
307 *† <i>Glamorganshire</i> ...	Miles, F. R., R.D., Commr., R.N.R.	T. W. Boleard ...	No. M.	R.M.S.P. Co. ...	Forms 911 & 138 14.12.30 to 6.1.31	13.1.31
125 *† <i>Glenamoy</i> , M.V. ...	Homan, C. E. ...	F. Laycock, G. Morgan, N. B. Jones.	M.L.	Glen Line ...	Form 915 5.5.30 to 5.11.30	18.11.30
<i>Glenbeg</i> , M.V. ...	Newing, L. ...	G. A. C. Barnard ...	No. A.	" ...	Form 911 2.9.30 to 6.12.30 ...	10.12.30
126 *† <i>Glengarry</i> , M.V. ...	Angier, J. ...	J. Tyler, J. W. Leslie, S. W. Bell.	" M.	" ...	Forms 911 & 138 7.12.30 to 24.12.30	26.1.31
<i>Glentiffer</i> ...	Eastern, J. ...	A. H. D. Shaw ...	" A.	" ...	Form 911 9.11.30 to 26.11.30	3.1.31
<i>Glentlue</i> , M.V. ...	Kennett, W. H. ...	J. A. Evans ...	" A.	" ...	" " 31.8.30 to 24.12.30	30.12.30
<i>Glenshane</i> ...	Martin, V. F. ...	R. C. Pett ...	" A.	" ...	" " 17.5.30 to 23.9.30	27.9.30
<i>Glentworth</i> ...	Kilgour, H. A. ...	A. L. Sanderson ...	" A.	R. S. Dalgleish ...	" " 1.5.30 to 28.7.30	7.8.30
<i>Gloucester Castle</i> ...	MacMahon, J. ...	J. L. Goatley ...	" A.	Union Castle ...	" " 1.11.30 to 1.1.31	3.1.31
<i>Glochina</i> ...	Pool, F. G. ...	S. G. Elliott, W. T. Brown ...	" A.	Stag Line ...	" " 6.6.30 to 9.7.30	14.7.30
<i>Guildford Castle</i> ...	Schalefield, H. L. ...	E. Hamlyn ...	" A.	Union Castle ...	" " 22.4.30 to 10.5.30	10.6.30
<i>Halesius</i> ...	Hawley, F. J. ...	A. S. P. May ...	" A.	R. P. Houston ...	" " 1.9.30 to 25.11.30	28.11.30
111 *† <i>Hardwicke Grange</i>	Fowler, W. H. ...	W. L. Baker, A. D. Seybold, W. E. Ellis.	" M.	Houlder ...	Forms 911 & 138 23.11.30 to 10.12.30	17.1.31
<i>Harmonides</i> ...	Elwell, F. R. ...	L. Pogson, S. C. Robertson, E. McLachlan.	" A.	R. P. Houston ...	Form 911 4.1.31 to 17.1.31	7.2.31
262 ** <i>Hauraki</i> , M.V. ...	Norton, A. T. ...	D. McLeish, A. W. Rabbitts, R. Kendall.	M.L.	Union S.S. Co., N.Z. ...	Form 915 15.8.29 to 31.10.30	8.1.31
<i>Hermintus</i> ...	Roberts, T. V. ...	F. W. Gilroy ...	No. A.	Aberdeen Common- wealth.	Form 911 24.8.30 to 5.10.30	17.10.30
<i>Herschel</i> ...	Watson, W. W. ...	M. P. Thompson ...	" A.	Lamport & Holt ...	" " 21.3.30 to 16.6.30	24.6.30
253 *† <i>Hertford</i> ...	Burton Davies, J. ...	W. Redwood, G. D. Baldwin, E. Hopkins, P. Shakespeare P. Block.	M.L.	Federal ...	Form 915 16.8.30 to 27.2.30	31.12.30
<i>Hestone</i> ...	McComish, A. B. ...	W. H. Ball ...	No. A.	R. P. Houston ...	Form 911 15.4.30 to 11.5.30	10.6.30
<i>Hibernia</i> ...	Dudgeon, L. T. ...	A. Marsh ...	C.C.	L.M. & S. Railway ...	Telegraphic Report 10.1.31	10.1.31
182 †† <i>Highland Brigade</i>	Lloyd, H. ...	W. Stephen, N. Hersee, C. Morgan.	No. M.	Nelson ...	Forms 911 & 138 7.11.30 to 22.12.30	5.1.31
116 †† <i>Highland Chieftain</i> , M.V.	Robinson, R. H. ...	W. J. Presland ...	" M.	" " " " " "	" " 18.12.30 to 4.2.31	9.2.31
099 †† <i>Highland Monarch</i> , M.V.	Ashby Graves, F. ...	R. Polden ...	" M.	" " " " " "	" " 1.12.30 to 21.1.31	26.1.31
079 *† <i>Hildebrand</i> ...	Buck, R. H., R.D., Commr., R.N.R.	W. H. Cross ...	W.T.	Booth ...	" " 20.11.30 to 1.1.31	1.1.31
075 *† <i>Hobson's Bay</i> ...	Kydd, O. J. ...	J. Worrall, B. F. Moffatt, C. Carroll, C. Campbell, C. C. Good.	M.L.	Aberdeen Common- wealth.	Form 915 28.5.30 to 9.1.31	5.2.31
<i>Holbein</i> ...	Gough, W. A. ...	F. Delaney ...	No. A.	Lamport & Holt ...	Form 911 9.12.30 to 8.1.31...	7.1.31
054 †† <i>Homeric</i> ...	Bulman, J. B. ...	H. G. Morgan, M. Bennett, W. Poustie.	W.T.	White Star ...	Forms 911 & 138 15.1.31 to 31.1.31	9.2.31
<i>Hubert</i> ...	Briscoe, W. ...	G. H. Clark ...	No. A.	Booth ...	Form 911 10.12.30 to 26.12.30	7.1.31
261 *† <i>Huntingdon</i> ...	Field, H. G. B. ...	W. H. Timberlake ...	W.T.	Federal ...	" " 2.8.30 to 9.8.30	18.8.30
289 *† <i>Ingoma</i> ...	Gibbins, W. ...	S. M. Smith, D. D. Kerr, R. Sutcliffe.	No. M.	Harrison ...	Forms 911 & 138 9.12.30 to 17.1.31	26.1.31
<i>Iris</i> , C.S. ...	Hughes, H. R. ...	T. A. Vickers ...	" M.	Pacific Cable Board ...	Form 911 10.12.29 to 27.12.29	17.3.30
160 *† <i>Ixion</i> ...	Dougall, W. T. ...	G. L. Oldrich, W. H. Deans, D. Trail.	M.L.	A. Holt ...	Form 915 19.4.30 to 18.9.30	26.11.30
<i>Jamaica Merchant</i>	Stewart, J. A. ...	B. W. Smith ...	"	Jamaica Direct Fruit	Form 911 21.11.30 to 27.12.30	13.1.31
<i>Jamaica Merchant</i>	Bach, L. G., R.D., Lieut. - Commr., R.N.R.	" " " " " "	"	" " " " " "	" " " " " "	"
072 ** <i>Jamaica Planter</i> ...	Towell, W. C. ...	J. Quick ...	W.T.	" " " " " "	Forms 911 & 138 10.9.30 to 26.11.30	18.12.30
<i>Jamaica Producer</i>	Gallop, J. W. ...	S. E. Taylor, C. E. Edney ...	No. A.	" " " " " "	Form 911 4.12.30 to 15.12.30	5.1.31
<i>Javanese Prince</i> , M.V.	Smith, J. ...	H. G. Edwards ...	" A.	Prince ...	" " 23.9.30 to 11.1.31	26.1.31
187 *† <i>Jeyapore</i> ...	Harris, W. L. ...	T. T. Ferguson, H. Flint, S. Hopkins.	" M.	P. & O. ...	Forms 911 & 138 11.10.30 to 25.11.30	16.12.30
188 †† <i>Katsar-i-Hind</i> ...	Headlam, P. C., R.D., Commr., R.N.R.	M. G. Morris ...	" M.	" " " " " "	" " 23.11.30 to 15.1.31	19.1.31
189 *† <i>Kalyan</i> ...	Cooper, C. P., O.B.E., R.D., Capt. R.N.R.	" " " " " "	" M.	" " " " " "	" " 9.12.30 to 25.1.31	27.1.31
041 *† <i>Karama</i> , M.V. ...	McIntosh, A. ...	K. D. Fisher, N. S. Milne, R. L. Rosoman.	M.L.	Shaw, Savill & Albion	Met. Log. 13.5.30 to 22.8.30	4.9.30
217 *† <i>Karapara</i> ...	Maclean, A. ...	S. J. Howe, H. E. Evans, J. B. Walker, H. T. Matthews.	No. M.	British India ...	Forms 911 & 138 19.11.30 to 2.1.31	19.1.31
190 *† <i>Kashgar</i> ...	Sudell, F., R.D., Commr., R.N.R.	R. P. Eddy, A. J. Nobbs, P. W. Clark.	" M.	P. & O. ...	Forms 911 & 138 26.7.30 to 2.11.30	4.11.30
191 *† <i>Kashmir</i> ...	Mallalae, R., Lt.- Commr., R.N.R.	H. M. Webb ...	" M.	" " " " " "	" " 15.11.30 to 19.12.30	19.1.31
114 †† <i>Kenya</i> ...	Grant, W. E. ...	" " " " " "	" M.	British India ...	" " " " " "	"
218 *† <i>Khandalla</i> ...	Baird, S. K. ...	R. H. R. Hay ...	" M.	" " " " " "	Forms 911 & 138 5.11.30 to 19.12.30	12.1.31

LIST OF VOLUNTARY OBSERVING SHIPS

V

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed. Received up to 13.2.31.	Date Received.
