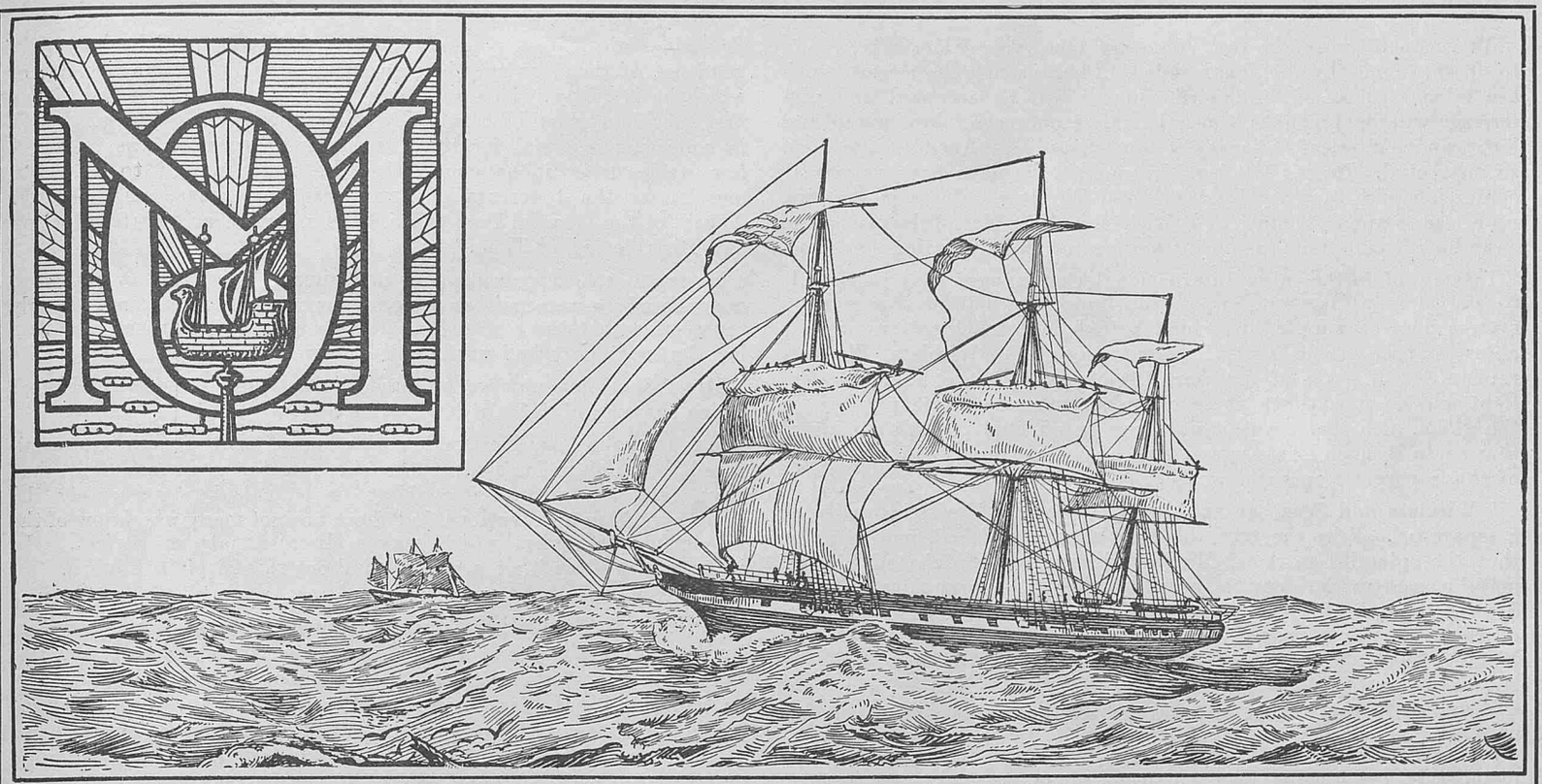


VOL. V. No. 56. THE MARINE OBSERVER. AUGUST, 1928.

TABLE OF PRINCIPAL CONTENTS.

THE "SELECTED SHIP."

Organized British Ship Wireless Weather Telegraphy.

SOME years ago in writing his views upon organization of Ships' Wireless Weather Telegraphy, the late Captain W. M. ISDALE, then Chief Marine Superintendent of the BRITISH INDIA STEAM NAVIGATION COMPANY made use of the words "Selected Ships."

He was commenting upon the suggested principles of a scheme put forward in an article which was published in Volume II, No. 24 (December, 1925), of this Journal entitled "Developments in Wireless and Weather an Aid to Navigation," and his comments, with those of others, will be found on pages 56 and 57 of Volume III, No. 28.

As the practice of Wireless and Weather an Aid to Navigation by use of reported synchronized observations is developed, so what was then evidently desirable is becoming a necessity, i.e., voluntary organization with some limitations, hence the **"Selected Ship"** as at present defined. The words used by Captain ISDALE have become a term.

At present ships in the list of this Journal indicated as having on board a mercurial barometer by the letters M.L., W.T. or M. in the equipment column are "Selected Ships" invited to make routine reports to "All Ships," and though some of these may not have the best type of wireless equipment for the purpose they are generally the most suitable. They are in most cases commanded and officered by the keenest and best Marine Observers afloat and the way in which—despite many difficulties—they do this valuable voluntary work of putting into the ether, Weather reports which may be collected by all ships, is highly creditable.

Now that the principle of the "Selected Ship" is becoming established, it is more than ever desirable that distribution should be the best possible.

With "Work of the Year" in the June Number we gave a Chart showing the position of all "Selected Ships" on June 1st, 1927, a typical day, and since then the distribution has been improved, but there is more to be desired. It will be seen that while the trade routes in the North Atlantic are well covered by "Selected Ships" and the Mediterranean is also suitably covered, there are great stretches of the trade routes across the Southern Ocean and the Pacifics where there are few "Selected Ships."

(2150) Wt. 52—9 1100 & 200 7/28 H. St. G. 4/ 1

As vacancies occur in the Voluntary Observing Fleet List, offers to observe made by the Commanders of ships using the routes which are in most need of "Selected Ships" will be accepted and preference will be given to those having a mercurial barometer and long range Wireless Telegraphy apparatus. All Agents have been so instructed. During the last two months we have been very busy conferring with Marine Observers and Wireless Officers in drawing up a report upon the state of British Ships' Wireless Telegraphy and as to how it can assist in the furtherance of an International scheme.

In view of forthcoming International Conferences it is impossible to say more at present, but we do hope that out of this work a system may be adopted in which British Marine Observers will be able to take their routine observations for Wireless Weather reports in all parts of the world twice daily in the hours of daylight and at such times as synchronize over very large portions of the globe, also that transmission may be effected in such a manner that there is much less wastage than at present and during the hours of single wireless operator watch.

"Wireless and Weather an Aid to Navigation" will be ready as a separate book by the time this Number is published, and in order that the splendid work of Marine Observers in "Selected Ships" may be used to the greatest possible advantage throughout the Sea Service, we ask all members of our Corps to bring this to the notice of their brother officers in the Royal and Merchant Navies and Fishing Fleets.

Information of the First Meridian and Time.

Some months ago, Mr. H. HARRIES, who was for many years a member of the Marine Division, from whom we took over in 1920, and who has devoted his life to studying the interests of Marine Observers, drew our attention to an article in "The Mariners Mirror," the Journal of the SOCIETY of NAUTICAL RESEARCH. The result was a call upon Mr. W. G. PERRIN of that Society, and Admiralty Librarian, who undertook to provide "The Prime Meridian" which appeared in our June Number and in which many will have found most instructive reading. Mr. PERRIN has unique opportunities of obtaining information of great interest to seamen and he has made good use of them, as may be seen in the Journal of his Society, of which he is editor. This article on the history of the fixing of our first meridian should be read by every navigator. Our good luck in collecting material for the THE MARINE OBSERVER was in, for a few weeks later it happened that we were invited to attend a meeting at the INSTITUTE of ELECTRICAL ENGINEERS, when Mr. F. ADDEY, of the General Post Office, gave a lecture on "Determination and Distribution of Time."

It was a well-expressed, clear and simple lecture to an audience, many of whom were neither astronomers nor navigators and our only regret was that there were but four or five seamen there and they for the most part had swallowed the anchor.

Mr. ADDEY has now contributed his article "Greenwich Time," which cannot fail to be of interest at Sea.

We all know the inestimable blessing of time signals communicated by wireless for finding the chronometer error and how they have been the means of enabling us to calculate accurately the Longitude from observations, but there are not many who know of the wonderful mechanism which makes these signals so perfect. In "Greenwich Time" we are told all about this in plain English.

In the first stages of the development of Wireless and Weather as an Aid to Navigation there was much doubt as to the need of timing observations and transmissions by Greenwich Mean Time. There are many at sea who will remember incidents in the early part of the Great War when misunderstandings and mistakes were made owing to the time used for timing the origin of signals; here, as in the need for synchronization of Wireless Weather Telegraphy Observation, may be found convincing proof that Greenwich Mean Time cannot be beaten for the purpose of Wireless Communication, and the advantages of a Fixed Prime Meridian used by all nations for the determination of Longitude at sea are obvious.

MARINE SUPERINTENDENT.

London.
April 30*th*, 1928.

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.

THE TRADE ROUTE ACROSS THE SOUTH PACIFIC BETWEEN PANAMA AND THE PORTS OF AUSTRALASIA.

THE following are further replies to the Marine Superintendent's Note published in Volume V, No. 51, under this heading:—

Lieut.-Commander W. P. Clifton Mogg, R.N.R., Commanding S.S. "Pakeha."

"After trial of various routes to Auckland from Panama it is considered that the Great Circle offers most advantages. No adverse current worth noting has been encountered on this route, although westerly gales are frequently met with when nearing N.Z. as east-going disturbances pass over. The west-going current, which is strongest on the Equator and is crossed near the Galapagos Islands on its course up from the South American coast, is lost to the eastward of Pitcairn, but it is considered that there is a general drift to the west on this route in so far that bottles sent adrift would eventually reach N.Z. or Australia, and, parenthetically, more bottles might be liberated in this area in order to verify these ideas.

"It is established that a current runs up from the Southern Ocean along the east coast of N.Z. with varying force, some of this is turning off to the eastward all the way up to at least 40° S., and will favour a ship at the start of the passage from Wellington to Panama or Cape Horn. To Panama from N.Z. the G.C. track is laid to cross the Equator in 83° W. in order to keep as far as possible to the south of the west-going current without losing too much distance.

"It is remarkable that so little east-going current is met with on the direct course from N.Z. to Cape Horn, except in one place, indeed in high southern latitudes the writer has often found a west-going set, but the only place where a constant current as distinguished from wind drift is to be found in this area in the writer's experience is in the neighbourhood of 120° W. This apparently sets in a N.E'ly direction, and the suggestion is made that this may help to form the cold current known as the Humboldt current.

"There is, of course, the easterly drift to the south of Cape Horn, but this appears to come up from the south not the west, and is always strong on the eastern side. Ice is always to be found on the N.E. side of the Horn in large quantities but rarely seen to the west.

"Whereas a ship can always reckon on a good favouring current all the way from the Cape of Good Hope to Australia, it can safely be said that this factor can be almost ignored between N.Z. and Cape Horn, though it is likely enough that there will be a certain amount of wind-drift after heavy westerly gales.

"The suggestion is made that attention should be turned at an early date to the strong current which is found running to the north from Cape Horn, apparently along the bank of soundings off the coast, at the rate of approximately 30 miles per day as far north as Cape Corrientes, and information is sought as to its further direction and rate, observing that, on at least two occasions, when

steering N.E. along the east coast of the Falklands, no N.E.-going current was observed.

"It is considered that little can be added to the admirable current charts now in use on the main routes, and unstinted praise and the thanks of all mariners are due to the Meteorological Office for the splendid service being rendered by THE MARINE OBSERVER."

Captain D. Urquhart, S.S. "Hertford."

"The old saying is here applicable, 'Different ships, different long splices,' and only by the perusal of the various Meteorological Logs and tabulating of same will definite information be gained re the various currents and winds of that Ocean. At present, some navigators go south looking for the favourable current, some north for fair weather, and some the shortest distance between ports, all having regard for the various shoals and Islands, etc.

"To state briefly, the Tracks taken by myself where I have found generally fair weather, winds and currents:—**Panama to New Zealand:** From C. Mala in Latitude 9° 25′ N., Longitude 79° 46′ W., steer on a Mercator's course for Hoos Island in Latitude 1° 36′ S., Longitude 89° 32′ W. On this leg, except for a month in the late Autumn, you will experience strong favourable sets from between 10-40 miles per day. From the Galapagos, steer on a Great Circle course to your destination. As far as Longitude 140° W. you have the effect of the South American current with you, also fair winds; from then onwards any kind of weather may be experienced, depending on the seasons. **New Zealand to Panama:** From your departure steer a Great Circle course to the Equator in Longitude 83° or 82° W. From thence on a Mercator's course to pass 20 miles off C. Mala. From the Equator to making C. Mala, you will experience a good set, but on making and rounding C. Mala the current sets dead against you, anything from ½ to 2¼ knots, its greatest effect being felt at the change of the Moon.

"I notice in one of THE MARINE OBSERVERS that you propose publishing 'Wireless and Weather an Aid to Navigation' in book form; this, I can assure you, will be a very welcomed addition to a sailor's library."

Captain F. A. Hemming, S.S. "Rimutaka."

"The movement of surface water in the South Pacific is not remarkable either from the point of view of strength of flow or consistency of direction and the vagaries of current would not appear to be directly attributable either to seasonal or observable conditions.

"The main circulation around the area of permanently high atmospheric pressure, in an anti-clockwise direction, is responsible for the general movement in these waters, but this circulation is assisted by the confluence of the South Pacific Connecting Current to the Southward and of the Equatorial, Humboldt and Counter Equatorial Currents to the northward and eastward.

"It would appear that the particular strength and direction of currents experienced along the Panama to New Zealand routes (which cut across the northern half of the general circulatory system) depends mainly upon the relative strengths of the contributory currents just mentioned and as these currents depend for their character upon local conditions prevailing in regions far removed from those under discussion, it is extremely difficult to foretell with any accuracy the rate and direction of their flow.

"A general forecast may, however, be deduced from observations of current experienced during the course of the first two days after leaving Cape Mala as follows:—

"Presence of tide rips to the eastward of the Galapagos Is. and a moderate S.E'ly. set experienced off Cape Mala followed by a weak W.N.W. set after passing the Galapagos is indicative that the Equatorial Counter Current, branching to the S.E. off the Central American Coast, is nearly neutralising the effect of the Humboldt Current flowing approximately N.W. away from the Peruvian coast. The general set after passing the Galapagos will be variable west and south-west and weak in character.

"A strong S.E. set soon after passing Cape Mala turning southerly and south-west on approaching the Galapagos shows that the Equatorial Counter Current is predominating from the northward. Moderately strong S.W. sets will generally be experienced for several days after passing the Galapagos, becoming more southerly and weakening as the 120th meridian is approached.

"A slight S.E., or no set after passing Cape Mala, followed by a slight to moderate W.N.W. set in the vicinity of the Galapagos, indicates that the Humboldt or Peruvian Current is running more strongly than those from the northward and moderate westerly sets, followed by moderate weakening south-westerly sets will be experienced between the Galapagos and the 120th meridian.

"After passing the 120th meridian the currents experienced generally become weak and variable and no reliance can be placed on their movements. After passing Pitcairn the sets are generally easterly, but in any case rarely exceed six miles per day. The reason that currents become weak and unreliable after passing the 120th meridian is no doubt due to the fact that the area of permanent high atmospheric pressure is situated so near to the South American Coast and that after passing this meridian the Panama to New Zealand routes pass out of the region influenced by the anti-clockwise circulatory system around this area."

Captain T. V. Hill, S.S. "Niagara."

"I wish to state that I have no experience of the Panama-New Zealand Route winds or currents, but of recent years only those met with in the Tasman Sea and Pacific routes as followed by our vessels to Vancouver and San Francisco.

"From a position West Is. (Three Kings) bearing 0°, 9½ miles, the course of 268° is steered to Sydney Heads, distance 1,029 miles, and practically no advantage has been found by deviating from this at any time of the year. This route is approximately used by both our full and low powered vessels.

"Apart from sets caused by prevailing winds of considerable duration, which appear to govern to a large extent, currents in the Tasman Sea, I have particularly found that marked differences in the atmospheric pressure covering the surrounding areas through which I have steamed, tend to create noticeable currents travelling in a direction from High to Low pressure areas which have existed practically stationary for some time. A study of weather charts compiled from ship and shore stations is useful in predicting such sets which interfere with the direction of the main currents known in this Sea. A knowledge of a N'ly. or S'ly. set may also be fairly accurately determined by regular observations of the temperature of the sea surface. A fall in reading denoting a set from the S'ward. and vice versa. These observations are of great assistance, especially when nearing the coast of New South Wales. In my opinion, strong E'ly. sets experienced on this route are caused principally by the South Equatorial Current striking the Australian coast and recurving to the Eastward. W'ly. sets are to my knowledge rare.

"From Sydney Heads the Great Circle track is taken to Cook Strait, Farewell Spit lighthouse bearing 196°, 12 miles. This track is not only advantageous owing to the saving in distance, but to the fact of approaching this dangerous corner on a more parallel course and at the same time counteracting N'ly sets usually experienced on this route when nearing the New Zealand coast, also as the prevailing winds in this area are S'ly, a more leeward course is made. These N'ly currents I consider exist from those set up to the southward of the Tasman Sea and change their direction to the southward only when the South Equatorial currents, striking the Australian Coast and recurving to the E'ward are predominant in strength, hence a strong E'ly set experienced by ships on the Sydney—Three Kings route may be taken as a warning that a S'ly or SE'ly set is likely over the western portion of the route from Cook Strait and these days of existing currents being exchanged by wireless, it becomes valuable knowledge to the Navigator.

"Other currents of smaller intensity which I have experienced on these two routes have been, I consider, set up purely by local conditions of wind and atmospheric pressure existing in the surrounding areas, these being of a temporary nature, and it is for the navigator to use the knowledge obtained from other vessels in the same waters to predict an expected set brought about by such conditions.

"Regarding winds on these routes, I have nothing to add to the information already at your disposal collected from Met. Logs, etc.

"Wishing you every success in your splendid task and thanking you for the valuable works received from time to time."

CURRENTS EXPERIENCED FROM C. LEEUWIN TO C. GUARDAFUI.

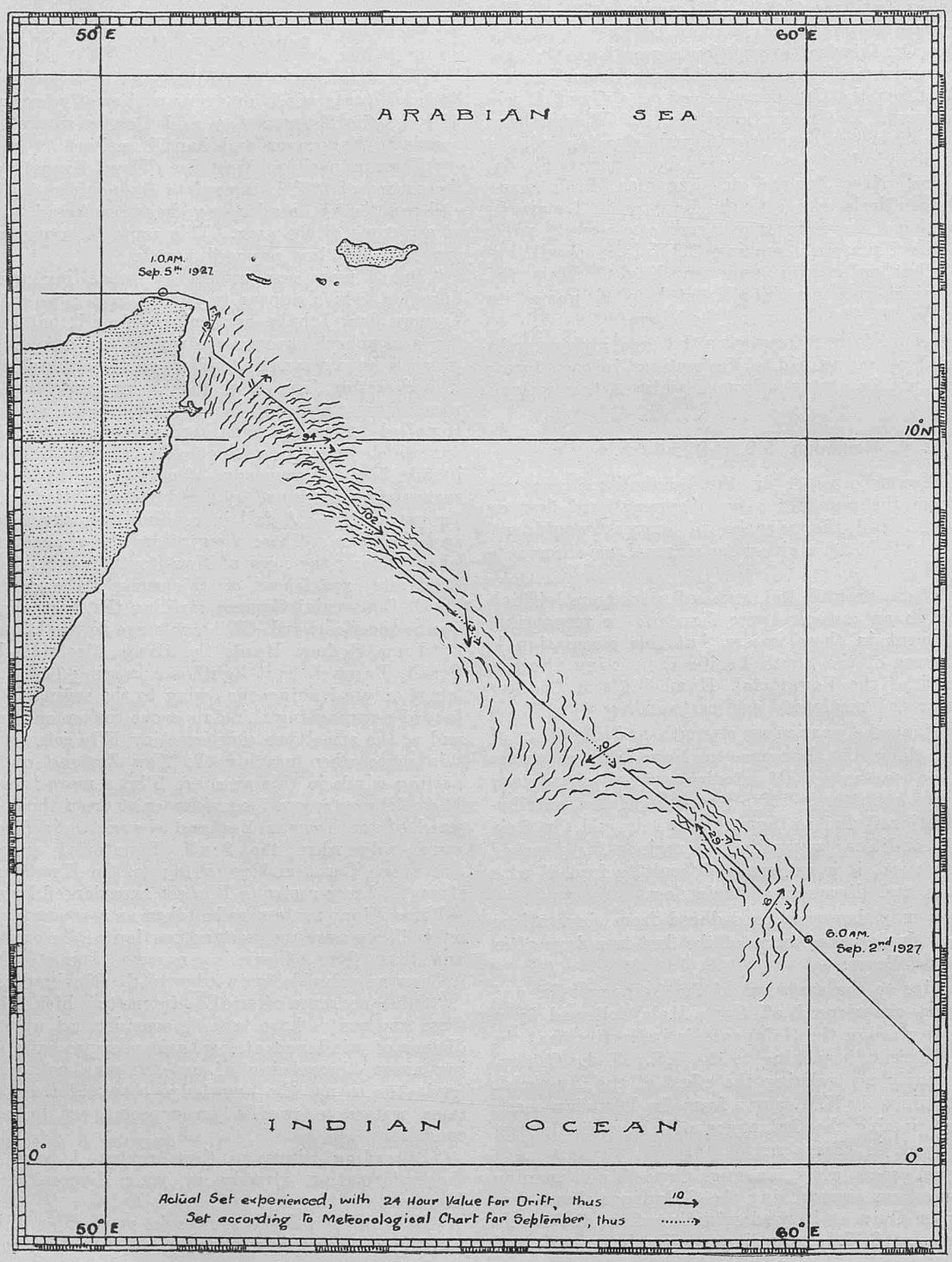
August—September, 1927.

Note accompanying the Meteorological Log of S.S. *Peshawur*, Captain H. G. WILDING:—

"Taking our departure from C. Leeuwin on 20th August, a Great Circle Course was set to a position in Latitude 6° 00′ N., Longitude 52° 00′ E. This track passes 116 miles to the southward of Centurion Bank, Chagos Archipelago. On this course, it was hoped we would be in the Trade Wind drift for a longer time than if we took the northern track. In addition, there was a possible saving of a small distance by Great Circle Sailing. After passing the Chagos, it was intended to steer for a position further north, probably in Latitude 8° 00′ N., Longitude 52° 00′ E., as recommended on Meteorological Charts.

"For the first five days, we experienced weak variable currents. Entering the Tropics in Longitude 91° E, we met a three-quarter knot current setting 320°, but twenty-four hours later we ran into an easterly set of similar strength. From Latitude 18° S., where we had expected to pick up the westerly drift, to the Chagos, we found very weak currents setting roughly east. Thus, since our departure, we had met with none of the normal sets, although the Trade Wind at times reached force 6 and was experienced from 23° S. to 6° S.

"Off the Chagos on August 30th, there was some doubt whether the reflex current indicated on the September Chart as setting east and S.E., in Latitude 9° N., would be established by 2nd or 3rd



September. Should it not be, the only result of steering to the position in Latitude 8° N. would be a loss of 80 miles of distance. Referring to the August Chart, the most suitable course appeared to be one direct for Guardafui, and it was finally decided to steer it.

"With the exception of a north-westerly set in Latitude 4° N., and a south-westerly one in Latitude 6° N., the currents actually encountered agreed with those on the September Chart, and in Latitude 9° N. proved to be stronger than recorded.

"The Sketch Chart shows the currents met with, and those according to the September Chart."

NOTE.—Currents observed in the region of Cape Guardafui may be compared with greater advantage with the Charts given in Volume I, No. 6 of THE MARINE OBSERVER than the Meteorological Charts of the East Indian Seas. The Charts in THE MARINE OBSERVER have been compiled more recently and each arrow represents a resultant calculated from the observations available.

CURRENT.

South Indian Ocean.

THE following is an extract from the Meteorological Log of S.S. *Port Victor*, Captain R. WILLIAMS, Cape Town to Melbourne. Observer, Mr. J. B. WATSON, 3rd Officer:—

"Phenomenal westerly currents experienced after clearing normal limits of Agulhas current (11th August) till the 17th August, 1927, Latitude 39° 57′ S., Longitude 64° 57′ E. During this period only two easterly sets were experienced, as shown in current observations. Similar currents have been experienced by vessels in W/T range on this track (S.S. *Nestor* and *Port Hobart*).

"Weather conditions were unfortunately unfavourable for accurate observations, the horizon usually being badly defined, and there was also some refraction. Most of the fixes and D.R.'s, however, should be accurate to within two or three miles."

ABNORMAL CURRENT OFF TRINIDAD.

West Indies.

CAPTAIN A. BICKER CAARTEN, of the Cable Ship *Henry Holmes*, having heard that the stranding of the Dutch S.S. *Amersfoort*, on Barbuda Island, on 21st September, 1927, was due to abnormal current, calls attention to a report which he made before THE MARINE OBSERVER was established, and when space on the monthly charts did not permit of publishing much useful information received.

The following is an extract from the original letter:—

"I have the honour to draw your attention to two occasions when abnormal currents came to my notice. The first was in August, 1920, when I was Cable Engineer of the Cable Ship *Viking*, under the command of Captain DANIEL, the second on a recent passage from Grenada to Pedernales Bank, Hayti, and back to Grenada.

"On August 31st, 1920, while repairing the Trinidad-Grenada cable, we experienced a westerly set of seven knots. This lasted from about 8 a.m. until 4 p.m. on the same date, gradually slowing down during the night to about three to three and a half knots. The speed of current was estimated from two sets of bearings over a period of half an hour, the engines being stopped at the time, a Mark Buoy having been placed at first position on the following bearings:—

Mount Tucuche, S 27° E.
Mal d'Estomac, S 12½° E.
Hill 1580, S 7½° W.
Chacachacare Lighthouse, S 21½° W.
Penas Point, S 35° W.
Sounding, 80 fathoms, mud."

NOTE.—The currents found on the second occasion referred to by Captain CAARTEN were all embodied in the current charts published in Volume IV, No. 45, of this Journal.

It will be noted that the region in which the abnormal current was experienced on August 31st, 1920, was outside the limits charted, only sufficient observations being available along the main trade routes.

The attention of Marine Observers is invited to the article entitled "Currents in the North Atlantic Ocean," which summarizes the information of these charts, Volume IV, No. 48; and great importance is attached to the current roses on the current charts in THE MARINE OBSERVER, they showing the remarkable variations of the set and drift of ocean currents.

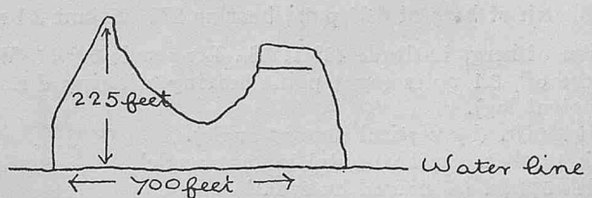
ICEBERGS.

South Atlantic Ocean.

THE following is an extract from the Meteorological Report of S.S. *Mamari*, Captain H. FALCONER, Wellington, New Zealand to London. Observer, Mr. P. CAMPBELL, 3rd Officer:—

"August 5th, 1927, 0508 G.M.T., 0127 A.T.S., Latitude 49° 21′ S., Longitude 53° 38′ W. Struck large iceberg, sustaining considerable damage to bow. Ice apparently extended about 15 miles to westward. Distance it stretched to eastward not known. Weather at time of accident, wind N.W, force 5. Moderate W.N.W. sea. Overcast, clear and very dark. Ice was not visible more than 200 yards at the most. Apparently it was surrounded by an impalpable mist. It disappeared as suddenly, when backing away from it, as it appeared when first seen. From the dead whiteness of the ice left on board it was concluded that the berg was an old one, which would probably add to the difficulty of seeing it. The temperature of the water in the vicinity of the berg was 38° F., no change from temperature of water taken at about half an hour earlier. Ship steering N 30½° E. (T) 12.5 knots.

"August 6th, 1917 G.M.T., 1555 A.T.S., Latitude 48° 20′ S., Longitude 57° 01′ W. Sighted two icebergs, wind west, force 2. Slight sea. Fine clear weather and bright sunshine. It was again noticed how suddenly these bergs became visible. Water temperature 38°, a fall of 1° from previous hour. By a running fix, the smaller of the two icebergs was found to bear west (T), distant 4¼ miles, by sextant, etc., rough dimensions were obtained. Its appearance and size as per diagram. The intervention of darkness prevented the size and position of the other berg being ascertained. It was dome shaped, larger and farther away. It was noticed that as soon as the sun set both bergs disappeared completely, even when one knew where they were."



THE following is an extract from the Meteorological Log of S.S. *Matakana*, Captain H. P. THURSTON, Port Chalmers to Montevideo via Cape Horn. Observer, Mr. J. DICKSON, 3rd Officer:—

"5th August, 1927, in Latitude 52° 43′ S., Longitude 63° 44′ W., at 7 a.m. Received a distress call from S.S. *Mamari*, reporting that she had a collision with an iceberg, in position, Latitude 49° 21′ S., Longitude 53° 38′ W., at 1.30 a.m., August 5th, also that there are many more bergs in vicinity. S.S. *Matakana* then alters course to fall in with *Mamari*.

"Saturday, August 6th, 1927".

"10.30 a.m. In position Latitude 49° 10′ S., Longitude 57° 10′ W., S.S. *Matakana* joins company with S.S. *Mamari*, proceeding slowly northwards to port.

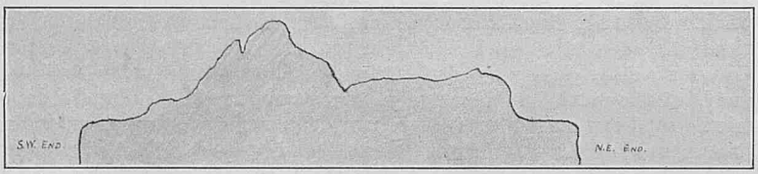
"4.38 p.m. Passed a large iceberg, 260 ft. high, 1,000 ft. long, and about 500 ft. wide, in position, Latitude 48° 17′ S., Longitude 56° 57′ W., bearing 270° 3.1 miles from ship. At 4.15 p.m., when the vessel was to leeward of the berg, the air felt very cold and raw; at that time the following observations were noted:—Temperature, sea surface water 39°, dry bulb 39°, wet bulb 38°, wind N.W., force 3-4. Our Meteorological Log shows that the temperatures of the sea surface water, wet and dry bulb, all fell a few degrees from noon

until 8 p.m., and then rose again, returning to the noon level at 4 a.m. on August 7th.

"4.50 p.m. Passed a large piece of ice just awash, dangerous to navigation, quite a number of such pieces of ice were observed in the vicinity, probably pieces broken off berg previously passed. The above-mentioned berg showed a dark colour, just like a rocky island, before sunset; just after sunset it showed white and snow covered, with parts of the sides a dark blue colour.

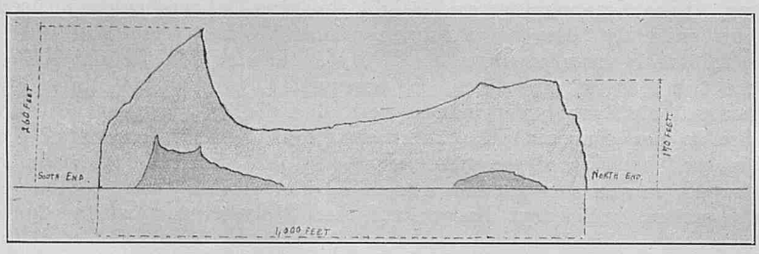
"5.25 p.m. Passed another large iceberg in position, Latitude 48° 09′ S., Longitude 56° 53′ W., bearing 045° about 4.7 miles from ship. As it was rather dark no measurements were obtained, but it appeared to be about the same height as the previous one, and considerably larger, probably about twice as long as the first one. No doubt there were quite a few more bergs in the vicinity, a sharp lookout was maintained throughout the night but no more ice was sighted.

"Sketches of the first berg sighted are reproduced."



1st Sketch of berg at 4.15 p.m., bearing 315° distant about 4.5 miles.

"Wind N.W., Force 3-4
Water 39°
Dry Bulb 39°
Wet Bulb 38°
} Vessel to leeward of the berg.



2nd Sketch of berg at 4.38 p.m., bearing 270° distant 3.1 miles.

"Position of berg, Latitude 48° 17′ S., Longitude 56° 57′ W.
Distance off, 3.1 miles (by 4 point bearing allowing distance run by patent log).
Height 260 ft. (by vertical sextant angle).
Length 1,000 ft. (by horizontal sextant angle).
Breadth 500 ft. (estimated by eye)."

EARTHQUAKE SHOCKS AT ST. THOMAS.

West Indies.

THE following is an extract from the Meteorological Report of C.S. *Henry Holmes*, Captain A. BICKER CAARTEN, at St. Thomas. Observer, Mr. M. A. GREEN, 2nd Officer:—

"In the port of St. Thomas, West Indies, on August 1st, 1927, 6.30 p.m. local M.T., wind dropped from force 4 to calm, sea became smooth, dark and oily looking. Barometer 30.002 inches. Air heavy and depressed. At 8.55 p.m. L.M.T. (August 2nd, 0055 G.M.T.) earthquake tremor. Heavy rumble under the earth, earth trembled, houses shaken, also vessels in harbour. At 8.56 p.m. earthquake subsided. Total period recorded of shock was 1 min. 15 secs.

"This is the worst shock ever known in St. Thomas, as reported.

"St. Thomas, Virgin Isles of U.S.A., August 28th, 1927, 4.0 a.m. (L.M.T.) (0800 G.M.T.). Moderate earthquake, heavy rumble under the ground. Buildings shaken. Total period approximately 1 min. It is as well to notice that earthquake shocks in this Island are becoming more frequent and violent."

CREPUSCULAR RAYS AFTER SUNSET.

North Atlantic.

THE following is an extract from the Meteorological Report of M.V. *Loriga*, Captain E. C. CLAPHAM, Colon to Liverpool. Observer, Mr. R. W. GILL, 3rd Officer:—

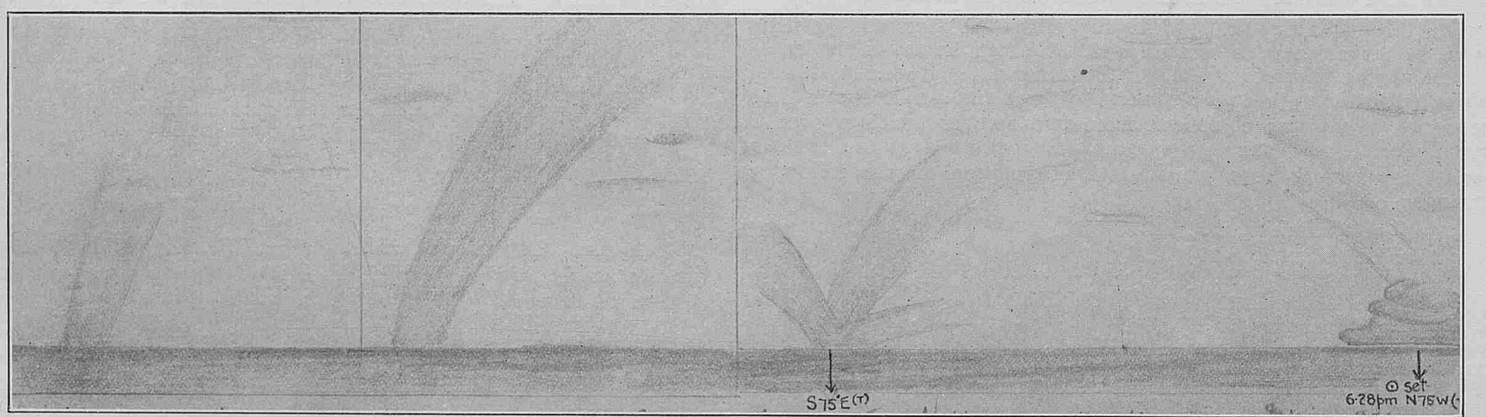
"August 19th, 1927, 2209 (G.M.T.), 6.28 p.m. (A.T.S.). Position by account Latitude 28° 05′ N., Longitude 52° 55′ W. When sun set (behind small Cu. cloud) bearing N. 75° W. (T.) at 6.28 p.m., observed what appeared to be a blue beam or ray of light in an otherwise pink-coloured sky.