283 *† Khiva ...	Dawson, E. E. N. ...	E. V. Lewis ...	No. M.	P. & O. ...	Forms 911 & 138 24.9.30 to 29.11.30	22.12.30
186 *† Kidderpore ...	Woodroffe, S. Y. ...	R. H. Hand ...	" M.	"	Form 915 1.5.30 to 1.11.30	6.1.31
169 ** Kwangchow ...	Stringer, C. B. L. ...	O. Fox ...	M.L.	China Nav. Co. ...	"	"
Laguna, M.V. ...	Dunn, R.E., O.B.E. ...	"	No. A.	Pacific S.N. Co. ...	"	"
193 *† Lahore ...	Hollow, J. H. ...	J. H. Benjamin ...	" M.	P. & O. ...	Forms 911 & 138 24.3.30 to 16.8.30	21.8.30
Lalande ...	Major, T. W. ...	A. N. Blundell ...	" A.	Lampport & Holt	Form 911 9.10.30 to 1.11.30	14.11.30
Lancashire ...	Fountain, C. ...	W. H. Campe ...	" A.	Bibby ...	" 13.3.30 to 9.4.30	22.4.30
036 †† Lancastria ...	Oram, B. B. R.D., Commr., R.N.R.	H. V. Clarke, J. S. Glendenning, F. Drake.	W.T.	Cunard ...	Forms 911 & 138 19.1.31 to 7.2.31	12.2.31
Laomedon ...	Watson, C. J. ...	A. E. Martin ...	No. A.	A. Holt ...	Form 911 26.10.30 to 7.12.30	29.12.30
082 *† La Paz, M.V. ...	Morgan, D. R. ...	R. W. Hannon, J. Sutherland, G. Pattison.	" M.	Pacific S.N. Co. ...	" 24.12.30 to 15.1.31	5.2.31
Laplace ...	Hickman, V. G. ...	R. H. Sneddon ...	" A.	Lampport & Holt	" 21.9.30 to 31.12.30	28.1.31
134 †† Lapland ...	Harvey, H. ...	"	W.T.	Red Star	"	"
076 *† Largs Bay ...	Jernyn, W. M. ...	F. B. Marsden ...	No. M.	Aberdeen Common-wealth.	Forms 911 & 138 11.10.29 to 3.11.30	29.12.30
112 *† La Rosarina ...	Webb, C. ...	W. S. Hamblin ...	" M.	Houlder ...	" 5.10.30 to 27.11.30	1.12.30
Lassell ...	Leicester, F. S. ...	W. H. Chapman ...	No. A.	Lampport & Holt	Form 911 7.9.30 to 21.11.30	24.12.30
064 †† Laurentic ...	Hume, R. ...	C. Cochran, — Hawkins, R. Conway.	W.T.	White Star ...	Forms 911 & 138 19.1.31 to 8.2.31	11.2.31
083 *† Lautaro, M.V. ...	Leyne, R. W. ...	G. A. Thexton ...	No. M.	Pacific S.N. Co. ...	Form 911 12.5.30 to 16.9.30	19.9.30
Leicestershire ...	Griffiths, C. A. ...	E. D. Brand, H. Kerbyson, A. Thomson.	" A.	Bibby ...	" 21.9.30 to 27.11.30	4.12.30
254 *† Limerick ...	Molyneux, P. L. ...	A. M. Dowman, N. A. Thomas	" M.	Federal ...	Forms 911 & 138 16.11.30 to 22.12.30	26.1.31
093 *† Llandaff Castle ...	Attwood J. ...	T. H. Watley ...	W.T.	Union Castle ...	Form 911 18.7.30 to 22.9.30	27.9.30
097 †† Llangibby Castle, M.V. ...	Harvey, H. B. ...	H. S. Warren ...	"	"	Forms 911 & 138 8.11.30 to 11.1.31	20.1.31
094 *† Llandoverly Castle ...	Morgan, A. O. R.D., Commr., R.N.R.	L. H. Farrow, T. C. Goldstone, F. R. Pope.	M.L.	"	Form 915 20.9.30 to 24.11.30	3.12.30
216 *† Llanstephan Castle ...	Bickford, C. N. ...	T. Campbell, H. Bunn, I. Duncan.	W.T.	"	Form 911 15.11.30 to 18.1.31	22.1.31
084 *† Lobos, M.V. ...	Grant, F. H. ...	R. W. Gill, R. H. Sissons ...	No. M.	Pacific S.N. Co. ...	Forms 911 & 138 30.10.30 to 16.11.30	3.12.30
Loch Katrine ...	Cocks, A. ...	M. A. Murch ...	" A.	R.M.S.P. Co. ...	Form 911 5.11.30 to 26.9.30	4.12.30
Lochmonar, M.V. ...	Schlanbusch, O. ...	F. G. Dawson, A. Yeatman, E. Smith.	" A.	"	" 2.10.30 to 22.12.30	22.1.31
London Exchange ...	Griffiths, J. ...	C. T. V. Rixham ...	" A.	Furness Withy	" 28.11.30 to 24.12.30	30.12.30
Lord Antrim ...	Jarvis, F. E. ...	C. A. Milligan ...	" A.	Ulster S.S. Co. ...	" 21.9.30 to 4.10.30	7.10.30
Loriga, M.V. ...	Large, E. H. R. D., Commr., R.N.R.	J. W. Gordon ...	" A.	Pacific S.N. Co. ...	" 16.10.30 to 10.1.31	13.1.31
194 †† Macedonia ...	Dickenson, C. C. ...	R. A. B. Kempton ...	W.T.M.	P. & O. ...	Forms 911 & 138 21.9.30 to 10.12.30	13.12.30
013 *† Macharda ...	Hanna, R. G. ...	A. C. Hocking ...	No. M.	Brocklebank ...	Form 911 9.11.30 to 6.12.30	10.12.30
232 ** Madura ...	Parker, A. A. ...	A. Usher ...	" M.	British India ...	" 28.12.30 to 8.1.31	26.1.31
048 *† Mahana ...	Cameron, J. M. ...	H. C. Smith, A. E. Masters, M. G. Stuart.	M.L.	Shaw, Savill & Albion	Form 915 13.9.30 to 5.1.31	8.1.31
141 *† Mahia ...	Andrews, C. M. ...	G. Sangwin, M. P. Congdon, J. Jackson.	W.T.	"	Forms 911 & 138 17.9.30 to 18.1.31	26.1.31
014 *† Mahronda ...	Sharpe, G. ...	A. Melville, H. Willington, W. Le Brocq.	No. M.	Brocklebank ...	" 23.11.30 to 12.12.30	29.12.30
015 *† Mahsud ...	Kershaw, R. W. ...	S. Richardson, E. Walker, J. R. Paisley.	" M.	"	" 18.8.30 to 7.11.30	11.11.30
016 *† Maidan ...	Ison, W. A. ...	F. Moore ...	" M.	"	" 27.9.30 to 6.12.30	15.12.30