"**View 1.**—6.28 p.m. (A.T.S.). As a ray of blue light rising from horizon bearing S 75° E. (true) approximate altitude 75°. Sky in vicinity tinged with pink and light patches of Cirrus.

"**View 2.**—About 6.34 p.m. Ray bending and assuming arc form.

"**View 3.**—Two further segments appearing. Main arc indistinct at its zenith, but visible over small Cumulus cloud, behind which sun had set. Disappeared gradually and at 6.40 p.m., A.T.S., no trace was seen.

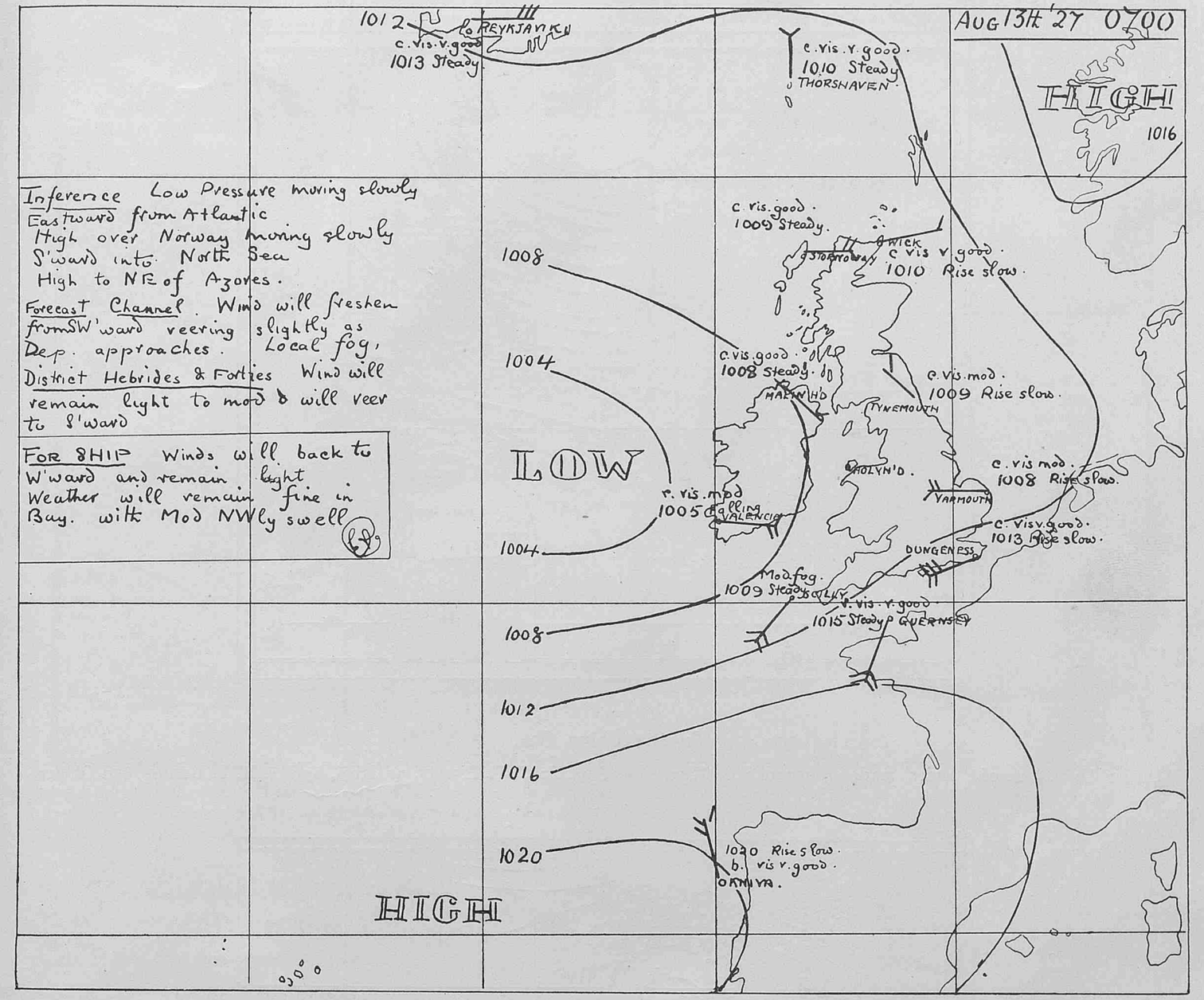
Approximate altitude lower limb of arc at its zenith 45°."



View 1. View 2. View 3.

WEATHER CHARTS MADE AT SEA.

Eastern North Atlantic.



THIS chart is reproduced by tracing from the notebook of Mr. E. A. ALLEN, midshipman S.S. *Khiva*, Captain C. P. COOPER, O.B.E., R.D., R.N.R., Marseilles to London. Although *Khiva* has returned weather charts in her Meteorological Log drawn by her principal observing officer, Mr. G. W. WOOD, we reproduce on this occasion this chart drawn by one of her midshipmen with a view to giving special encouragement to these young officers upon whom so much depends in the future.

Mr. ALLEN received his first training and instruction in H.M.S. *Worcester*, Thames Nautical Training College, and was examined in Marine Meteorology by the Marine Superintendent with a number of *Worcester* Cadets in 1925.

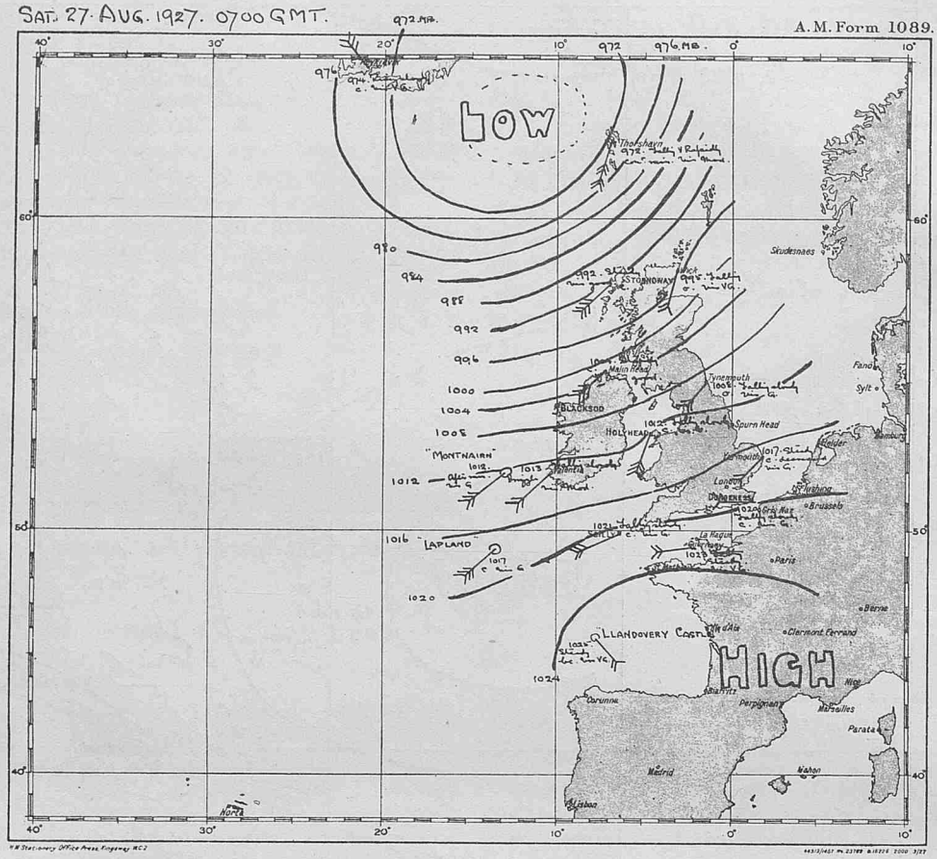
Midshipmen and apprentices are advised to ask the officer of the watch for copies of routine weather reports received from " Selected Ships " when at sea. By so doing they will be able to practise wireless and weather an aid to navigation and thus prepare themselves for the voluntary duties of principal observing officer when their time comes.

According to the Meteorological Log of S.S. *Khiva* the wind backed to S.W., force 4, during the evening of the 13th, with a moderate N.W. to westerly swell. Weather remained fine until 0230 of the 14th, when fine rain commenced to fall, with occasional poor visibility.

All who practise wireless and weather an aid to navigation are advised to concentrate upon endeavouring to make reliable forecasts for the next 24 hours for their own ship, allowing for the difference of position as the ship proceeds on her course. It may be found to be helpful if the officers who make charts and forecasts will report to the Captain as soon as possible and obtain his initial with the time upon the chart. They will then have his authority as to the forecast being genuine and that it has not been written up subsequently.

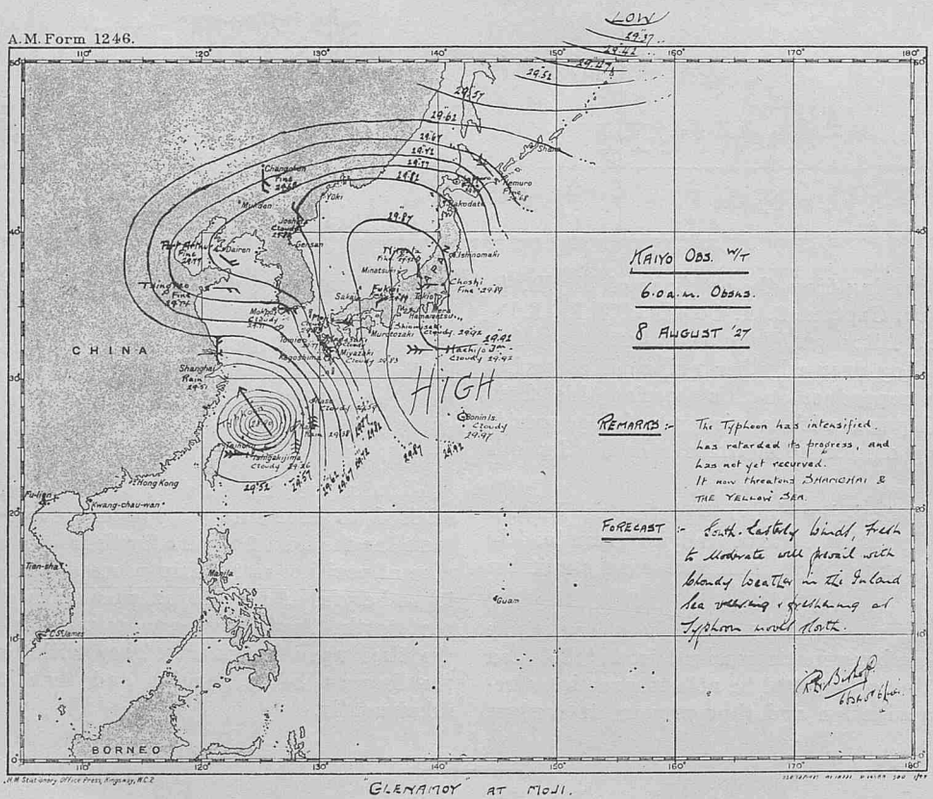
Eastern North Atlantic (*continued*).

Weather Chart (one of a series) made at sea on board S.S. *Llandovery Castle*, Captain G. OWENS, London to Cape Town, by Lieutenant C. H. WILLIAMS, R.N.R., 2nd Officer.



In the China Sea.

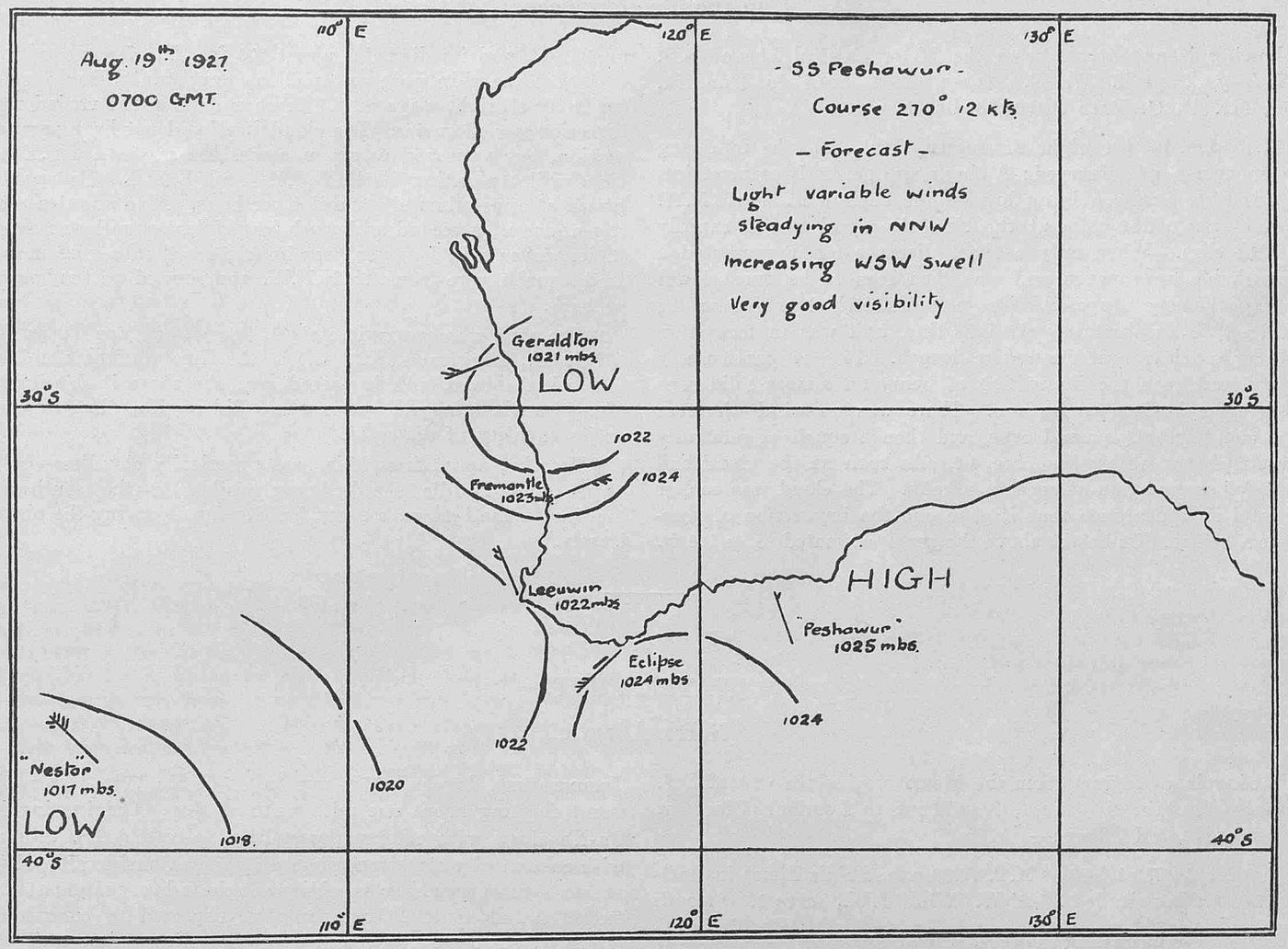
Weather Chart (one of a series) made on board S.S. *Glenamoy*, Captain C. E. HOMAN, at Moji, by Mr. R. L. BISHOP, 3rd Officer.



GLENAMOY AT MOJI.

In Australian Waters.

Weather Chart made at sea on board S.S. *Peshawur*, Captain H. G. WILDING, Adelaide to Suez, by Mr. J. K. CRONE.



According to *Peshawur's* Meteorological Log, the wind had backed to N.W., force 3, by 4 a.m. (A.T.S.) of the 20th. A moderate to heavy S.W. swell was experienced. Exceptional visibility from 8 a.m. 20th August onwards.

THUNDERBOLT.

Canton River.

Compasses Affected.

THE following is reported by Captain ALEX CAMPBELL, S.S. *Sai On*:—

"At 0.50 p.m., on August 2nd, 1927, whilst steaming across the mouth of Deep Bay and having Black Point 2 points on our port bow, a thunderbolt fell on our port beam, and on striking the water burst with a terrific report.

"It was about 100 yards from the ship when it struck the water, and after the ship had ceased to vibrate we found the standard compass with an error of 2 points left and the steering compass 1 point left. Before this occurrence they were correct."

The HARBOUR MASTER, Hong Kong, obtained the following additional particulars from Captain CAMPBELL:—

"There are absolutely no signs of the ship having been struck.

"The course at the time was S.E. ½ S.

"The deviation introduced was westerly in the N. semicircle and easterly in the south.

"The error appears to be permanent and it will be necessary to re-adjust his compasses."

NOTE.—The phenomenon observed by S.S. *Sai On* was probably a case of ball lightning. This form of lightning appears as a luminous ball or mass. Occasionally the ball has been observed to fall to the earth's surface and run along the ground, sometimes entering a house by an open window. While much rarer than the ordinary lightning discharge it has been observed many times. Sometimes the ball disappears noiselessly; at other times as in the present instance it bursts with a loud report.

UNUSUAL FORM OF LIGHTNING.

West Indies.

THE following is an extract from the Meteorological Report of S.S. *Inkum*, Captain J. T. MEETHAN, Hamburg to Pensacola. Observer, Mr. H. JACKSON, 3rd Officer:—

"On Thursday, August 18th, 1927, at 7.15 p.m., a rather unusual spectacle presented itself when steaming to the westward, three miles south of the Abaco light (Latitude 25° 51′ N., Longitude 77° 11′ W.), on running out of a heavy shower of rain, the horizon to the S.W. having been ablaze with sheet lightning all the evening, again became visible and the lightning with greater play and intensity. Out of the centre of this silent confusion of light one thin streak of lightning was seen to emerge, shooting up the sky in a perfectly straight line until apparently right overhead, and then scattering at the extremity like a rocket. Unlike the usual fork lightning, it was not blinding, and gave the impression of being decidedly sluggish in its upward path."