017 *† Maihar ...	Charlton, W. L. ...	C. Cadwallar, H. Gillespie, A. D. Spring.	M.L.	"	Form 915 6.7.30 to 25.9.30	4.11.30
042 *† Maimoa ...	Johnson, J. W. ...	J. W. Hart, A. Winton, E. Sainsbury, J. F. H. Stroud	"	Shaw, Savill & Albion	" 22.9.30 to 8.12.30	30.12.30
Maimyo ...	Smith, G. C. ...	J. L. Rodgers ...	No. A.	Brocklebank ...	Form 911 5.11.30 to 11.12.30	19.12.30
018 *† Makalla ...	Maughan, J. W. ...	E. Williams ...	" M.	"	Forms 911 & 138 22.9.30 to 4.12.30	24.12.30
225 ** Makura ...	MacDonald, D. ...	A. P. Cousin, S. H. Crawford, N. H. Pearson, M. V. Langdale.	M.L.	Canadian-Australasian	Form 915 20.5.30 to 30.8.30	31.10.30
298 ** Malabar, M.V. ...	Donaldson, A. ...	A. Campbell, L. Millar, G. Rothery, S. ...	"	Burns, Philp & Co. ...	" 9.4.30 to 21.9.30	20.11.30
019 *† Malakuta ...	Adamson, F. L. ...	H. Simpson ...	No. M.	Brocklebank ...	Forms 911 & 138 24.5.30 to 11.10.30	22.10.30
020 *† Malancha ...	Whitham, F. ...	R. Humble, H. B. Kelly ...	" M.	"	" 26.7.30 to 30.10.30	6.11.30
219 *† Maida ...	Denne, G. H. A. ...	D. B. Lattin, G. W. P. King, E. B. Outlack.	" M.	British India ...	Form 138 25.10.30 to 15.1.31	29.1.31
195 †† Maloja ...	Browning, J. B. R.D., Commr. R.N.R.	R. H. Turner, C. H. Hand, E. J. Spurling.	" M.	P. & O. ...	Forms 911 & 138 26.4.30 to 10.7.30	16.7.30
196 †† Malwa ...	Britten, P. O. ...	P. J. Lawrence ...	" M.	"	" 11.8.30 to 13.11.30	21.11.30
Mamilus ...	Cole, N. ...	"	" A.	White Star ...	"	"
Manchester Brigade ...	Stott, C. H. ...	J. H. Round, E. E. Bonnaud, J. Gregory.	M.L.	Manchester Liners ...	Form 915 10.5.30 to 25.11.30	5.12.30
Manchester Hero ...	Mitchell, G. M. ...	R. O. Jones ...	No. A.	"	Form 911 11.11.30 to 16.12.30	1.1.31
Manchester Producer ...	Struss, F. D. ...	T. J. Boyd ...	" A.	"	" 1.6.30 to 3.7.30	23.7.30
028 †† Mandala ...	Whittingham, A. G. R.D., R.N.R.	W. E. F. Powell ...	" M.	British India ...	"	"
146 *† Mandasor ...	Richardson, T. ...	— Madden ...	" M.	Brocklebank ...	"	"
220 *† Manela ...	Maples, S. H. ...	T. M. Robertson, E. W. Cholerton, L. W. Kerton.	" M.	British India ...	Forms 911 & 138 12.12.30 to 29.12.30	19.1.31
021 *† Mangalore ...	Mallett, R. ...	J. McGilvray, G. E. Jones, A. M. Parry.	" M.	Brocklebank ...	" 17.12.30 to 26.12.30	1.1.31
022 *† Manipur ...	Cochran, G. N. ...	L. F. Dodson, R. Penston, A. Hill.	" M.	"	" 5.12.30 to 1.1.31	3.1.31
294 *† Manistee ...	Edwards, A. C. ...	"	M.L.	Elders & Fyffes	"	"
231 *† Manora ...	Hudson, H. T. R.D., Commr., R.N.R.	J. Brawn, D. W. Speirs, D. D. Bangay.	No. M.	British India ...	Form 911 20.9.30 to 2.12.30	4.12.30
197 †† Mantua ...	Jack, H. M. ...	F. R. N. Greasley ...	" M.	P. & O. ...	Forms 911 & 138 26.10.30 to 18.12.30	19.12.30
299 ** Marella ...	Mortimer, S. ...	J. Cummings, M. Pemberton, W. D. Colquhoun-Thomas.	M.L.	Burns Philp ...	Form 915 7.5.30 to 23.8.30	20.11.30
Marengo ...	Donaldson, A. ...	H. Bryan, G. W. Revell, W. L. Hepson.	"	Ellerman Wilson ...	" 5.6.30 to 6.10.30	10.10.30
222 †† Margha ...	Pitcairn, C. M. ...	P. Wright, H. Watkins ...	"	British India ...	" 24.8.30 to 14.11.30	19.11.30
104 *† Marquesa ...	Hemmings, W. H. ...	"	"	"	"	"
044 †† Mataroa ...	Smiles, R. S. ...	J. Wetherall ...	No. M.	Furness Houlder	Forms 911 & 138 22.9.30 to 21.10.30	25.11.30
"	Kershaw, W. A. R. ...	F. Eadon, H. A. Hill, F. C. Chamby, L. B. Miller.	M.L.	Shaw, Savill & Albion	Form 915 15.8.30 to 23.11.30	27.11.30
023 *† Matheran ...	Mulcahy, J. J. ...	S. S. Slade, W. F. Harris, C. B. Rogers.	No. M.	Brocklebank ...	Forms 911 & 138 8.1.31 to 8.2.31	10.2.31
223 *† Matiana ...	Green, F. V. ...	L. A. Bunn, J. W. Daly ...	" M.	British India ...	" 17.1.31 to 28.1.31	5.2.31
024 *† Matra ...	Cornish, N. P. ...	C. Shaw, W. Robertson, O. Jones.	" M.	Brocklebank ...	" 1.12.30 to 25.12.30	19.1.31
032 †† Mauretania ...	McNeil, S. G. S., R.D., Capt., R.N.R.	R. H. C. Crawford ...	W.T.	Cunard ...	" 10.12.30 to 8.1.31	12.1.31
287 †† Melita ...	Stewart, A. ...	L. N. Outram ...	" A.	Canadian Pacific	" 21.12.30 to 8.1.31	12.1.31
Melmore Head ...	Moore, J. R. ...	"	No. A.	Ulster S.S. Co. ...	"	"
071 *† Meltonian ...	Cannon, J. R. ...	W. Lawton ...	" M.	Leyland ...	Forms 911 & 138 1.12.30 to 3.1.31	13.1.31
Mercian ...	Hughan, C. ...	"	" A.	"	Form 911 28.7.30 to 30.9.30	8.10.30

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Record Contributed Received up to 13.2.31.	Date Received.
255 *† <i>Meriones</i> ...	Hanney, T. W. ...	J. G. Jones ...	No. A. ...	A. Holt ...	Form 911 13.12.30 to 2.1.31 ...	9.2.31
255 *† <i>Middlesex</i> ...	Clarke, P. B. ...	J. Lunnon, J. Ricketts, R. Stephens, J. Halliday. ...	" M. ...	Federal ...	Forms 911 & 138 8.7.30 to 12.8.30 ...	20.11.30
147 †† <i>Minna</i> ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A. ...	Scottish Fishery Brd. ...	Form 911 11.1.31 to 9.2.31 ...	12.2.31
147 †† <i>Minnedosa</i> ...	Jones, D. T. Carr ...	H. M. Sanders, C. Duggan, D. Ewing. ...	W.T. ...	Canadian Pacific ...	Forms 911 & 138 28.12.30 to 16.1.31 ...	19.1.31
068 †† <i>Minnetonka</i> ...	Gates, T. F., C.B.E. ...	H. E. D. McCartney, R. Everard, J. W. Grier. ...	No. M. ...	Atlantic Transport ...	" " 27.10.30 to 13.12.30 ...	16.12.30
069 †† <i>Minnewaska</i> ...	Claret, F. H., C.B.E., Commr., R.N.R. ...	E. Pengelly, D. Davies, F. Mummery. ...	" " " ...	" " " ...	" " 9.12.30 to 28.12.30 ...	31.12.30
224 *† <i>Mississippi, M.V.</i> ...	Finch, E. ...	L. C. Hill ...	" A. ...	British India ...	Form 911 21.10.30 to 26.1.30 ...	8.12.30
224 *† <i>Modasa</i> ...	Gilchrist, J. W. ...	H. Donohoe, W. Ascroft, H. C. Pearson, A. Frogbrook. ...	" M. ...	" " " ...	Forms 911 & 138 27.11.30 to 29.12.30 ...	26.1.31
198 †† <i>Moldavia</i> ...	Allin, C. H. C. ...	C. S. Pirie, E. J. Kerridge ...	" M. ...	P. & O. ...	" " 29.11.30 to 20.12.30 ...	9.1.31
199 †† <i>Mongoitia</i> ...	Rhodes, H. R. ...	M. R. Wood, G. K. Fox, W. N. Eade. ...	" M. ...	" " " ...	" " 7.9.30 to 10.12.30 ...	24.12.30
148 †† <i>Montcalm</i> ...	Rothwell, A. ...	T. L. Gillette, A. Mackie, A. Vaughan ...	W.T. ...	Canadian Pacific ...	" " 11.1.31 to 30.1.31 ...	3.2.31
149 †† <i>Montclare</i> ...	McCombie, J. ...	E. A. Shergold, J. Sharples, J. Soames, R. M. A. Stapleton. ...	" " " ...	" " " ...	" " 4.1.31 to 23.1.31 ...	27.1.31
150 †† <i>Montrose</i> ...	Dott, J. F. ...	" " " " " " " ...	W.T.M. ...	" " " ...	Form 911 16.3.30 to 30.4.30 ...	3.5.30
164 †† <i>Mooltan</i> ...	Morton, A. J. ...	R. M. Richardson ...	No. M. ...	P. & O. ...	" " " " " " " ...	" " " " " " "
226 †† <i>Mulbera</i> ...	Caffyn, F. ...	J. M. Peters, C. J. Davidson, C. Furze. ...	" M. ...	British India ...	Forms 911 & 138 23.1.30 to 28.12.30 ...	3.1.31
200 *† <i>Nagoya</i> ...	Cooper, C. P., O.B.E., R.D., Capt. R.N.R. ...	F. D. Shaw ...	" M. ...	P & O. ...	" " 21.2.30 to 23.4.30 ...	25.4.30
201 †† <i>Naldera</i> ...	Harrison, R., D.S.O., R.D., Capt. R.N.R. ...	J. O. Divers, C. W. Mayne, M. F. Shute, H. J. Mann. ...	M.L. ...	" " " ...	Form 915 23.8.30 to 27.11.30 ...	4.12.30
227 *† <i>Nardana</i> ...	Reilly, J. V. ...	H. Goater, R. Bamforth, R. Lord, H. Grace ...	" " " ...	British India ...	Met. Log. 23.11.29 to 3.9.30 ...	8.9.30
118 *† <i>Narenta</i> ...	Falconer, A. C. ...	W. A. Chamberlain, G. S. Grant, L. M. Smith. ...	No. M. ...	R.M.S.P. Co. ...	Forms 911 & 138 24.11.30 to 9.12.30 ...	22.12.30
202 †† <i>Narkunda</i> ...	Parker, J. J. W., R.D., Commr. R.N.R. ...	C. H. Moulton, A. H. Wing, F. Collinson, M. A. Trenfield. ...	" M. ...	P. & O. ...	" " 9.1.31 to 20.1.31 ...	9.2.31
136 *† <i>Navigator</i> ...	Curphey, E. B. ...	A. Frogbrook ...	W.T. ...	Harrison ...	" " " " " " " ...	" " " " " " "
305 *† <i>Nebraska</i> ...	Bridges, E. A. ...	L. J. Dixon, J. F. M. Heddle, R. Milington, J. Kavanagh. ...	No. M. ...	R.M.S.P. Co. ...	Forms 911 & 138 27.12.30 to 22.1.31 ...	26.1.31
203 *† <i>Nellore</i> ...	Gordon, A. S. ...	" " " " " " " ...	M.L. ...	E. & A. S.S. Co. ...	Form 915 2.8.30 to 28.10.30 ...	30.12.30
162 *† <i>Nestor</i> ...	Adcock, F. ...	W. L. Harris, A. E. Stephenson, P. Elder. ...	" " " ...	A. Holt ...	" " 6.7.30 to 10.11.30 ...	15.11.30
<i>Nevisian</i> ...	McCormick, J. ...	" " " " " " " ...	No. A. ...	Leyland ...	Form 911 4.4.30 to 5.7.30 ...	10.7.30
<i>Newfoundland</i> ...	Foxworthy, A. W. ...	R. F. Handley, E. Sainty, L. Macklin. ...	M.L. ...	Furness Withy ...	Form 915 1.5.30 to 11.9.30 ...	20.9.30
210 *† <i>Niagara</i> ...	Hill, T. V. ...	G. H. Kime, D. A. Menlove, S. P. Bourke. ...	" " " ...	Canadian-Australasian ...	" " 20.8.30 to 8.11.30 ...	8.1.31
<i>Ningchow</i> ...	Beale, H. E. ...	E. Butler ...	No. A. ...	A. Holt ...	Form 911 5.1.31 to 16.1.31 ...	23.1.31
229 *† <i>Nirvana</i> ...	Ayres, R. M. ...	S. H. Kinson, J. B. Hore, A. H. Baird. ...	" M. ...	British India ...	Forms 911 & 138 17.6.30 to 6.7.30 ...	29.7.30
256 *† <i>Norfolk</i> ...	Mead, G. F. ...	G. H. Letts, P. L. Shakespeare, L. Hill. ...	M.L. ...	Federal ...	Form 915 3.7.30 to 8.8.30 ...	16.8.30
<i>Norna</i> ...	Angus, W. ...	T. R. Ness ...	No. A. ...	Scottish Fishery Brd ...	Form 911 3.1.31 to 27.1.31 ...	5.2.31
100 *† <i>Norseman, C.S.</i> ...	Hammond, S. M. ...	R. Moss ...	" M. ...	Western Tel. Co. ...	" " 13.7.30 to 6.8.30 ...	28.8.30