SQUALL WITH ROLL CUMULUS CLOUD.

In the Mediterranean.

THE following is an extract from the Meteorological Log of S.S. *Port Sydney*, Captain W. G. HIGGS, Port Said to Dunkirk. Observer, Mr. H. G. BOYS SMITH, 3rd Officer.

"At 11.15 p.m. on the night of August 11th, 1927, the following cloud phenomenon was observed: A single and perfectly symmetrical roll of Cumulus was seen lying low on the horizon to the N.N.W. Although it was a flat calm at the time the cloud moved rapidly towards the ship. When only a short distance off it presented a very remarkable appearance and was then seen to be much lower than was previously supposed. The cloud stretched as far as the eye could see in an absolutely straight line, and was in formation perfectly cylindrical over its entire length. It was particularly hard-edged and gave the impression of being an almost solid rope stretching from horizon to horizon. There was no wind whatever until the cloud actually passed over, and then a squall of relatively cool air struck the ship with force 4-5. As soon as the cloud had passed it fell away again at once to a calm. The cloud was so low and so solid in appearance that it gave one the impression of passing under a bridge. Its height above the sea I estimated to be 150 ft. or 200 ft., and its diameter about 500 ft. The few seconds whilst it was over the ship gave an excellent opportunity for observing its perfectly straight alignment. From end to end it varied neither in direction nor diameter. The cloud itself did not have any revolving motion, but appeared to sweep across the sea in a S.S.E'ly. direction whilst pointing itself W.S.W. and E.N.E. Its speed I estimated at approximately 20 miles per hour. Five minutes after passing under it, a second and much less violent squall was experienced in its wake; this, however, was little more than a gust in duration. Both squalls were from the N.N.W. and showed no tendency to veer or back.

"The ship was approximately 15′ north of Cape Tenez (Latitude 36° 33′ N., Longitude 1° 22′ E.) at the time and the cloud was seen to reach the land. As it passed over the shore it developed waves along its whole length, but nowhere did it either lose its continuity or its equality of diameter.

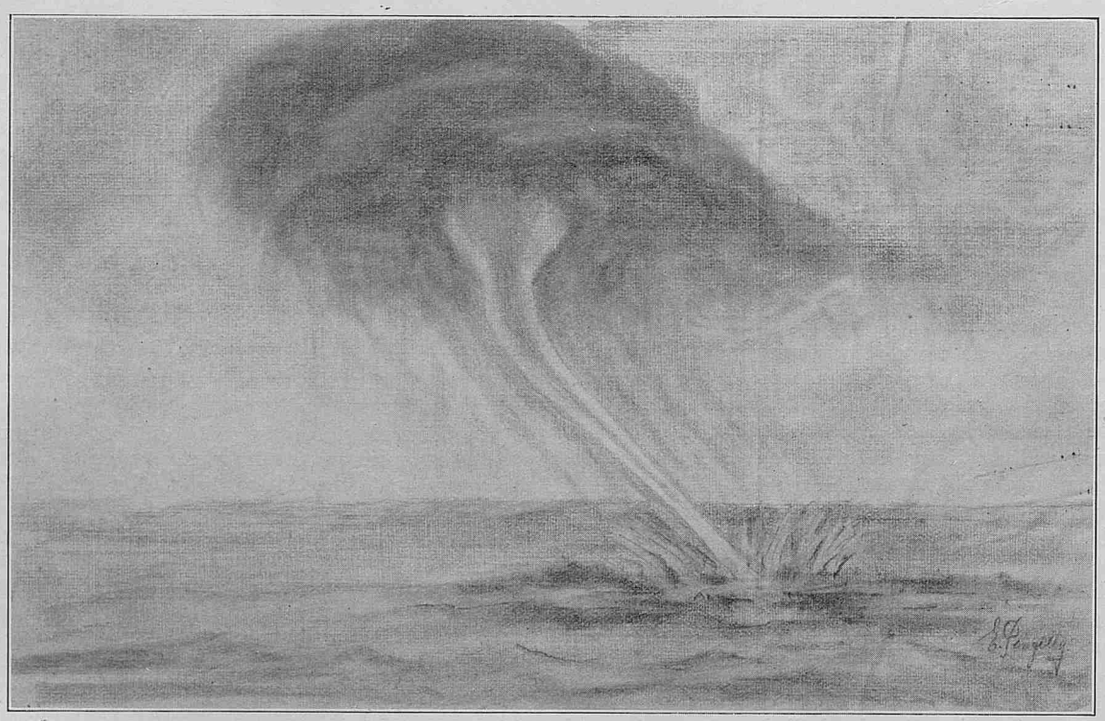
"The sky, apart from this, was practically cloudless—only a few upper and middle clouds being visible to the southward—and brilliant moonlight gave every facility for observing the phenomenon closely."

WATERSPOUT.

North Atlantic.

THE following is an extract from the Meteorological Report of S.S. *Minnewaska*, Captain F. CLARET, New York to London. Observer, Mr. E. PENGELLY, 3rd Officer:—

"August 1st, 1927, at 0930 G.M.T. (5.30 a.m. Ship's Time) in Latitude 40° 22′ N., Longitude 57° 48′ W. Wind S.W., force 1. Smooth sea. Occasional light passing showers. Cloud amount 5, $\frac{\text{Cu. Cu-Nb.}}{\text{S.E.}}$ 1. Temperature, dry bulb 77°, wet bulb 73°, sea 77°. Observed waterspout forming about one mile south of ship. Originating in heavy Cu-Nb cloud with column descending, joining a few minutes later with column of water from surface of sea. Considerable disturbance at base, spout assuming an oblique angle and very attenuated. Phenomenon lasted about 15 minutes and dispersed by column dividing laterally, cloud ascending and water becoming quiescent."



PARTIAL WATERSPOUT AT NAURU ISLAND, PACIFIC OCEAN.

THE following is an extract from the Meteorological Report of S.S. *Wonganella*, Captain H. SUFFERN, Australia to Central Pacific Islands. *Observer*, Mr. G. F. PHILLIPS:—

"August 13th, 1927, 5 p.m., at Nauru. Observed waterspout begin to form about 5' W. of ship which was moored to No. 1 buoy.

"As nearly as one could judge at that distance, it was 100 ft. diameter at the base and showed as a definitely cut circle of spray on the water about (perspectively) twice its own diameter, inside the horizon.

"I thought its rotary motion was clockwise, but am not certain of this.

"Spinning continually, it rose to a height of perhaps 400 ft., the diameter increasing with height till the top of the whirl was about twice the diameter of the base which did not vary.

"There was no sign of a spout descending from the heavy Cu-Nb above it and the base seemed stationary.

"It reached its greatest height at 5.7 p.m., then subsided rapidly, all movement ceasing at 5.10 p.m.

"The weather conditions were as follows at 5.3 p.m.:—barometer 29.717 in, temperature air 86°, sea 84°. Wind E. by S., force 1-2 since 9.30 a.m., no sea, and only very slight swell, apparently from S.S.E.

"$\frac{\text{Cu-Nb}}{\text{E by S}}$1 heavy mountainous mass at S.S.E. moving W. on horizon and probably raining beyond it; a heavy mass at N., which previously passed over ship without rain or other disturbance till, when near W. horizon it commenced to rain heavily in a sharply defined local shower near southern edge of cloud from 4.40 to 5.55 p.m.

"The waterspout formed a little to N.E. of rain. The N-S. length of this cloud was a full 3 hands, while the rain shower was only about 2 fingers wide."

GREENWICH TIME.

By F. ADDEY, B.Sc., F.R.A.S., M.I.E.E.

No one who has to do with navigation needs to be reminded of the importance of Greenwich time. Without his chronometers telling him the time at Greenwich, the navigator would experience very great difficulty in finding the position of his ship. The chronometers of course, have to be checked at intervals, either by astronomical observations made on shore by the navigator himself, or, more usually, by time signals, such as time balls or time guns, controlled by astronomical observatories. In recent years such visual or audible signals have been largely superseded by wireless time signals, and to-day a ship in any part of the world can receive every day one or more observatory time signals emitted through high power wireless stations.

But although the importance of these facilities for checking the chronometers is fully recognised, there are probably few officers of the Merchant Navy who know anything of the organisation behind the time signals with which they are familiar, and the accuracy of which they take for granted.

In the following article an attempt is made to throw a little light behind the scenes and to show how Greenwich time is first determined at the observatory and then distributed for the use of Seamen.

In order to measure the passage of time we make use of some body in steady motion, and we determine equal intervals of time by equal distances moved through by the body. The earth rotating on its axis is the most steadily moving body which is easily available to us for this purpose, and it is accordingly adopted as our fundamental timepiece.

The period of time taken by the earth to make one complete rotation, or the period of time which elapses between the instant when a star is due south at a place, and the instant when the same star is next due south at the same place, is taken as the fundamental unit of time, and is called a "sidereal day".

The sidereal day would, however, not be suitable as a unit of time for everyday life, because we have to regulate our lives by the sun. If at the begnning of the year, say, we agreed to start reckoning our sidereal days from a star which happened then to be in line with the sun (so that sidereal noon and solar noon coincided), six months later we should find that sidereal noon coincided with solar midnight, because the earth, having passed over half its annual journey round the sun, would now have the star and sun on opposite sides of it instead of their being in the same line.

In one year the earth makes $366\frac{1}{4}$ complete rotations on its axis, that is, there are in a year, $366\frac{1}{4}$ sidereal days. These are measured by the apparent movement of a selected star round the earth from east to west.

Owing to the motion of the earth round the sun, the sun appears in a year to make one revolution round the earth from west to east. Thus the total number of times the sun appears to move round the earth from east to west, due to the rotation of the earth on its axis, is one less than the corresponding number for a star, or the number of solar days in a year is $365\frac{1}{4}$.

For our daily life the period which elapses between two successive southings of the sun, called a "solar day", is used as the basis of our system of time reckoning. The solar day is always longer than the sidereal day, the difference being a little less than four minutes. The solar day is the longer because the earth is moving round the sun as well as rotating on its axis. If at a given instant the sun and a star are, for some place on the earth's surface, both due south, the star will again be due south at the same place when the earth has completed exactly one revolution. The star is so far away that the motion of the earth in its orbit while it is making the one rotation on its axis makes no difference to the apparent position of the star. But because the earth has moved forward a certain distance in its orbit while it has been making the rotation on its axis it will have to turn through a little more than one complete rotation in order to bring the sun once more due south at the place considered.

Another way of looking at the matter is as follows: Because of the movement of the earth round the sun, the sun appears to move round the earth, from west to east. Therefore if on a certain day the sun and a star happen to be due south together, the next day the star will be south before the sun, because the sun will have apparently moved a little to the eastward of the star during the preceding day.

The difference between sidereal days and solar days is not, however, uniform throughout the year. As has just been explained, this difference is due to the displacement of the earth in its orbit, or the apparent eastward displacement of the sun among the stars. But the speed of the orbital motion of the earth is not uniform. The shape of the orbit is an ellipse with the sun at one of the foci. When the earth is in the part of its orbit near the sun it moves more quickly than it does when it is in the more distant portion of its orbit. Owing to this varying speed of the earth in its orbit the amount which the earth moves forward in a day, or the amount by which the sun apparently moves round the earth from west to east, also varies, and consequently the extra amount which the earth has to turn on its axis beyond one complete rotation in order to present the same place to the sun varies correspondingly. Thus the length of the solar day is not constant.

But even if the earth's orbit were circular, so that its speed round the sun were uniform; the length of the solar day would still not be constant. The axis of the earth is inclined to the plane of its orbit, so that as the earth goes round the sun, the sun does not appear to go round the earth along a path exactly above the earth's equator, the so-called "celestial equator", but to follow a path which is inclined to the equator, being north of the equator from April to September, and south of the equator from October to

March. It can be shown by simple spherical geometry that the motion of the sun in this inclined path would make successive solar days vary in length, even if the apparent speed of the sun around the earth were uniform.

The combined result of the two causes mentioned above is to make solar days sometimes longer and sometimes shorter than the average. The length of the average solar day is the time unit which is used for everyday life. Time reckoned on this basis is called " mean solar time ", and if the place on the earth's surface which we have in mind when we are considering the successive southings of the sun happens to be Greenwich, then the time so determined is known as " Greenwich Mean Time ".

The difference on any particular day between solar time and mean time is called the " equation of time ". The value of the equation of time is given in almanacks, and is sometimes marked on sundials, so that the time shown by a sundial, which is the solar time at the place, can be converted into the local mean time.

For fundamental time determinations, as mentioned above, the sidereal day is used. This is because a star can be observed more accurately than the sun, observations can be made on many stars and so one observation can be checked against another, and the complications due to the varying length of the solar day are avoided.

Some star or its equivalent has to be selected which, when it is due south, shall indicate the commencement of the sidereal day. There is no actual star chosen for this purpose, but, instead, that point on the sky is used where the apparent path of the sun during the year crosses the celestial equator from south to north, that is, the point where the sun is situated on the the 21st March. The position of any star with reference to this point can always be determined, so that the sidereal time at which any particular star will be due south, reckoning zero time as the time of southing of the standard point mentioned above, is known. Thus by observing the southing of the stars the true sidereal time can be determined,

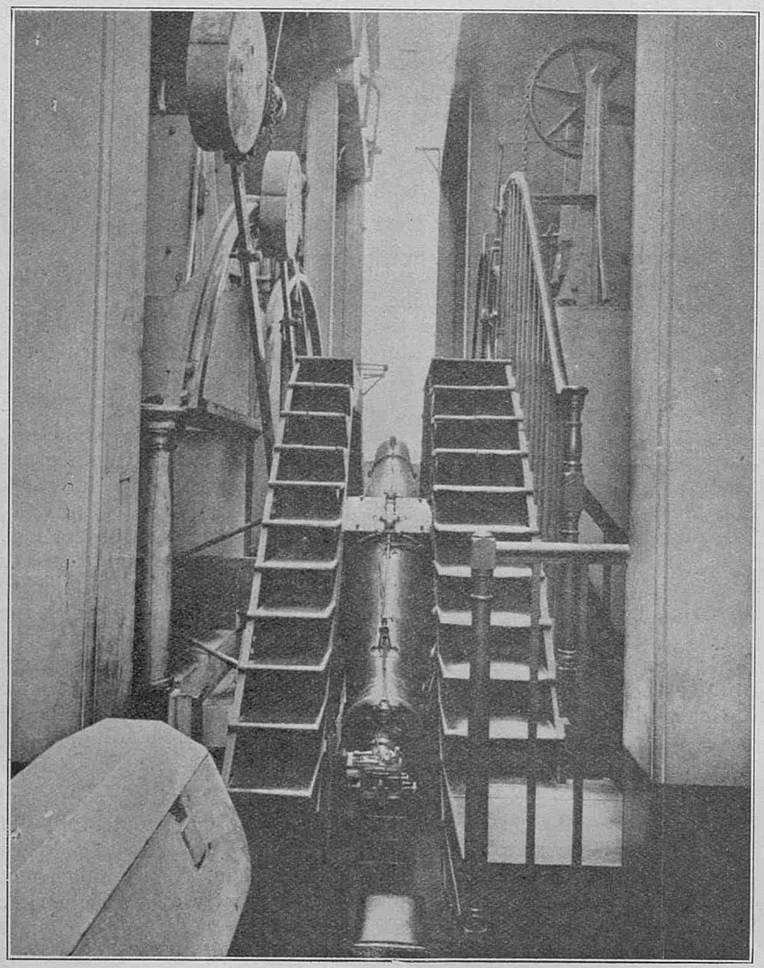


Figure 1.—Transit telescope, Greenwich Observatory.

and so the error of the observatory clock, the amount by which it is fast or slow, can be found.

The observations are made at Greenwich with a telescope of eight inches aperture mounted so that it can be moved up or down, but cannot deviate from the north-south direction, that is, from the plane of the meridian (FIGURE 1). The eyepiece of this telescope is provided with a number of vertical cross wires. The telescope is set to the correct elevation for the particular star to be observed, and then, as the star passes across the field of the telescope due to its apparent diurnal motion from east to west, the times shown by the observatory clock when the star crosses each of the cross wires are noted. The correct sidereal time of crossing each wire is known by calculation, and so the clock error is determined.

Up to a few years ago the method used for carrying out this comparison between the clock and the stars was for the observer to signal to a recording instrument, called a chronograph, by pressing a key at the instant of transit across each wire. The chronograph (FIGURE 2) consists of a slowly rotating drum covered with paper. As the drum turns, a pen, pressing on its surface, is slowly moved along its length by means of a screw, so that a spiral line is traced on the paper. This pen is moved sideways by an electromagnet when the observer presses the key, so that the transits of the stars across the wires are recorded by displacements of the line. The observatory clock is also connected to the same electromagnet, and records its seconds in the same way. A special signal, sent by the clock at the exact minutes, enables the clock time corresponding to any particular second mark to be determined. Thus by afterwards examining the chronograph record the clock signals can be very accurately compared with the star signals.

This method has, however, the serious defect that different observers differ in their judgment as to the exact instant when a transit occurs. Some observers always signal a little too soon, others always a little too late. To eliminate the difficulties introduced by this " personal equation," as it is called, the " impersonal micrometer " was devised, and is now used at all important observatories. In this instrument only a single vertical wire is used. This wire is not fixed, but can be moved from one side to the other of the field of the telescope by means of a screw. As soon as the star comes into the field the observer brings the cross wire into coincidence with it, and by turning the screw keeps the wire in coincidence with the star during its passage through the field.

A wheel, carrying certain electrical contacts, is geared to the screw by which the wire is moved, and a spring pressing on the edge of this wheel touches one or other of the contacts when the cross wire reaches known positions in the field—the positions in which the fixed cross wires would have been situated in the earlier arrangement. Thus the closing of these contacts corresponds to the signalling by the key of the transits of the star across the fixed cross wires, but the contacts are made automatically, in fact, the observer is not aware when a contact is made. The contacts signal to the chronograph and cause the ink line to be displaced, as already described.

By the impersonal micrometer the errors due to the varying personal equations of different observers are almost entirely eliminated.

The determination of the error of the observatory clock at the time when the observations are made would be of little use if the clock itself did not run regularly. By star observations made at different times the rate at which the clock is gaining or losing can be determined. If this rate remains steady the correct time at any instant can be obtained by applying the necessary correction to the time actually shown by the clock. The utmost ingenuity of clockmakers has accordingly been exerted to produce a clock of which the rate will be constant. There is no need for the clock to keep exact time, in fact, no clock ever does so, but the amount it gains or loses per day must be as uniform as possible.

The standard sidereal clock at Greenwich Observatory is one of the " free pendulum " clocks devised by Mr. SHORTT and manufactured by the SYNCHRONOME COMPANY. This clock is a development of the " Synchronome " clock invented by Mr. HOPE-JONES, (FIGURE 3). In the Synchronome clock an L-shaped lever G, pivotted at F and normally held up by a catch K, is released every half minute by an arm D carried on the spindle of a toothed

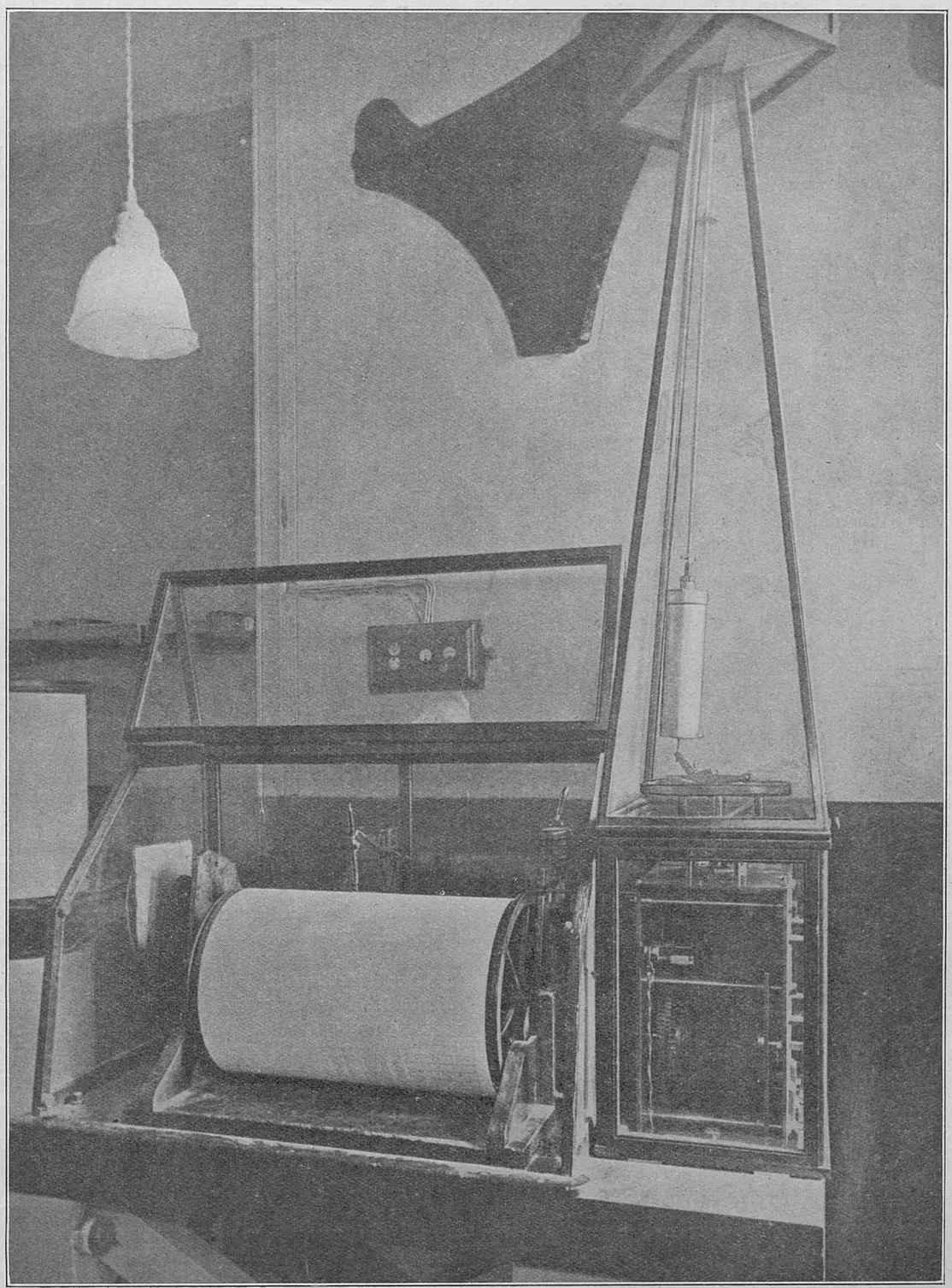


Figure 2.—Chronograph, Greenwich Observatory.

wheel C. This wheel is pulled forward one tooth at each swing of the pendulum to the right by means of the gathering spring B fixed to the pendulum P. When the lever G is released, which occurs as the pendulum is moving to the right through the middle of its swing, a roller R carried on the lever runs down the sloping end of an arm carried on the pendulum rod, and so gives the pendulum an impulse which maintains its oscillations for the next half minute. Immediately after this had been done the extremity of the short arm of the lever G touches a contact screw carried on the end of the arm A. This arm also carries the armature of the electromagnet M. It is normally held over to the right by the spring which can be seen under the magnet. When the lever touches the contact screw a circuit is closed from an external battery through the lever G, the arm A and the electromagnet M. The magnet is energised, its armature is attracted, and the lever G is thrown up into its original position, where it is held by the catch K. The short arm of the lever G is thrown clear of the contact screw, the circuit is broken, and the arm A returns to its position of rest. This arrangement is called a "remontoir."

The work which the pendulum has to do in pulling round the wheel C to bring about the periodic release of the remontoir prevents the pendulum from swinging absolutely freely, and so interferes with its exact time-keeping functions.

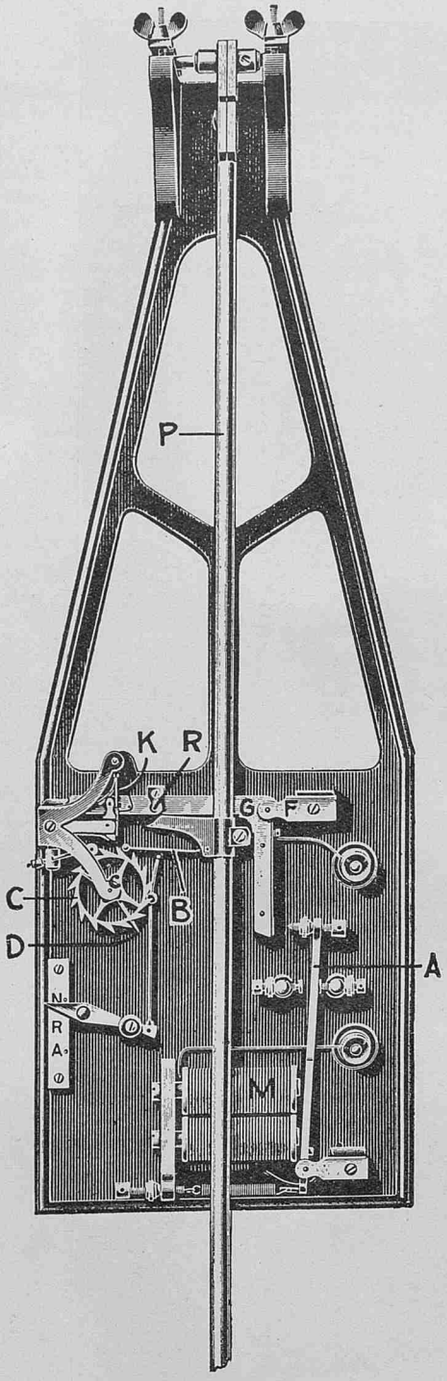


Figure 3.—Remontoir mechanism of Synchronome clock.

To overcome this drawback, Mr. SHORTT conceived the idea of separating the time-keeping duty from that of actuating the remontoir. The principle of his method is shown in FIGURE 4. He provides two pendulums instead of a single one. One of these pendulums, known as the "master" or "free" pendulum, has no work whatever to do, except to continue swinging as regularly as possible. It receives an impulse each half minute from a remontoir, but it does not release this remontoir itself. A second pendulum, known as the "slave" pendulum, performs all the function of working the remontoir mechanism. At each half minute the slave pendulum releases its own remontoir, as explained above. The restoring current, in addition to passing through the lever G, the arm A and the electromagnet M of the slave clock, also passes through the electromagnet E. The arm which carries the armature of this electromagnet also carries the catch K which holds up the remontoir lever G of the free pendulum. Thus when the remontoir of the slave clock is actuated the remontoir of the free pendulum is released.

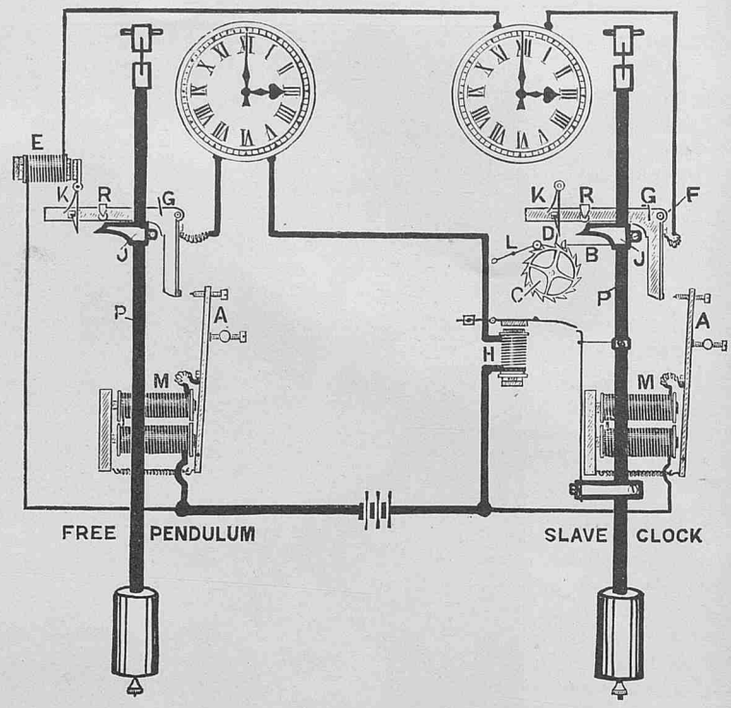


Figure 4.—Principle of Shortt, Free Pendulum system.

The latter remontoir, however, does not actually drop until the free pendulum is at that point of its swing where the roller R can slide down the inclined face of the arm J. Thus the instant at which the remontoir lever of the free pendulum shall drop is definitely under the control of the free pendulum itself. When it does drop the contact which is subsequently closed to bring about its restoration to its position of rest also sends a current through the electromagnet H. The armature of this electromagnet is mounted on a lever, the end of which, slightly curved downwards, normally just clears the upper end of a long spring fixed to a block carried on the rod of the slave pendulum. This spring is prevented from springing too far to the left by a catch which is also fixed to the pendulum rod. The arrangements are such that the slave pendulum is actually swinging to the left when the contact of the free pendulum remontoir arrangement, which is rather more complicated than is shown in the simplified diagram, is closed. If the slave pendulum is keeping correct time the top of the long spring just mentioned will have passed under the end of the arm carrying the armature of the electromagnet H before this arm is depressed. But if the slave pendulum has fallen a little behind the free pendulum the armature of the electromagnet H will have been depressed before the long spring reaches the end of the armature lever. The end of this lever will then catch the top of the long spring and will bend it to the right as the pendulum completes its swing to the left. On its return swing the pendulum will receive an impulse from the pressure of the spring on the end of the armature lever, which will accelerate its motion. The slave pendulum is definitely arranged to lose slightly, and the correcting device just described accelerates it sufficiently to keep it in step with the master pendulum.

In order to make its motion as free as possible, the master pendulum is enclosed in a cylinder from which most of the air has been removed. The pressure of the residual air is only about 1 in. of mercury.

At Greenwich Observatory the master pendulum (FIGURE 5) is placed in an underground chamber, a relic of the old castle which previously occupied the site, and the temperature of this chamber is maintained as uniform as possible.

The rate of the SHORTT free pendulum clock is so constant that, whereas with the sidereal clock previously in use it would have been unsafe to go more than a week without checking the clock with the stars, it would now be possible to go for two or three months without a check, and still to know the correct time. Of course, the clock

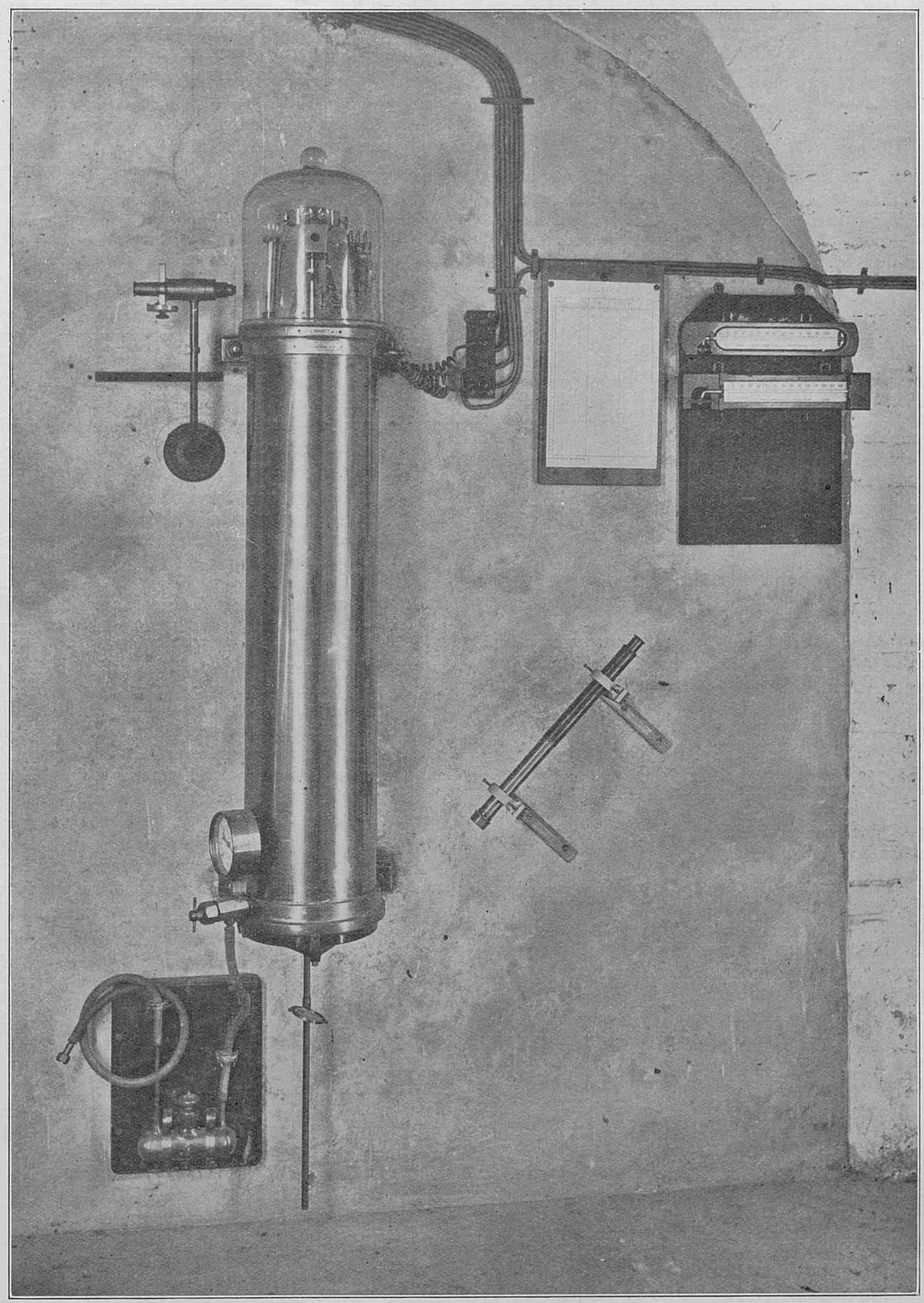


Figure 5.—Standard sidereal clock, Greenwich Observatory.

is never allowed to go unchecked for such a long period. A number of star observations are made every clear night, but cloudy weather may sometimes last for several successive days, and it is then that the advantages become manifest of having a clock which can be relied on to run steadily over a considerable period.

As already explained, the time used in everyday life is not sidereal time, but mean solar time—in this country Greenwich mean time. The sidereal clock can be any amount wrong, its error is constantly determined and allowed for, but the mean time supplied from Greenwich must be as accurate as possible.

It is necessary, therefore, not only at frequent intervals to determine the error of the standard mean time clock at Greenwich, but also to have some means of correcting this error, so that the clock shall show correct time.

The error is determined by comparing the standard mean time clock with the standard sidereal clock. It has already been explained that the number of sidereal days in a year is one more than the number of solar days. The sidereal clock thus gains on the solar clock 1 day in $365\frac{1}{4}$ solar days or 1 second in $365\frac{1}{4}$ seconds. This is approximately 1 second in 360 seconds or six

minutes. Hence every six minutes the sidereal and solar clocks get into step with one another, and tick together, while halfway between these periods of coincidence they are half a second out of step.

The comparison between the two clocks is made by noting the times which they indicate when they are in step. They then differ by an exact number of seconds, so that fractions of a second do not have to be estimated.

It is therefore known that a certain indication of the mean time clock corresponds with a certain indication of the sidereal clock. The error of the latter is calculated from the star observations and the known rate of the clock. Thus the true sidereal time corresponding to the observed indication of the mean time clock is known. It is an easy calculation to convert the true sidereal time into true mean time. When this is done the true mean time corresponding to the observed indication of the mean time clock is known, and the amount by which this clock is in error is accordingly determined.

Fixed to the pendulum of the mean time clock is a magnet, the poles of which move over the ends of two coils of wire. By sending a current of electricity through these coils in one direction or the other the force exerted on the moving magnet can be either added to or subtracted from the force of gravity. In the former case the pendulum is accelerated and in the latter case it is retarded.

The length of time during which a current of given strength has to be sent through the coils to produce any desired correction in the time indicated by the clock is known. Thus when its error has been determined the clock can at once be adjusted to show correct mean time. This correction is carried out before the transmission of every important time signal.