<i>Northland</i> ...	Williams, J. T. ...	F. Bottom ...	" A. ...	Northland, Ltd. ...	" " " " " " " ...	" " " " " " "
297 *† <i>Northumberland</i> ...	Upton, H. L., D.S.C., R.D., Commr. R.N.R. ...	" " " " " " " ...	" M. ...	Federal ...	" " " " " " " ...	" " " " " " "
<i>Nova Scotia</i> ...	Furneaux, S. J. ...	J. E. Wilson ...	M.L. ...	Furness Withy ...	Form 911 3.9.30 to 29.9.30 ...	2.10.30
230 *† <i>Noushera</i> ...	Longhurst, J. H. ...	R. Burch, B. H. Bentall ...	No. M. ...	British India ...	" " 5.5.30 to 23.8.30 ...	1.12.30
231 *† <i>Nuddea</i> ...	Beeching, P. H. ...	D. A. Jones, W. Monk, W. G. Pitcher. ...	" M. ...	" " " ...	Forms 911 & 138 15.11.30 to 6.1.31 ...	8.1.31
<i>Oaklands Grange</i> ...	Phillips, A. G. M. ...	J. C. Thomas ...	" A. ...	Houlder Bros. ...	Form 911 30.5.30 to 18.9.30 ...	4.10.30
170 †† <i>Orama</i> ...	Staunton, H. G., C. B. E., R. D., Commr. R.N.R. ...	W. Eliot, K. Morrison, R. W. Roberts. ...	W.T. ...	Orient ...	Form 915 13.10.30 to 13.1.31 ...	21.1.31
<i>Oranian</i> ...	Gittings, R. P. ...	H. O. Quinn ...	No. A. ...	Leyland ...	Form 911 26.11.30 to 17.1.31 ...	29.1.31
309 †† <i>Orbita</i> ...	Roberts, E. ...	E. C. Hicks, C. C. Gibson, J. E. Smithson. ...	W.T.M. ...	Pacific S.N. Co. ...	Forms 911 & 138 4.11.30 to 12.1.31 ...	19.1.31
086 †† <i>Orcoma</i> ...	Harvey, J. G. ...	W. J. Rutter, J. W. Coxon, G. H. Pilling. ...	" " " ...	" " " ...	" " 2.9.30 to 9.11.30 ...	13.11.30
087 †† <i>Orduna</i> ...	Ridyard, A., O.B.E. ...	T. J. Naylor, R. F. A. Cox, R. B. Bryant. ...	" " " ...	" " " ...	" " 3.10.30 to 16.12.30 ...	22.12.30
171 †† <i>Orford</i> ...	Owens, A. L., Commr. R.D., R.N.R. ...	S. C. K. Dowling ...	No. M. ...	Orient ...	" " 11.11.30 to 27.1.31 ...	2.2.31
088 †† <i>Orita</i> ...	Benson, C. W. ...	J. D. Richards, H. Matthews, S. Woodman. ...	W.T.M. ...	Pacific S.N. Co. ...	Forms 911 & 138 16.12.30 to 31.12.30 ...	26.1.31
174 †† <i>Ormonde</i> ...	James, L. V., D.S.C. ...	T. L. Shurrock, N. Smith, C. Pinckney. ...	W.T. ...	Orient ...	" " 17.8.30 to 18.11.30 ...	28.11.30
172 †† <i>Oronsay</i> ...	Cameron, E. P. R.D., Commr. R.N.R. ...	E. M. Mackay. ...	" " " ...	" " " ...	" " 28.9.30 to 31.12.30 ...	8.1.31
173 †† <i>Orontes</i> ...	O'Sullivan, F. R. ...	J. M. N. Swanson, S. Burnand, W. McKay. ...	No. M. ...	" " " ...	" " 5.10.30 to 17.12.30 ...	22.12.30
085 *† <i>Oropesa</i> ...	Ross, J. ...	E. J. Thomas ...	" M. ...	Pacific S.N. Co. ...	" " " " " " " ...	" " " " " " "
089 *† <i>Oroya</i> ...	Galloway, M. ...	J. M. Forsyth, J. Ayland, E. S. Jones. ...	" M. ...	" " " ...	Forms 911 & 138 20.8.30 to 28.10.30 ...	1.11.30
105 †† <i>Orsova</i> ...	Thorne, G. G., R.D., Commr. R.N.R. ...	" " " " " " " ...	W.T. ...	Orient ...	" " " " " " " ...	" " " " " " "
290 *† <i>Otaio</i> ...	Mead, G. F. ...	D. Hughes, H. M. Knight, R. A. Belfield, G. D. Moir. ...	No. M. ...	New Zealand S.S. Co. ...	Form 915 12.12.29 to 26.5.30 ...	29.5.30
237 *† <i>Otaki</i> ...	Clarke, P. B., D.S.C. ...	F. Goodman, A. E. Coles, G. R. Grandase. ...	M.L. ...	" " " ...	" " " " " " " ...	" " " " " " "
177 †† <i>Otranto</i> ...	Matheson, C. G., D.S.O., R.D., Capt. R.N.R. ...	" " " " " " " ...	W.T. ...	Orient ...	Forms 911 & 138 12.1.31 to 10.2.31 ...	13.2.31
279 *† <i>Pacific Exporter</i> ...	Holland, C. E., R.D., Commr. R.N.R. ...	A. Knapp ...	" " " ...	Furness Withy ...	Form 911 13.7.30 to 5.10.30 ...	9.10.30
<i>Pacific Shipper, M.V.</i> ...	Goodwin, J. ...	S. Porter ...	No. A. ...	" " " ...	" " 1.11.30 to 2.2.31 ...	6.2.31
<i>Pakeha</i> ...	Elford, H. C. ...	A. J. Tillott ...	" A. ...	Shaw, Savill & Albion ...	" " 12.11.30 to 18.12.30 ...	26.1.31
<i>Pancras</i> ...	Jackson, T. H. ...	L. A. Sayers, N. Caris ...	M.L. ...	Booth ...	Form 915 7.5.30 to 23.9.30 ...	6.10.30
<i>Parceora</i> ...	Evans, J. O. ...	C. Parry ...	No. A. ...	" P " Steamers, Ltd. ...	Form 911 15.7.30 to 6.8.30 ...	23.9.30
<i>Paris</i> ...	Cook, C. L. ...	Mr. Biles ...	C.C. ...	Southern Ry. ...	Telegraphic Report. 19.1.31 ...	19.1.31
<i>Patia</i> ...	Sapsworth, S. A. ...	R. O. Laycock, E. W. Harvey, W. F. Isaac. ...	No. A. ...	Elders & Fyffes ...	Form 911 30.10.30 to 29.11.30 ...	3.12.30
<i>Pelsander</i> ...	Read, J. W. ...	C. T. Morgan ...	" A. ...	A. Holt ...	" " 1.9.30 to 23.11.30 ...	16.12.30
058 †† <i>Pennland</i> ...	Making, V. L. ...	J. C. Flett, — Otterson, — Cross. ...	W.T. ...	Red Star ...	Forms 911 & 138 15.12.30 to 5.1.31 ...	6.1.31
204 *† <i>Peshawur</i> ...	McBryde, A. M. ...	D. Meikle, J. T. Sheffield, T. E. Wrigley, M. P. Fyrth, G. A. Nixon. ...	M.L. ...	P. & O. ...	Form 915 1.8.30 to 5.12.30 ...	9.12.30

LIST OF VOLUNTARY OBSERVING SHIPS

vii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Record Contributed. Received up to 13.2.31.	Date Received.