The mean time clock at Greenwich controls several electrical circuits. It drives the large twenty-four hour public clock placed in the Observatory wall by the main entrance. It sends a time signal once an hour to the Central Telegraph Office. This is used to synchronise clocks and to ring time gongs both inside the office and at the premises of subscribers to the time service. It also sends signals to the British Broadcasting Corporation on the last six second beats of each hour and half-hour. These signals are used by the B.B.C. for the six time signals which it radiates usually at 6.30 p.m. and 9 p.m., but which could, if necessary, be sent out at any other hour or half-hour as well.

At 10 a.m. a more extended service of time signals comes into operation (FIGURE 6). By means of automatic switches, known as "chronophers," which are controlled by clocks synchronised by the time signals, certain telegraph lines from the Central Telegraph Office to provincial towns, and certain lines from these towns to out offices, are, just before 10 a.m., disconnected from their telegraph instruments and joined to relays which are connected through to Greenwich. At the out offices the lines are extended by hand switches through relays to suitable indicating apparatus. The 10 a.m. signal from the Greenwich mean time clock is thus distributed over the country.

The B.B.C. wireless time signals have already been mentioned. These perform a very important service in maintaining correct time among the general community. But more important still are the wireless time signals sent out from Rugby* for communicating the time to mariners for the purpose of longitude determinations.

Longitude is determined by ascertaining the difference between the local time and the time at the same instant at the standard place. It is easy by comparatively simple observations to determine the local time at a place. The real problem is to find out what is the corresponding local time at the standard place. This problem is so difficult that up to about three hundred years ago it was, for navigational purposes, considered as impossible of solution.

The author of a book on navigation, written about 1590, dismisses the longitude problem in the following delightful sentence:—

"Now there be some that are very inquisitive (!) to have a way to get the longitude, but that is too tedious for seamen, since it requireth the deep knowledge of astronomy, wherefore I would not have any man think that the longitude is to be found at sea by any instrument; so let no seamen trouble themselves with any such rule, but (according to their accustomed manner) let them keep a perfect account and reckoning of the way of their ship."

Navigation was then practically entirely a matter of sailing by dead reckoning. By means of a crude device known as the cross-staff (FIGURE 7), the meridian altitude of the sun could be observed, and thus, with the aid of a table of the sun's declination, the latitude could be determined to within about 100 miles. Such observations were used as a check on the positions obtained by dead reckoning. But of practicable methods for checking longitude there were none. GALILEO, soon after his discovery in 1610 of the eclipses of the satellites of Jupiter, suggested that the standard times at which these would take place should be calculated beforehand and published, so that the satellites could be used by mariners as a clock. Although this method is practicable, though not very accurate, for use on land, it proved to be useless at sea, owing to the difficulty of making the observations from a moving ship. Later on the suggestion was made that the moon should be used as the hand of a gigantic clock, of which the figures on the dial were the stars, and that the standard time should be determined by observing the position of the moon among the stars as it moves in its monthly journey round the earth. This method also proved impracticable at first, owing to the want of sufficiently accurate tables of the moon's motion. It was to supply this information that Greenwich Observatory was built by CHARLES II in 1676. The method of determining the standard time in this manner, known as the method of "lunar distances," is not very accurate, and it involves somewhat intricate calculations, for owing to the nearness of the moon to the earth her apparent position among the stars at any instant is different according to the position of the observer. The tables giving the

* See page 39, Vol. V, No. 50 of THE MARINE OBSERVER.

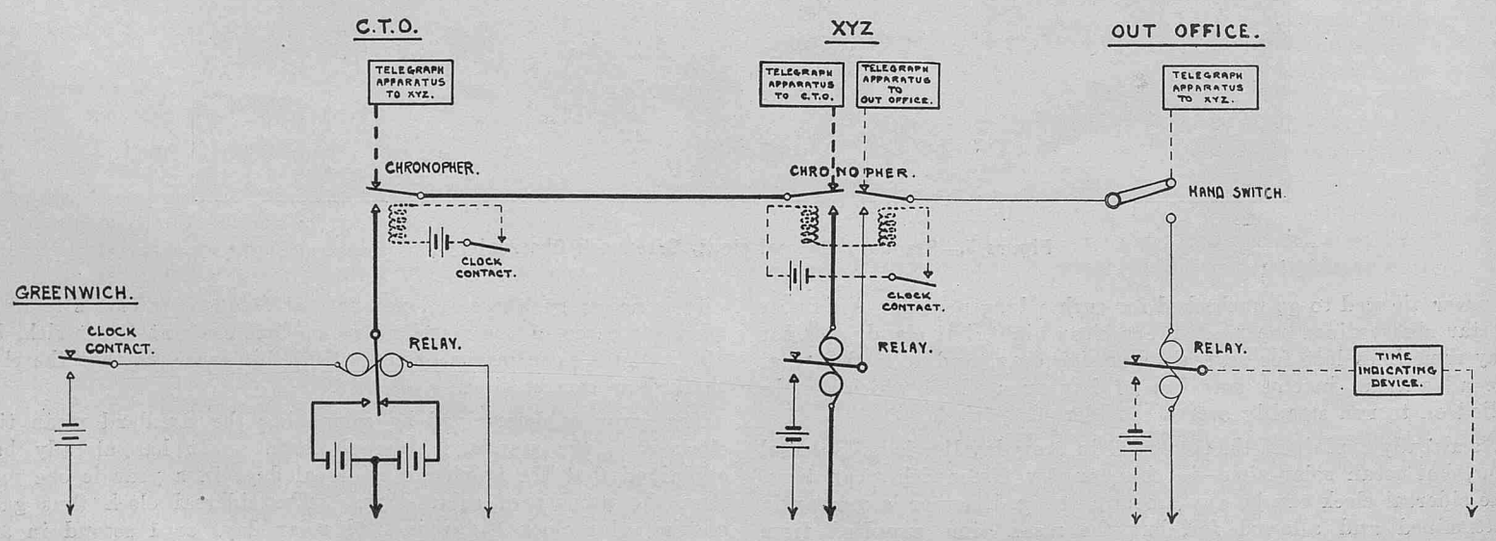


Figure 6.—Landline connections for 10 a.m. time signal from Greenwich Observatory.

Figure 7.—The "Cross-Staff."

moon's apparent positions are therefore calculated for an imaginary observer at the centre of the earth, and before the actual observations can be compared with the tables they must be reduced to give the position of the moon as it would appear to an observer in this position. The method of lunar distances continued, however, to be employed as an auxiliary to more improved methods up to a few years ago.

The most obvious solution of the longitude problem, is, of course, to provide a clock which will give true Greenwich time, after the necessary corrections for error and rate have been applied. Unfortunately, however, this is by no means an easy thing to do.

In 1713 the British Government offered a prize of £20,000 for anyone who could construct a clock suitable for use at sea by means of which the longitude could be determined to within 30 miles.

A clockmaker named JOHN HARRISON, who was the son of a Yorkshire carpenter, and who commenced by working at his father's trade, succeeded in making a chronometer in 1761 which, after it had been taken on a voyage to Jamaica and back, determined the longitude of Portsmouth within 18 miles, and so won the prize. Since then the marine chronometer has been still further improved, and to-day it is an instrument of truly marvellous accuracy.

But although the chronometer has been so highly developed it cannot, of course, be depended on to keep an absolutely steady rate, and every opportunity has to be taken to check its indications by means of time signals.

The advent of wireless telegraphy has immensely simplified the problem of the determination of longitude. A ship can now keep her chronometers under constant check. In fact, with the facilities made available by wireless telegraphy for ascertaining standard time at frequent intervals, a good watch will serve for determining longitude at sea where formerly an expensive chronometer was necessary.

The clock installation at Greenwich for supplying the time signal broadcast from Rugby at 10 a.m. and 6 p.m. consists of a SHORTT free pendulum master clock and slave, adjusted to keep mean solar time (FIGURE 8). These clocks can be compared with the standard sidereal clock, and their error corrected by an electro-magnetic device, exactly as already described for the ordinary mean time clock.

The signal sent out from Rugby consists of a series of dots lasting from 9.55 till 10 a.m. and from 5.55 p.m, till 6 p.m., the intervals between the beginnings of the dots being 60/61 seconds in length, with half second dashes instead of dots at the exact minutes.

By having the dots spaced at less than a second interval the wireless signals periodically come into step with the beats of the chronometer which is being checked. By noting the time shown by the chronometer and the number of the dot at which coincidence occurs it is possible by an easy calculation or from tables to ascertain the error of the chronometer to an accuracy of one sixty-first of a second.

These signals are sent from Greenwich by a special pendulum, also supplied by the Synchronome Company, which is controlled by the free pendulum mean time clock and which is corrected electromagnetically at the same time as the correction is applied to the free pendulum clock. The mechanical and electrical devices necessary to send the combination of dashes and dots described above are very complicated, but the principle is shown on the diagram (FIGURE 9).

The pendulum is slightly shorter than a ½-second pendulum, and makes one complete to and fro oscillation in one 60/61st second.

It is driven by a remontoir once in each complete oscillation, the impulse being given as the pendulum is swinging to the **right.** The driving contact works a dial on the face of the clock, and at the time signal periods also controls a relay which passes the impulse to the Central Telegraph Office and thence to Rugby. The impulses last about 1/10th second.

In series with the relay coils are two contacts. One is closed by the clock from a little before five minutes before 10 a.m. and 6 p.m. till after the exact hour. The other is closed by the clock immediately after the 60th beat of the 54th minute of each hour, and is locked mechanically. The lock is released by the clock mechanism immediately after the remontoir beat at the exact hour, but, as explained below, the contact is held closed electromagnetically until the end of the final long dash.

In order to obtain the long signal at the exact minute a contact is closed by the clock immediately after the 60th beat of the preceding minute and opened immediately after the exact minute.

The closing of this contact causes the next 1/10th second impulse, at the exact minute, to be passed through an electromagnet, which closes another contact. This second contact is then held closed mechanically until the return swing of the pendulum to the **left,** when the contact is opened by a pin carried on the pendulum. The second contact is thus kept closed for about half a second. This contact is in parallel with the remontoir contact, so that the relay is held over to marking after the remontoir contact has opened and thus a long signal is emitted.

Immediately after the exact hour the lock on the second of the two contacts in series with the relay coils is released. Unless some arrangement were made to prevent the opening of this contact, the path through the relay coils would now be broken, and the final signal would only be a dot, and not the half second dash which is required. To prevent the opening of this contact before

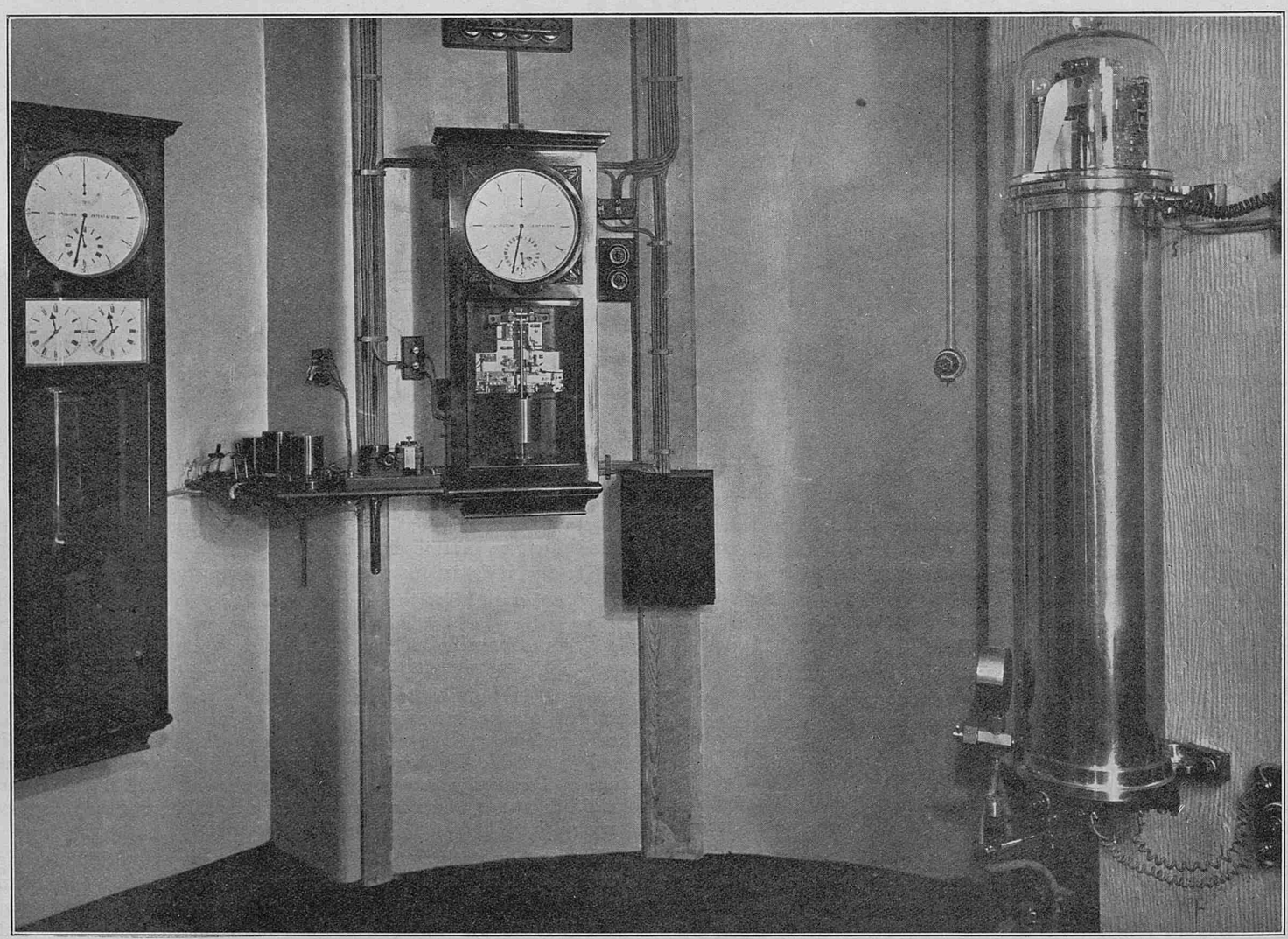


Figure 8.—Rugby time signal clocks, Greenwich Observatory.

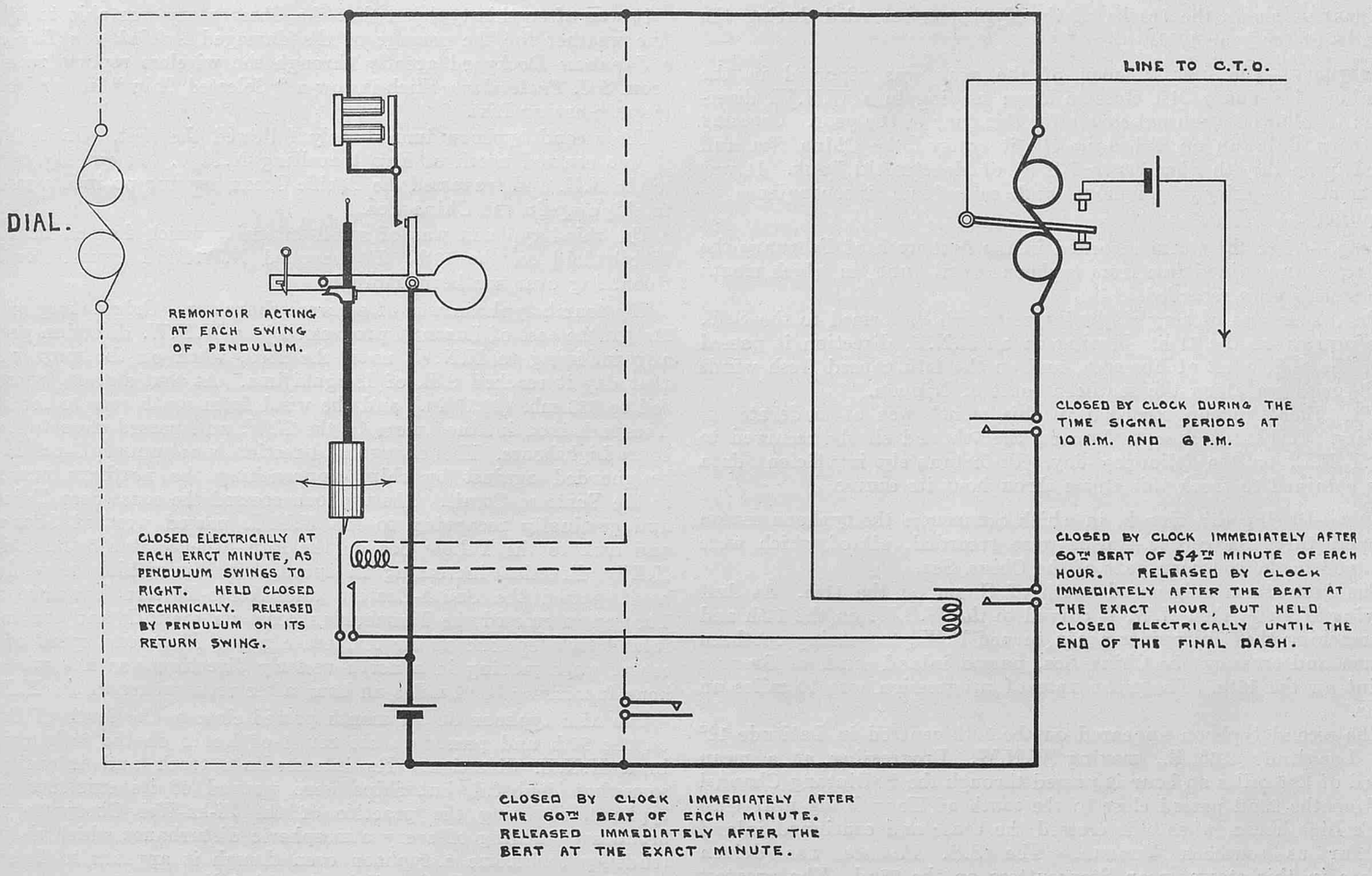


Figure 9.—Connections of Rugby time signal pendulum, Greenwich Observatory.

the conclusion of the long signal, an electromagnet, joined in series with the contact which gives the half second signal, is arranged to hold the contact in series with the relay closed until the half second signal contact opens. Thus the relay is actuated so as to give a final half second signal.