238 *† <i>Plako</i> ...	Aslin, E. P. C. ...	A. D. Wilson, A. W. Marshall, R. H. Carter.	No. M.	New Zealand Co. ...	Forms 911 & 138 6.12.30 to 24.1.31	7.2.31
<i>Polycarp</i> ...	Elliot, A. ...	H. W. Taggart ...	" A.	Booth ...	Form 911 19.9.30 to 5.10.30	14.10.30
127 *† <i>Port Adelaide</i> ...	Williams, R. ...	J. G. A. Dunn, F. W. Elgar, D. Morgan, E. N. Lawrey.	M.L.	Commonwealth & Dominion.	Form 915 9.9.30 to 1.1.31	20.1.31
128 *† <i>Port Auckland</i> ...	Durham, R. S., D.S.C.	W. Craig, A. Brown, E. Mickleburgh.	"	" " "	Form 915 31.7.30 to 4.12.30	13.1.31
129 *† <i>Bowen Campbell</i> ...	Hearn, G. W. ...	F. R. Gorman ...	No. A.	" " "	Form 911 24.6.30 to 19.11.30	2.12.30
130 *† <i>Caroline</i> ...	Swan, L. H. ...	J. C. Goddard, N. M. Muzzell, C. Midwinter.	M.L.	" " "	Form 915 7.10.30 to 25.1.31	31.1.31
131 *† <i>Darwin</i> ...	Brown, A. H. ...	V. G. Battle, E. W. R. Young, R. E. Garner.	"	" " "	" 4.7.30 to 19.11.30	25.11.30
132 *† <i>Denison</i> ...	Sawbridge, I. R. ...	W. L. Lynd, L. C. Asser, E. Wheeler, A. McClounan.	"	" " "	" 9.4.30 to 8.8.30	12.8.30
133 *† <i>Dunedin, M.V.</i> ...	Ferris, J. ...	A. A. Cooper, A. G. Newbury, R. A. Holloway, T. Milburn.	"	" " "	" 6.5.30 to 15.9.30	27.9.30
<i>Fairy</i> ...	Mason, W. S., D.S.C.	H. M. Post, C. A. Hodson, T. Soanes.	"	" " "	" 18.4.30 to 21.8.30	9.9.30
<i>Fremantle, M.V.</i> ...	Farmer, F. ...	J. Stannard ...	No. A.	" " "	Form 911 4.5.30 to 8.6.30	17.6.30
<i>Gisborne, M.V.</i> ...	Gilling, W. ...	A. Naismith ...	" A.	" " "	" 4.8.30 to 6.9.30	9.9.30
<i>Hobart, M.V.</i> ...	Hayter, S. W. ...	L. J. Skales ...	" A.	" " "	" 6.9.30 to 10.10.30	17.10.30
	Cottell, S. C. ...	E. R. Rowlands, G. Jinman, L. Copeland.	M.L.	" " "	Form 915 15.7.30 to 2.1.30	26.11.30
135 *† <i>Hunter</i> ...	Higgs, W. G. ...	G. T. C. Harris, C. R. Townshend, W. M. Clough, P. A. Manday.	"	" " "	" 7.10.30 to 29.1.31	5.2.31
<i>Huon</i> ...	Compton, J. E. ...	F. J. Lavers ...	No. A.	" " "	Form 911 25.1.30 to 1.3.30	12.3.30
137 *† <i>Nicholson</i> ...	Gregory, S. E. A. ...	E. N. Rogerson, R. D. Elson, E. N. Howard, S. Ward.	M.L.	" " "	" 7.9.30 to 8.1.31	15.1.31
138 *† <i>Pirie</i> ...	Jack, J. ...	G. W. Horton, H. E. Braine, R. C. H. Webb.	"	" " "	" 27.9.30 to 1.11.30	7.11.30
140 *† <i>Victor</i> ...	Hall, G. S. ...	F. G. L. Jones, J. L. Porter, R. C. Pocock.	"	" " "	" 14.6.30 to 28.10.30	7.11.30
<i>Wellington</i> ...	Jones, C. N. ...	H. Duckling ...	No. A.	" " "	Form 911 9.4.30 to 29.6.30	1.7.30
106 *† <i>Princesa</i> ...	Friend, A. B. ...	E. Loughheed, A. M. Tilsley, F. Poulson.	" M.	Houlder " ...	Forms 911 & 138 4.1.31 to 21.1.31	13.2.31
163 *† <i>Protesilaus</i> ...	Holden, W. R. F. ...	J. Cooper, J. Holden, H. N. Hardie.	M.L.	A. Holt ...	Form 915 17.5.30 to 30.11.30	2.2.31
<i>Pyrrhus</i> ...	Wilkinson, T. G. ...	J. C. Podmore ...	No. A.	" ...	Form 911 14.12.30 to 9.1.31	9.2.31
205 †† <i>Rajputana</i> ...	Cadiz, F. G., D.S.C. ...	G. A. Wild, D. Hockley, D. B. Beekley.	" M.	P. & O. ...	Forms 911 & 138 7.12.30 to 29.1.31	2.2.31
063 *† <i>Rancher</i> ...	McCullum, J. ...	T. A. Sergeant, R. J. F. Paice	" M.	Harrison ...	Forms 911 & 138 2.11.30 to 4.2.31	7.2.31
228 †† <i>Ranchi</i> ...	Brooks, C., D.S.O., R.D. Capt. R.N.R.	J. J. Youngs, A. Brown, C. Edgecombe.	M.L.	New Zealand S.S. Co.	Form 915 26.9.30 to 9.1.31	15.1.31
236 †† <i>Rangitane M.V.</i> ...	McKellar, A. W., R.D. Capt. R.N.R.	J. Oxnard, L. Griffiths, D. Chadwick, W. Jarvis.	W.T.M.	" " "	Forms 911 & 138 30.8.30 to 10.12.30	1.1.31
257 †† <i>Rangitata M.V.</i> ...	Hunter, J. L. B. ...	L. F. Malcouronne, H. K. Cockerill, R. J. Coffey.	"	" " "	" 5.7.30 to 18.10.30	25.10.30
240 †† <i>Rangitiki M.V.</i> ...	Barnett, E. ...	J. Strike, R. A. Perry, D. S. Charles.	No. M.	P. & O. ...	" 11.10.30 to 3.12.30	9.2.31
207 †† <i>Ranpura</i> ...	Furlong, G. H. S. ...	G. Morrice ...	"	Harrison ...	" 12.10.30 to 2.1.31	8.1.31
<i>Recorder</i> ...	Egerton, J. J. ...	A. Angel, T. S. Marchington, F. Bishop, G. C. Hoeart.	M.L.	New Zealand S.S. Co.	Form 915 1.5.30 to 8.10.30	14.10.30
239 *† <i>Remuera</i> ...	Wilde, H. J. ...	C. Anderson ...	No. A.	A. Holt ...	Form 911 13.12.30 to 26.12.30	9.2.31
<i>Rhexenor</i> ...	Stout, G. L. ...	H. S. Butler ...	" A.	Houlder Bros. ...	" 17.5.30 to 29.8.30	13.9.30
<i>Rhodesian Trans- port.</i> ...	Bowen, A. C. ...	A. G. Malan ...	" A.	Union Castle ...	" 27.8.30 to 14.11.30	24.11.30
<i>Ripley Castle</i> ...	Goodacre, R. W. ...	F. Wright ...	" A.	Goole Steam Shipping	" 27.12.30 to 18.1.31	8.2.31
<i>Rother</i> ...	Woodhead, T. H. ...	G. C. Saul, H. F. C. Wilkinson, L. W. Fulcher.	M.L.	New Zealand S.S. Co.	Form 915 6.6.30 to 20.9.30	23.9.30
241 *† <i>Rotorua</i> ...	Lamb, C. B. ...	R. A. Belfield, E. G. Henry, A. Hocken, J. B. Styrrin.	No. M.	Blue Star ...	Forms 911 & 138 16.8.30 to 1.12.30	3.12.30
062 *† <i>Royal Star</i> ...	Walsh, W. ...	T. S. Farrar, H. I. Phillips, F. Cooke.	W.T.	New Zealand S.S. Co.	Form 915 2.8.30 to 19.11.30	26.11.30
246 *† <i>Ruahine</i> ...	Urquhart, D. ...	"	"	" " "	"	"
242 *† <i>Ruapehu</i> ...	Robinson, F. W. ...	"	"	" " "	"	"
300 *† <i>St. Albans</i> ...	Diamond, S. L. ...	F. O. Colvin, C. Stratford, H. Nuzum.	"	Eastern and Aus- tralian.	Met. Log. 4.4.30 to 8.6.30	21.8.30