Mr. HOPE-JONES is to be congratulated on the ingenious manner in which he has met the requirements which the signalling clock has to fulfil.

The commencement of the Rugby time signal at the end of last year marks the latest step forward in the methods used for the distribution of time. The hope has recently been expressed by a leading astronomer and geographer that at no distant day Rugby may broadcast a time signal every hour instead of only twice a day, and that ultimately, from a special wireless station, the beats of the pendulum of the Greenwich mean time clock may be broadcast continuously, day and night, so that at any time and at any place an observer will be able to compare his clock with the standard clock at Greenwich and so ascertain correct Greenwich time.

TYPHOONS OF THE CHINA SEA DURING THE YEAR 1926.

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

INFORMATION regarding recent typhoons in the China Sea having been requested by Marine Observers engaged in the Far Eastern Trades the following particulars of storms recorded during the year 1926 are extracted from a report compiled by Father E. GHERZI, S.J., Director of the Zi-ka-Wei Observatory, who, owing to his untiring work on behalf of seamen needs no introduction to those members of our Voluntary Observing Corps frequenting Chinese waters.

In the report Father GHERZI states:—

"Best thanks are offered to Captains of the numerous ships in Shanghai who have helped us greatly in our poor efforts in this common struggle against the typhoon scourge.

"We must also mention the wireless reports received from steamers at sea. Of course they are more numerous during the dangerous months, so that altogether they go up to several thousands. Some of these received in fine weather periods have enabled us to give a complete assurance of safe voyage for small or damaged craft which were anxious to leave Shanghai with a sure prospect of a calm passage over the China Sea. I shall mention only as an example the disabled German liner *Adolph von Bayer* of the HUGO STINNES Co.; she needed two days of good weather in order to reach safely the Japanese yards for repairs. Thanks to the co-operation of the Masters at Sea who responded to our wireless call, we were able to guarantee this."

During the year 1926 twenty-three typhoons of greater or less intensity were recorded. The following comparative table shows how their distribution compares with the normal frequency for each month of the year.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average frequency ...	1·2	0·7	0·7	0·5	1·3	1·3	3·4	3·5	4·2	3·7	2·0	1·3
Frequency 1926 ...	—	1	—	—	—	2	3	5	6	3	2	1

CHART A shows the tracks of the Typhoons recorded during the months of the year 1926.

February.—The first typhoon of the year was reported in the evening of January 31st close to Yap: moving in a W.N.W. direction; it followed a normal course for this time of the year. Crossing northern Palawan on February 4th it entered the China Sea and filled in on the 6th when centred S.W. of Macclesfield Bank. It was of small intensity throughout and caused no inconvenience to shipping.

June.—After the storm recorded in the first week of February the China Sea remained free from typhoons until June, in which month two storms were recorded.

One storm was of very slight intensity, which formed to the S.W. of Formosa on the 11th. Moving in an E.N.E. direction it passed over the S.E. coast of Formosa, and on the 14th caused fresh winds and rough sea along the southern coast of Nippon.

The other typhoon recorded in this month was of moderate intensity. It passed close to Yap on the 7th and slowly recurved to the E.N.E. on the following day. Unfortunately insufficient data was obtained to track this storm throughout its course.

July.—During this month, in which commences the typhoon season proper, three dangerous storms were recorded, all of which were confined to the southern part of the China Sea.

The first storm originated south of Guam on the 11th. At first moving W.N.W. then N.W. it curved to the W.S.W. on the 14th and on reaching the Philippines again turned N.W., traversing northern Luzon and crossing the China Sea, passed inland south of Breaker Point on the 18th. The mean rate of progression was 10 miles an hour.

The second typhoon appeared on the 19th centred in Latitude 12° N., Longitude 136° E., moving W.N.W. Progressing at a mean speed of 13.5 miles an hour it passed through the Ballintang Channel and on the 22nd passed close to the south of Hong Kong near Gap Rock Lighthouse, whence it crossed the coast and continued inland as far as southern Yunnan. The S.S. *Pawnee* was driven ashore in this storm, near Stonecutters on the 22nd. The greatest velocity of the wind recorded at Hong Kong was 60 miles an hour.

The third typhoon of the month was of moderate intensity. Passing south of Guam a.m. on the 28th it moved to the W.N.W. and N.W., and on the morning of the 31st it was centred close to the south-eastern end of Formosa. The centre crossed Formosa near Taito, and passing over the Strait to the south of Ockseu passed inland on the 1st August. The mean rate of progression was 17 miles an hour.

August.—The typhoons recorded in this month were five in number, which is slightly above the average for August. The first typhoon of the month was of a severe nature and was first observed on the morning of the 11th centred in about Latitude 12° N., Longitude 136° E. It progressed at an average rate of 11.5 miles an hour in a W.N.W. to N.W. direction until the 15th, when it passed over the land in the neighbourhood of Taichou, and inclining more to the northward passed west of Shanghai. On the 16th the storm recurved to the N.E., and increasing its speed to about 24 miles an hour crossed the Liaotung peninsula, and on the 18th passed near Helampo inclining more and more eastward.

During this typhoon the U.S. Gunboat *Asheville* had an exciting experience, on the 15th, when anchored in a small bay open to the S.E. near Wenchow, in Namki Island. The wind came with full hurricane force from the S.E. blowing right into the Bay causing the ship to drag her four anchors, and when the centre passed the breakers were only 100 yards from the ship. With the passage of the centre the gale veered to the S.W. and N.W. causing the ship to drag in the opposite direction, seawards away from danger. Lieutenant-Commander S. BOUNTWELL ROBINSON, U.S.N., commanding the *Asheville* estimated the wind velocity at about 140 miles an hour and records the lowest pressure at 945 mb. (27.91 ins).

Many vessels on receiving the Zi-ka-Wei Observatory signals were able to take suitable shelter and escaped with only a few hours of rough and heavy swell but the Italian Cruiser *Libia* not being able to get the warning of the N.N.E'ly course of the typhoon, instead of continuing her course towards the N.E. Promontory made for Weihaiwei harbour which she had to enter in a full gale amongst crowded shipping.

It was after this typhoon that the Observatory was able to assure fine weather for the passage of the damaged *Adolph von Bayer* to a Japanese Dockyard greatly through the wireless reports received from S.S. *Protesilaus* which is now a " Selected Ship " in our Voluntary Observing List.

The second typhoon immediately followed the first. On the 18th it was centred north of Yap travelling N.N.W. It quickly curved to the N.E. and traversed the Pacific Ocean causing no inconvenience to shipping in the China Sea.

The third typhoon was of small intensity which formed near the Macclesfield on the 19th. It travelled N.W. and crossed Hainan dissolving over southern Yunnan.

The fourth typhoon was of a severe character. Originating on the 21st to the east of Luzon it progressed in a W.N.W. direction gradually inclining to N.N.W. until the 23rd, when on the morning of that day it reached S.E. of Ishigakijima. At that station, pressure fell to 988 mb. (29.17 in.) and the wind from south rose to force 11. The path then inclined more to the N.W. and passed close to Agincourt Lighthouse. This change in direction is not unusual and should be guarded against by ships approaching the northern entrance to the Formosa Strait. The typhoon crossed the coast near Taichow and gradually recurving to the N.N.E. passed west of Shanghai and took to the Yellow Sea on the 25th, whence it continued in a N.E'ly direction increasing in speed, but diminishing in violence as it passed the South-Eastern and North-Eastern Promontories. The centre crossed the Manchurian coast on the 27th and continued inland as a cyclone of the temperate zone. The mean speed of the centre when moving in a north-westerly direction was 10.7 miles an hour increasing to 22 miles an hour after recurvature to the N.E.

The fifth typhoon of the month passed close to the south of Guam on the 24th and passed to the south of Bonin on the 28th moving in a N.N.E. direction. Its intermediate track and intensity is somewhat doubtful, but ships were warned of its existence as a typhoon, it being the practice of the Zi-ka-Wei Observatory to broadcast warning of every atmospheric disturbance which shows a tendency to become a typhoon even though it appears to those at the Observatory to be the slightest probability.

September:—Six typhoons were recorded this month which is slightly more than the normal frequency.

The first storm, which was of a severe nature, was signalled on the morning of the 1st, centred in Latitude 19° North, Longitude 133° East, moving in a N.N.W. direction. Between the 2nd and 3rd it gradually recurved to the North and N.N.E. Traversing Southern Honshu on the 4th it entered the Pacific to the S.E. of Yezo on the 5th continuing in a N.E.'ly direction.

The German ship, *Koenigsberg* (Captain E. BOY-ED) passed through the centre of this storm on the 4th when in about Latitude 33° 25′ North, Longitude 136° 23′ East. Her barometer fell suddenly to about 956 mb. (28.24 in.) and her wind backed from S.E., force 7, to east, force 12, and finally to S.W. force 12. Thirty minutes of calm was experienced in the storm centre, with a pyramidal breaking sea.

The second typhoon started on the 5th by the North of Yap, and moved W.N.W. until the 8th when it inclined to N.W. and crossed the Ballintang Channel. On the 9th it recurved to the N.E. passing through the Formosa Strait. In the Formosa Strait it again recurved to the N.W. crossing the coast in the vicinity of Santu Inlet. The lowest barometric reading recorded at Chapel Island Lighthouse was about 957 mb. (28.27 in.) and the strongest wind, east, force 9.

The third storm of the month was of a severe nature. Originating on the 11th in about Latitude 12° N., Longitude 138° E. it moved in a W.N.W. direction gradually inclining N.W. and N.N.W. until the 15th when it gradually recurved N.N.E., causing severe damage to Oshima and crossed Van Diemen Strait on the 17th. Continuing on a N.N.E. course to the N.E. of Nippon the storm caused heavy damage in Kobe, Osaka, Kyoto and Tokyo. The Italian steamer *Fiume* passed through the centre when in Latitude 33° 30′ North, Longitude 136° East. Within the storm field she recorded winds of terrific force, and lowest barometric reading uncorrected, 952 mb. (28.11 in.).

The mean speed of the centre on the N.W. branch of its track was 14 miles an hour and 15.7 miles an hour after recurvature to the N.E.

The fourth typhoon moved far away from the Far Eastern shores. It originated on the 16th, west of Guam. At first moving in a W.N.W.'ly direction it recurved on the 19th over the Pacific Ocean to the N.E. passing to the north of Bonin Islands, on the 22nd.

The fifth storm of the month was first observed on the 22nd, passing by the north of Yap in a N.N.W. direction. Maintaining a N.W.'ly course it crossed the Ballintang Channel and at increased speed continued its course passing south of Gap Rock Lighthouse and passed inland near St. John Island on the 27th. The mean speed of the typhoon was 15.5 miles an hour. This storm caused great damage and loss of life at sea. A big fishing fleet consisting of 130 junks from Yeungkong were caught in the storm near Macao and to the south of Gap Rock causing about 2,000 casualties.

In Hong Kong pressure fell to about 990 mb. (29.23 in.) on the 27th and in the violent squalls the velocity of the wind registered 101 miles per hour. Several small steamers dragged their anchors and drifted ashore.

The sixth and last typhoon of the month formed near the Macclesfield as a secondary centre of the preceding storm and was centred on the 28th, in Latitude 15° North, Longitude 115° E. It progressed on a W. by N. course at a mean speed of 15 miles an hour and passed inland on October 1st striking the coast to the north of Tourane. Though only a small storm it was of a most violent nature.

The S.S. *Wong Kung* Captain R. M. de la SALA passed through the centre of this typhoon, and on arrival in port reported " Here ends one of the most boisterous and tempestuous passages have ever experienced in the China Seas during 25 years of experience. It was not so much the wind force as the sea which made the vessel resemble somewhat a chip of wood in a cauldron of boiling water."

Weather charts made at sea during this typhoon by Mr. C. B. ROCHE, Chief Officer, S.S. *Khyber* on the 29th and 30th of the month, were published in the September and December Numbers of THE MARINE OBSERVER, Volume IV, showing that *Khyber* could maintain her course and speed with safety, thereby demonstrating the value of Wireless and Weather as an Aid to Navigation.

October:—Three typhoons were recorded this month, two of which traversed exceptional courses to the S.W. over the China Sea before filling up.

The first storm passed between Guam and Yap in a W.N.W. direction on the 1st. On the 7th when to the East of northern Luzon the centre inclined north-westward and on the following days when crossing the Ballingtang Channel, close to the south of Basco, altered direction W. by S. and on the 10th S.W., filling up when to the south of the Taya Islands. It was of a violent nature and progressed at a mean speed of 8.2 miles an hour, which greatly decreased during the last two days.

The second typhoon followed a somewhat similar track to the first. It was reported on the 9th moving W.N.W. passing close to the south of Guam. Reaching the N.E. of Luzon on the 13th its track inclined more westerly crossing the Ballintang Channel with decreasing intensity. Reaching the China Sea its track curved to the S.W. filling up near the Macclesfield. The mean speed was 12.1 miles an hour.

The third typhoon of the month passed by the south of Yap on the 27th moving W.N.W. It continued in this direction at a mean speed of 11 miles an hour until the 30th when it began to recurve in Latitude 15° N., Longitude 128° E., to N.W. north and N.E. increasing its speed to a mean of 15 miles per hour. At midnight on 1st November it was centred in Latitude 22° N., Longitude 135° E.

November:—Two typhoons were recorded in this month, both of which entered the China Sea after crossing the central part of the Philippines.

The first storm passed to the west of Guam in a W.N.W. direction on the 1st. Reaching the 125th meridian on the 4th it altered its course to the southward of west and crossed the Philippines passing not far south of Manila, doing great damage, killing about 200 people and injuring many more. Entering the China Sea it moved in a westerly direction until the 7th, when in Latitude 15° N. Longitude 115° E. inclined to the S.W. and crossed the Anam coast to the south of Varella Lighthouse near Cape Padaran on the 9th. Its mean speed of progression was 10.3 miles an hour.

The second typhoon was observed on the 11th to the N.E. of Mindanao moving W.N.W. It was of moderate intensity when crossing the Philippines, but on the 13th on reaching the China Sea increased in violence. On the 14th when in Latitude 14° N., Longitude 115° E. it changed direction to N.W. and filled up to the N.W. of the Paracels. Its mean speed of progression was about 11.2 miles an hour.

December:—The only storm reported in this month passed to the S.W. of Yap on the 4th. Moving in a N.W.'ly direction it gradually recurved between the 6th and 7th to the N.E. passing South of Bonin on the 10th moving in an E.N.E. direction.

The mean speed of the centre was approximately 8.3 miles an hour on its north-western track and 15.4 miles an hour after recurvature to the N.E.

With a view to giving first hand and full information in THE MARINE OBSERVER of severe typhoons each season, the Commanders of all British ships in Far Eastern waters are invited to provide observations of typhoons they encounter. For this purpose a special Form 905 may be obtained, together with Blue Post Cards, from Lieutenant-Commander J. H. DRUMMOND, R.N. Chart and Chronometer Depot H.M. Dockyard, Hong Kong, or any of the Agents of the British Meteorological Office, a list of whom will be found on the reverse side of the N. Atlantic Ice Chart in each Number of THE MARINE OBSERVER.

LOCAL WINDS, INDIAN OCEAN.

III.—Coasts of India, Ceylon, Malaya and Sumatra.

These coasts all lie within the limits of the Indian monsoon regions, and in general the winds experienced are the regular monsoon winds, intensified or modified by local geographical conditions, by the occurrence of land and sea breezes, and interrupted at times by tropical cyclones between April and December.

West Coast of India.—In the southern part of the Arabian Sea, the South-West Monsoon sets in during May, and advances northward, reaching the coast about Karachi a month later. The change is always accompanied by turbulent stormy weather, with thunderstorms and rain, and a heavy swell from the S.W. After the first blow, the weather moderates, and light to strong breezes prevail on the coast from between S.W. and West, with hazy weather, until September.

About the end of September the South-West monsoon begins to give way, and occasional squalls from the land may be expected. By October the wind has veered to west or N.W. and there are occasional calms; and in November the North-East monsoon sets in, its advent being marked by storms of thunder and rain, but of less intensity than those accompanying the onset of the South-West monsoon. The North-East monsoon persists until March, the weather being generally fine during this period.

During December and January strong north-easters are sometimes experienced, lasting two or three days, accompanied by clouds of dust, and often by gloomy squally weather, with rain.

During this season land and sea breezes prevail on the coast, the land breezes being fresh or strong, particularly during November to February. They set in about midnight from between N.N.E. and E.N.E., freshening towards daybreak, and veering gradually eastward. They are followed by a calm, after which a light sea breeze from between S.W. and N.W. blows during the afternoon. In March and April the land breezes become irregular and diminish in strength, while the sea breezes become stronger, from between west and N.W., blowing very hard at times, with thick misty weather.

On the coasts of Sind, Kutch and Kathiawar, similar conditions to those at Karachi prevail, the South-West monsoon blowing steadily during June, July and August, from between S.W. and West. During the rest of the year, land or sea breezes prevail, these being most regular during November, December and January. From February to May, and in September and October, these breezes are modified by the prevailing monsoon, the sea breeze (from S.W.) being much stronger and more pronouced during the South-West monsoon, while during the North-East monsoon months, the land breeze (from N.E.) is the more important and of longer duration.

Off the coast of the Bombay province during the cold season, October to February, land and sea breezes prevail with great regularity. The land breeze varies from between east and N.E., but sometimes, though not frequently, comes from south of east. It usually sets in between 10 p.m. and 2 a.m., being latest during October, becoming fresh or strong towards daybreak. The land breeze dies down about 10 a.m. and after a lull of one to two hours, is followed by the sea breeze from W.N.W., which gradually veers to N.W. or N.N.W. by the evening.

In March and April the land breezes are light and uncertain, and of short duration, a light northerly wind or calm frequently prevailing during the night.

In June the South-West monsoon sets in, and ceases in September, with general and heavy rains during its continuance. It usually blows from between S.W. and west, with severe squalls at times, veering gradually as the season advances, until in September the prevailing wind is from W.N.W., with moderate weather. Land and sea breezes again spring up during this month and are firmly established again by October.

The winds and weather on the Malabar coast are very similar to those of Bombay, except where there are gaps in the mountain chain, the land breezes in the cold season continue to blow for more than a day without any intervening sea breeze. The South-West monsoon also sets in earlier as we proceed southward, the difference between Cape Comorin and Bombay being from 15 to 20 days.