<i>St. Heller</i> ...	Skinner, M. B. ...	J. Goodchild, J. Braye ...	C.C.	G.W. Railway ...	Telegraphic Report 13.12.30	13.12.30
<i>St. Julien</i> ...	Pitman, R. ...	"	"	" " "	" 12.2.31	12.2.31
<i>St. Patrick</i> ...	Sanderson, C. W. ...	"	"	" " "	" 10.9.30	10.9.30
038 †† <i>Samaria</i> ...	Richardson, L. ...	F. E. Martin ...	W.T.	Cunard ...	Forms 911 & 138 1.12.30 to 20.12.30	23.12.30
<i>Sangate Castle</i> ...	Malin, R. G., Lieut.- Commr., R.N.R.	F. P. Collins, A. MacKellar, F. G. Watts.	"	"	"	"
<i>Sardinian Prince</i> ...	Aylen, C. E. H. ...	"	No. A.	Union Castle ...	Form 911 21.12.30 to 4.1.31	17.1.31
<i>Saxon</i> ...	Pearson, F. T. ...	H. P. Clegg ...	" A.	Prince ...	" 2.11.30 to 21.12.30	24.12.30
291 *† <i>Scholar</i> ...	Jackson, C. R. ...	C. G. Cuthbertson ...	" A.	Union Castle ...	" 1.9.30 to 21.10.30	25.10.30
<i>Scotia</i> ...	Peterkin, A. G. ...	J. Richardson ...	" M.	Harrison ...	Telegraphic Report 11.2.31	11.2.31
033 †† <i>Seythia</i> ...	O'Neill, J. ...	W. H. Hughes ...	C.C.	L.M. & S. Railway	Forms 911 & 138 12.1.31 to 1.2.31	4.2.31
<i>Sea Victory</i> ...	Gibbons, G., R.D., R.N.R.	C. W. W. Hill, E. Gleave, F. P. Collins.	W.T.	Cunard ...	"	"
211 *† <i>Shropshire, M.V.</i> ...	Gammon, G. H. ...	P. Curley ...	No. A.	Dover Navigation ...	Form 915 3.10.30 to 12.12.30	13.12.30
<i>Silksworth</i> ...	English, G. L. ...	R. Cuming, C. F. Hicks, A. D. Quayle, E. W. Jefferies.	M.L.	Bibby ...	Form 911 25.10.30 to 25.1.31	2.2.31
258 *† <i>Somerset</i> ...	Blacklock, G. ...	D. Hughes, H. M. Knight, M. I. D. Walters, T. E. Davies.	No. A.	R. S. Dalgleish	Form 915 19.7.30 to 23.11.30	28.11.30
<i>Spero</i> ...	Pilcher, C. R. ...	"	"	Federal ...	"	"
277 *† <i>Stephen</i> ...	Montgomery, H. ...	H. W. Vickers, A. Kirk	"	Ellerman Wilson	Form 915 27.9.30 to 26.12.30	31.12.30
<i>Surrey</i> ...	Jones, W. C. H., R.D., Commr., R.N.R.	J. Whayman, D. H. Daniels	"	Booth ...	Form 911 17.10.30 to 12.12.30	29.12.30
<i>Sutherland Grange Sylvafield, M.V.</i> ...	Almond, J. G. ...	R. Rees, D. J. Murray, C. A. Cremin, W. Coates.	"	Federal ...	Form 915 2.5.30 to 9.9.30	26.9.30
	Matthews, S. ...	"	No. A.	Houlder Bros.	"	"
	MacDonald, W. ...	J. Johnson ...	" A.	Hunting & Son	Form 911 10.1.31 to 10.2.31	13.2.31
045 †† <i>Tainui</i> ...	Clifton Mogg, W. P., Lieut. Commr., R.N.R.	G. A. Harvey, E. Baker, A. G. Collins.	M.L.	Shaw, Savill & Albion	Form 915 13.9.30 to 26.12.30	30.12.30
234 *† <i>Talma</i> ...	Harley, G. ...	M. H. Vincent ...	No. M.	British India ...	Forms 911 & 138 19.10.30 to 14.12.30	12.1.31
046 †† <i>Tamaroa</i> ...	Hartman, W. H. ...	L. R. Bull, F. Altwood, R. R. Roseman, B. D. Atkin.	W.T. M.	Shaw, Savill & Albion	Forms 911 & 138 11.10.30 to 18.1.31	20.1.31

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Record Contributed. Received up to 13.2.31.	Date Received.
264 ** <i>Tanda</i> ...	Pilcher, E. T., Lieut.-Commr., R.N.R.	H. M. Sanders, R. Lloyd-Harry, B. M. Dun. G. Chadwick-Smith.	M.L.	E. & A. S.S. Co. ...	Form 915 5.9.30 to 2.12.30 ...	4.3.31
165 *† <i>Tantalus</i> , M.V. ...	Dodds, R. ...	F. C. Oppen, R. M. Gray, W. J. Ryan.	"	A. Holt... ...	" 6.9.30 to 8.1.31 ...	16.1.31
047 *† <i>Taranaki</i> , M.V. ...	Wood, C., D.S.C. ...	G. Campbell, W. D. Pim, K. A. Gordon, S. P. Wallis.	"	Shaw, Savill & Albion	" 26.7.30 to 11.11.30 ...	17.11.30
<i>Tarantia</i> ...	Caithness, J. B. ...	J. M. Cherry ...	No. A.	Anchor ...	Form 911 18.12.30 to 5.1.31 ...	19.1.31
<i>Tasmania</i> ...	Williams, J. V. ...	" ...	" A.	New Zealand S.S. Co	" ...	"
<i>Teiresias</i> ...	Wilkinson, W. H. ...	F. Stott ...	" A.	A. Holt & Co. ...	Form 911 9.10.30 to 26.12.30 ...	31.12.30
243 *† <i>Tekoa</i> ...	McNish, R. ...	J. G. Phillips, R. Aldridge, E. Mason.	" M.	New Zealand S.S. Co.	Forms 911 & 138 1.10.30 to 1.11.30 ...	8.11.30
<i>Telamon</i> ...	Brown, R. ...	G. Edge ...	" A.	A. Holt... ...	Form 911 26.10.30 to 23.11.30 ...	10.12.30
<i>Tetela</i> ...	Brice, E. H. ...	F. P. Inch, G. Roberts, J. W. Toner.	" A.	Elders & Fyffes ...	" 11.1.31 to 7.2.31 ...	13.2.31
<i>Teucer</i> ...	Davies, J. ...	C. C. L'Estrange, L. C. Podmore.	" A.	A. Holt... ...	" 19.12.30 to 14.1.31 ...	5.2.31
077 †† <i>Themistocles</i> ...	Young, A. D. ...	C. C. Beal, J. Smallwood, Aird, Morrison, Matthews.	W.T. M.	Aberdeen Common-wealth	Forms 911 & 138 11.10.30 to 26.1.31 ...	3.2.31
<i>Theseus</i> ...	Carnon, C. G. ...	P. Dunsire ...	No. A.	A. Holt... ...	Form 911 5.10.30 to 7.11.30 ...	8.12.30
007 *† <i>Thistleglen</i> ...	Whitfield, G. A., O.B.E.	W. H. Gould, S. B. Davis, E. W. Kent.	M.L.	Allan Black & Co. ...	Form 915 26.4.30 to 29.9.30 ...	2.10.30
235 *† <i>Tilawa</i> ...	Coleborn, E. ...	F. R. B. Langdon, A. S. Jones, J. W. Walker.	No. M.	British India... ...	Forms 911 & 138 22.11.30 to 19.1.31 ...	9.2.31
168 *† <i>Tinhow</i> ...	Chicken, W. E. ...	G. W. Seth, P. Aydon, E. Smith.	"	A. Weir & Co. ...	" " 6.8.30 to 12.11.30 ...	16.12.30
161 *† <i>Titan</i> ...	Power, J. J. ...	C. C. L'Estrange ...	M.L.	A. Holt... ...	Form 911 10.2.30 to 21.5.30 ...	27.5.30
244 *† <i>Tongatiro</i> ...	Hamilton, F. S. ...	F. S. Cashmore, G. Dibley, W. Redwood, D. Baldwin, E. G. Williams.	"	New Zealand S.S. Co.	Form 915 27.9.30 to 29.1.31... ...	5.2.31
025 †† <i>Transylvania</i> ...	Bone, D. W. ...	A. Middleton, J. A. Leferre, D. I. Chamberlain.	W.T.	Anchor ...	Forms 911 & 138 1.12.30 to 21.12.30 ...	29.12.30
288 *† <i>Traveller</i> ...	Barrow, W. T. C. ...	A. D. Morison ...	No. M.	Harrison ...	Form 911 14.11.30 to 14.1.31 ...	19.1.31
<i>Trecarrell</i> ...	Hunt, D. ...	W. E. McEwan, G. A. Solly, E. Proctor.	" A.	Hain S.S. Co. ...	" 11.12.30 to 8.1.31 ...	11.2.31
005 *† <i>Trematon</i> ...	Mill, C. R. ...	J. Jenkyn, C. M. Quick, E. Stinson, W. B. Paul, T. M. Meakin, R. S. Davies.	M.L.	" " ...	Met. Log. 16.9.29 to 8.3.30... ...	25.3.30
119 *† <i>Trojan Star</i> ...	Griffin, G. A. ...	A. Emerson, L. S. Hassell ...	No. M.	Blue Star ...	Forms 911 & 138 12.8.30 to 13.12.30 ...	6.1.31
245 *† <i>Turakina</i> ...	Laird, J. ...	A. E. Bainforth, H. Smith, J. Gould.	" M.	New Zealand S.S. Co	" " 12.10.30 to 7.2.31 ...	12.2.31
276 †† <i>Tuscania</i> ...	Rome, W. B. ...	J. R. C. Evans, M. J. Case, W. F. Lochead, E. B. Sandon.	W.T.	Anchor... ...	" ...	"
167 *† <i>Tyndareus</i> ...	Findlay, J. ...	" ...	M.L.	A. Holt ...	Form 915 24.6.30 to 2.12.30... ...	3.2.31
<i>Uffington Court</i> ...	Clarke, E. J. ...	E. V. Quickenden ...	No. A.	Haldin & Co. ...	Form 911 29.3.30 to 2.5.30 ...	6.5.30
176 *† <i>Ulysses</i> ...	Owen, R. D., O.B.E.	J. W. Prior ...	W.T.	A. Holt ...	" 1.5.30 to 14.6.30 ...	17.6.30
113 *† <i>Upwey Grange</i> ...	Goodrick, H. P. ...	A. Bradbury, G. T. Hurst ...	No. M.	Houlder ...	Forms 911 & 138 28.9.30 to 5.12.30 ...	9.12.30
039 *† <i>Valacia</i> ...	Gronow, S. ...	J. Kettlewell ...	" M.	Cunard ...	" " 9.5.30 to 19.6.30 ...	5.7.30
292 †† <i>Viceroy of India</i> ...	Ohlson, B. J., D.S.O., R.D., Commr. R.N.R.	A. G. Stansfield... ...	" M.	P. & O. ...	" ...	"
<i>Vigilant</i> ...	Simpson, E. S. S. ...	J. Wilson ...	" A.	Scottish Fishery Bnd.	Form 911 3.1.31 to 31.1.31 ...	4.2.31
206 ** <i>Waioapu</i> ...	Hender, W. H. ...	J. E. Warwick, C. T. Robb, G. M. Cootie.	" M.	Union S.S. Co. of N.Z.	" 16.11.30 to 10.12.30 ...	28.1.31
263 ** <i>Wairuna</i> ...	Stewart, A. R. ...	J. E. Warwick, C. T. Robb, G. M. Cootie.	M.L.	"	Form 915 4.7.30 to 6.10.30 ...	28.11.30
<i>Warfield</i> ...	Steel, R. ...	A. J. K. Collins ...	No. A.	Red Star ...	Form 911 29.10.30 to 9.11.30 ...	20.11.30
060 †† <i>Westernland</i> ...	Trant, A. W., O.B.E.	W. L. Wood, C. Clark ...	W.T.	"	Forms 911 & 138 10.11.30 to 13.12.30 ...	16.12.30
260 *† <i>Westmoreland</i> ...	Reilly, H. E. ...	J. D. Marks, D. Clegg, J. Reeve.	M.L.	Federal... ...	Form 915 21.9.30 to 30.1.31 ...	6.2.31
<i>William Scoresby</i> , R.R.S.	Irving, J. J. C., Lieut. Commr. R.N.	" ...	M.L.	Falkland Islands Government.	" ...	"
<i>Winchester Castle</i> ...	Gardner, G. F., O.B.E., Lieut.-Commr. R.N.R.	" ...	W.T.	Union Castle ...	" ...	"
096 †† <i>Windsor Castle</i> ...	Bickford, C. N. ...	W. S. Byles, E. H. Dixey, J. Traigner.	M.L.	"	Form 915 1.5.30 to 7.9.30 ...	10.9.30
043 ** <i>Zealandic</i> ...	Chave, Sir B., K.B.E.	G. L. Almond ...	W.T.	Shaw, Savill & Albion	Forms 911 & 138 31.10.30 to 4.12.30 ...	10.12.30
<i>Zent</i> ...	Gaskell, J. H., R. D., Lieut. Commr. R.N.R.	" ...	"	"	" ...	"
<i>Conway</i> , H.M.S. ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ...	Cadets' M.L.	"	Cadets' Met. Log. 21.9.30 to 13.12.30 ...	18.12.30
<i>Pangbourne Nautical College</i> ...	Tracy, A. F. G., Commr., R.N.	" ...	"	"	Cadets' Met. Log. 24.9.30 to 16.12.30 ...	20.12.30
<i>Worcester</i> , H.M.S. ...	Steele, G. C., V.C., Lieut.-Commr., R.N.	" ...	"	"	Cadets' Met. Log. 26.9.30 to 17.12.30 ...	19.12.30
<i>Abaco</i> ...	" ...	The Keepers ...	Lighthouse Register.	"	Lighthouse Register 1.7.29 to 31.12.29 ...	24.3.30
<i>Cay Lobos</i> ...	" ...	" ...	"	"	Lighthouse Register 13.11.29 to 23.5.30 ...	26.1.31
<i>Double Headed Shot</i> ...	" ...	" ...	"	"	Lighthouse Register 1.1.30 to 9.6.30 ...	26.1.31
<i>Inagua</i> ...	" ...	" ...	"	"	Lighthouse Register 4.2.30 to 14.8.30 ...	26.1.31
<i>Sombrero</i> ...	" ...	" ...	"	"	Lighthouse Register 1.7.30 to 31.12.30 ...	28.1.31
<i>Watling Island</i> ...	" ...	" ...	"	"	Lighthouse Register 1.1.30 to 30.6.30 ...	26.1.31
<i>Cape Pembroke</i> (Falkland Is.)	" ...	" ...	"	"	Lighthouse Register 1.1.30 to 30.6.30 ...	15.8.30

LIST OF SHIPS CO-OPERATING THROUGH THE METEOROLOGICAL OFFICE WITH THE MINISTRY OF AGRICULTURE AND FISHERIES (FISHERIES LABORATORY, LOWESTOFT) IN THE COLLECTION OF WATER SAMPLES, ETC.

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., received up to 31.1.31.	Date Received.
<i>Dartan</i> ...	Hannaford, W. ...	D. G. Longmuir ...	Leyland	Water Samples ...	16.1.31
<i>Darro</i> ...	Green, J. ...	G. B. Medleycott ...	R.M.S.P. Co. ...	" " ...	23.1.31
<i>Davistan</i> ...	Trickey, J. ...	J. Holman ...	Leyland	" " ...	16.1.31
<i>Dorelian</i> ...	Hugan, C. ...	G. H. Jolly ...	"	" " ...	15.12.30
<i>Hildebrand</i> ...	Buck, R. H., R.D. Commr. R.N.R.	W. H. Cross ...	Booth ...	" " ...	8.1.31
<i>Mercian</i> ...	Hughan, C. ...	W. Parry ...	Leyland	" " ...	7.10.30
<i>Nevisian</i> ...	McCormick, J. ...	T. J. Jones ...	"	Water Samples ...	24.11.30