Normal conditions are disturbed at times by the occurrence of tropical cyclones, the maximum periods for which in the Arabian Sea are May and June, and October and November, months that are characterized by the changes of the monsoons. They also occur, but less frequently, in April and July, and in September, December and January. February, March and August are entirely free from cyclonic storms.

Ceylon and Bay of Bengal.—The North-East and South-West monsoons blow over Ceylon and the Bay of Bengal, but their general direction and strength vary in different localities. The N.E. and East winds of the former monsoon commence in the northern part of the Bay in October, but the monsoon is not fully established until November, and does not reach Ceylon until the middle of that month. It prevails generally until February.

In Ceylon and the southern part of the Bay, the South-West monsoon, though occasionally commencing before the end of April, usually sets in about the middle of May, and lasts until October, while in the northern part of the Bay, the monsoon prevails from the middle of April to September.

Both monsoons are more steady in force and direction on the east coast of Ceylon, than on the west coast.

On the east coast of India the South-West monsoon is the fine weather season, while the North-East monsoon season is the period of rains and squally weather. On the eastern side of the Bay this condition is reversed, the South-West monsoon, after crossing the Bay, producing heavy rain on the Arakan and Martaban coasts, while the North-East monsoon is the fine season.

Land and sea breezes are general on most parts of the coasts of Ceylon and the Bay of Bengal, especially between the monsoons.

In the Bay of Bengal during the South-West monsoon season proper, June to September, there is a rapid succession of cyclonic storms generally of moderate extent and small intensity; while during May and October, transition periods, storms occur less frequently, but are generally of greater extent and intensity. These severe storms, or tropical cyclones, in which the wind exceeds force 10, may occur in any month from April to December, but the months of maximum frequency are May, October and November. Full information of these storms was given in the July, 1926, Number of this Journal.

Malacca Strait.—Although Malacca Strait is within the limits of the North-East and South-West monsoons, yet on account of the high land on either side of the Strait, the winds are variable, and land and sea breezes are regular on both the Malayan and Sumatra coasts. In the offing the monsoons are only regular when they are at their height in the adjacent seas, and even then they only appear as moderate breezes during part of the day. They become more regular near Singapore, but with frequent calms.

Squalls from the South-West, called "Sumatras" are common during the South-West monsoon, being most frequent on the north coast of Sumatra. They generally blow during the early part of the night, are sometimes sudden and severe, and generally accompanied by thunder, lightning and rain, and have the characteristics of an arch squall. They also frequently occur on the Malay coast between Klang Strait and Tanjong Bulus, where they often blow for six or eight hours at a time as a moderate or strong gale.

Squalls from the north-west, called north-westers, are also experienced, but are not so frequent as the "Sumatras." They are most common during the South-West monsoon in the north-western part of the Strait between Achin Head and Aroa Islands, but sometimes blow through as far as Singapore Strait. Sometimes severe at their commencement, their strength soon abates. They are generally preceded by a black cloud arch, which rises rapidly from the horizon towards the zenith, and are sometimes accompanied by lightning, thunder and heavy rain.

Sumatra, North and West Coasts.—On the north coast of Sumatra the South-West monsoon prevails from about April to November, and the North-East monsoon from November to April. During the height of the North-East monsoon, the wind blows from between east and N.E. from about 10 a.m. to 4 p.m. and then drops to a calm by sunset, and during the night is replaced by a breeze from off the land.

On the west coast the influence of the monsoons is felt as far south as Latitude 2° N. Between Achin Head and Latitude 4° N., the South-West monsoon prevails from May to October, and this at times continues to blow during the night; generally, however, land winds are clearly perceptible at night from either North or S.E. Squalls are frequent during this season, and there is often a considerable sea along the coast.

The North-East monsoon period is from December to March, but it is less strongly marked. When the monsoon has fairly set in, there is usually a gentle southerly breeze in the morning, followed by a calm, and in the afternoon a light sea breeze. After sunset, comes the land wind, which prevails throughout the night.

From Latitude 4° N. to Latitude 2° N. is a region of frequent calms and light variable winds, with occasional squalls.

South of Latitude 2° N., the winds gradually merge into those of the North-West and South-East monsoons of the South Indian Ocean. The North-West monsoon occupies the belt between the southern limit of the North-East monsoon and the northern limit of the South-East Trade, during the months October to March. During the months April to September, this same coastal region of Sumatra is occupied by the extension northward of the South-East Trade, following the sun in declination; and is, frequently referred to in this locality as the South-East monsoon.

(To be continued.)

WEATHER SIGNALS.

II.—WIRELESS WEATHER SIGNALS.

WIRELESS WEATHER BULLETINS.

The Key and Decode Tables of the International Weather Telegraphy Code will be found on pages 20 to 23 of Volume V No. 49. (The January, 1928, Number.)

The method of decoding station weather reports made in code was described in the British "Weather Shipping" Bulletin, on pages 37 and 38 of Volume V No. 50. (The February, 1928, Number.)

The same method of decoding weather reports applies in all cases where the International Code is used.

Where *other* than International code tables are used they are published along with the signals described and an explanation is given.

CANADA, NOVA SCOTIA, NEWFOUNDLAND AND LABRADOR, ETC.

(Spark Issues.)

THE following stations broadcast weather bulletins, the wavelength used being 600 metres (spark) in all cases. Where the times of transmission are omitted, forecasts are sent on request. Stations marked with an asterisk (*) are open during the season of navigation only.

Country.	W/T Station.	Call Sign.	Position (approx.). Lat. N.		Long. W.		Time, G.M.T.
			°	′	°	′	
Canada (Nova Scotia).	†Lurcher Lt. Vsl. ...	VDR	43	49	66	32	—
	Yarmouth	VAU	43	46	66	07	0200, 1400
	Chebucto Head ...	VAV	44	30	63	31	0130, 1330
	North Sydney ...	VCO	46	13	60	15	—
	Sable Island ...	VCT	43	56	60	02	—
Canada ...	Grindstone Island ...	VCN	47	23	61	54	—
	*Fame Point, Que. ...	VCG	49	07	64	36	0145, 1345
	*Clarke City, Que. ...	VCK	50	11	66	37	—
	*Father Point, Que.	VCF	48	31	68	28	—
	Quebec	VCC	46	48	71	12	—
	*Montreal	VCA	45	34	73	38	—
	*Heath Point Lt. Vsl. (Anticosti I.).	VCI	49	03	61	30	—
Canada (New Brunswick).	St. John	VAR	45	14	66	03	—
Newfoundland and Labrador.	‡Belle Isle	VCM	51	53	55	22	0230, 1430
	Cape Race	VCE	46	39	53	04	0215, 1415
	Point Amour ...	VCL	51	27	56	50	—
St. Pierre and Miquelon Is.	St. Pierre	HYS	46	47	56	11	0100, 1300

† The station keeps watch for the first half of every odd hour from 1200 to 0000, and from 0300 to 0330, G.M.T.
‡ Wavelength, 600 metres (I.C.W.).

UNITED STATES OF AMERICA (ATLANTIC COAST) C.W. ISSUES.

Washington.—Arlington W/T Station, approximate Latitude 38° 52′ N., Longitude 77° 05′ W., call sign **NAA,** broadcasts weather bulletins at 0300 G.M.T., on wavelengths of 2,653 metres (A.C.W.) and 4,409 metres (C.W.) simultaneously, and at 1500 G.M.T. on wavelengths of 18.6 and 2,653 metres (A.C.W.) simultaneously.

The bulletins are divided into two parts and begin with the words "Weather Bureau Bulletin."

First Part.

Part 1 of the 0300 and 1500 G.M.T. bulletins contains observations taken at 0100 and 1300 G.M.T., respectively, from the stations in the list below. Upper air observations are included in this part from those stations marked with a dagger (†) if received in time, and also weather reports from ships at sea.

Indicator Letters.	Station.	Position (Approx.) Lat.	Long.	Indicator Letters.	Station.	Position (Approx.) Lat.	Long.
*J	St. Johns, N.F. ...	47°34′N.	52°42′W.	CN	Cincinnatti, Ohio...	39°03′N.	84°24′W.
*S	Sydney, N.S. ...	46°10′N.	60°10′W.	PB	Pittsburg, Pa. ...	40°27′N.	80°01′W.
*CK	Cochrane, Ont. ...	49°20′N.	81°00′W.	F	Buffalo, N.Y ...	42°52′N.	78°54′W.
*FP	Father Point, Que.	48°31′N.	68°19′W.	D	Detroit, Mich. ...	42°21′N.	82°45′W.
*ML	Montreal, Que. ...	45°30′N.	73°35′W.	L	Alpena, Mich. ...	45°05′N.	83°28′W.
E	Eastport, Me. ...	44°53′N.	67°02′W.	M	Marquette, Mich. ...	46°30′N.	87°20′W.
N	Northfield, Vt. ...	44°08′N.	72°42′W.	CH	Chicago, Ill. ...	41°53′N.	87°37′W.
T	Nantucket, Mass. ...	41°17′N.	70°05′W.	DU	Duluth. Minn. ...	46°47′N.	92°06′W.
NY	†New York, N.Y. ...	40°28′N.	74°00W.	LC	La Crosse, Wis. ...	43°45′N.	91°18′W.
AC	†Atlantic City, N.J.	39°21′N.	74°26′W.	SL	St. Louis, Mo. ...	38°36′N.	90°18′W.
WA	†Washington, D.C. ...	38°52′N.	77°03′W.	KC	Kansas City, Mo. ...	39°07′N.	94°38′W.
NF	†Norfolk, Va. ...	36°50′N.	76°18′W.	O	Omaha, Nb. ...	41°23′N.	96°01′W.
LB	Lynchburg, Va. ...	37°18′N.	79°01′W.	OK	Oklahoma City, Okla.	35°32′N.	97°28′W.
AV	Asheville, N.C. ...	35°32N.	82°28′W.				
H	Hatteras, N.C. ...	35°14′N.	75°32′W.	DA	Dallas, Tex. ...	32°46′N.	96°31′W.
C	Charleston, S.C. ...	32°43′N.	79°52′W.	EP	El Paso, Tex. ...	31°50′N.	106°30′W.
*B	Bermuda	32°17′N.	64°46′W.	SE	Seattle, Wash. ...	47°38′N.	122°25′W.
CO	†Columbia, S.C. ...	34°02′N.	80°57′W.	RO	Roseburg, Oreg. ...	43°11′N.	123°10′W.
JA	Jacksonville, Fla. ...	30°19′N.	81°51′W.	SF	San Francisco, Calif.	37°50′N.	122°30′W.
K	†Key West, Fla. ...	24°33′N.	81°48′W.				
AT	Atlanta, Ga. ...	33°42′N.	84°26′W.	DI	San Diego, Calif. ...	32°42′N.	117°15′W.
TA	Tampa, Fla. ...	27°35′N.	82°29′W.	BS	Boise, Idaho ...	43°40′N.	116°00′W.
P	†Pensacola, Fla. ...	30°21′N.	87°19′W.	LD	Lander, Wyo. ...	41°40′N.	108°40′W.
MG	Montgomery, Ala	32°21′N.	86°23′W.	DV	Denver, Colo. ...	39°48′N.	105°05′W.
VK	Vicksburg, Miss. ...	32°22′N.	90°57′W.	*ED	Edmonton, Alberta	53°32′N.	113°05′W.
NO	New Orleans, La. ...	29°57′N.	90°02′W.	*SC	Swift Current, Sask.	50°30′N.	107°45′W.
LR	Little Rock, Ark. ...	34°45′N.	92°20′W.				
GV	Galveston, Tex. ...	29°19′N.	94°48′W.	BK	Bismarck, N. Dak.	—	—
NV	Nashville, Tenn. ...	36°10′N.	86°47′W.	*HT	Horta, Azores ...	38°32′N.	28°38′W.

* Cloud reports not included.

The stations are indicated by the letters given above and are followed by two or more groups of five figures in each group. The first two groups contain surface observations. The remaining groups contain observations of clouds and upper air data.

An X will be substituted for any missing data.

Code used: Special (United States Meteorological).

Explanation of first and second Groups.

First Group.—1st three figures give the barometer reading corrected in inches and hundreths, the initial 2 or 3 being omitted. (To convert to millbars, see Table XLV).

4th figure gives the wind direction (Table XLI).

5th figure gives the wind force by Beaufort scale; the letters W (whole gale) S (storm) H (hurricane) will be sent for forces 10, 11 and 12 respectively.

Second Group.—1st figure gives the present weather (state of weather at surface, Table XLII).

2nd figure gives the barometric change in hundredths of an inch during the two hours preceding observation (Table XLIII).

3rd figure gives the past weather during the preceding 12 hours (Table XLIV).

4th and 5th figures give the air temperature in whole degrees Fahrenheit. When the temperature is zero or 100°, the 4th and 5th figures will be 00; when between 2° and 8°, inclusive, the 4th figure will be 0 and the 5th figure the temperature; when below zero, the correct temperature can be obtained by subtracting the code figures sent from 100°. The initial figure 1 is omitted for temperatures of 100° or more. No confusion should arise in decoding temperatures below zero or above 100°, if the season of the year and the position of the reporting stations are considered, for example:—

Duluth DU 74 = 74° in summer and —26° in winter.
Kansas City KC 04 = 104° in summer and 4° in winter.
Chicago CH 00 = 100° in summer and zero in winter.

Ship Reports.—Weather reports from ships in the Atlantic Ocean, and during the hurricane season additional reports from ships in the Gulf of Mexico and Caribbean Sea, follow the land stations' reports as follows:—

0300 G.M.T. bulletin contains 0000 G.M.T. observations; also Noon G.M.T. observations which were received too late for inclusion in the 1500 G.M.T. bulletin.

1500 G.M.T. bulletin contains Noon G.M.T. observations; also 0000 G.M.T. observations received too late for inclusion in the 0300 G.M.T. bulletin.

NOTE.—Ship reports of previous observations are only included when conditions are unusual.

The reports from ships are given in two five-figure groups for each ship preceded by the call sign of the ship.

First Group.—1st two figures give the latitude (north) to the nearest degree.

3rd, 4th and 5th figures give the longitude (west) to the nearest degree.

Second Group.—1st three figures give the barometric pressure in inches and hundredths, the initial 2 or 3 being omitted. (To convert to mbs, *see* Table XLV.)

4th figure gives the wind direction (Table XLI).

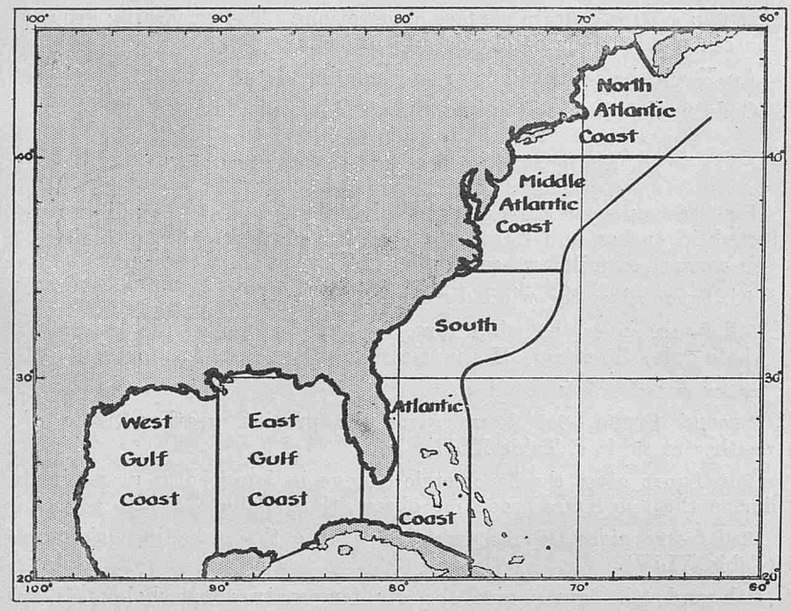
5th figure gives the wind force by Beaufort Scale.

Second Part.

Part II of the bulletin is in plain language, and consists of a summary of general pressure distribution, including the location of high and low areas, and the barometer readings at their centres; wind and weather forecasts for the areas shown on the CHARTLET on p. 172.

Storm warnings are also broadcast for these areas, and flying weather forecasts for each of six aviation zones.

CHARTLET OF U.S. MARINE FORECAST AREAS.



Weather Information broadcast for the benefit of Shipping approaching New York Harbour.

The following W/T stations broadcast weather conditions at Sandy Hook from observations made one hour previous to the times of transmission. The information will include barometric pressure, temperature, wind direction and force, state of sky, state of sea, and visibility.

W/T Station.	Call Sign.	Position (approx.).		Time, G.M.T.	Wave-length. Metres.
		Latitude.	Longitude.		
Tuckerton, N.J.	**WSC**	39° 33′ N.	74° 23′ W.	1400, 2200	650 (I.C.W.).
Chatham (Marion), Mass.	**WCC**	41° 43′ N.	70° 46′ W.	1400, 2200	2,200 (C.W.).

BERMUDA ISLANDS.

Spark Issues.

The W/T Station at Bermuda Dockyard, approximate Latitude 32° 19′ N., Longitude 64° 50′ W., broadcasts weather conditions prevailing at Bermuda at 0015 and 1215 G.M.T., on a wavelength of 1,600 metres, spark, and at 0020 and 1220 G.M.T., on a wavelength of 600 metres, spark.

SPECIAL WEATHER TELEGRAPHY TABLES.

NOT NEW INTERNATIONAL CODE.

Code Tables and their Meanings, used in connection with the "Arlington" Bulletins (U.S.A.).

Table XLI.—Wind Direction (True).

Code Figure.
- 0 = calm or no movement.
- 1 = north.
- 2 = north-east.
- 3 = east.
- 4 = south-east.
- 5 = south.
- 6 = south-west.
- 7 = west.
- 8 = north-west.

Table XLII.—Present Weather (State of Sky and Weather at Surface).

Code Figure.
- 1 = clear (3 tenths or less).
- 2 = partly cloudy (4 to 7 tenths).
- 3 = cloudy (8 to 10 tenths).
- 4 = raining.
- 5 = snowing.
- 6 = thunderstorm.
- 7 = sleeting or hailing.
- 8 = dense fog.

Table XLIII.—Barometric Change during two hours preceding Observation.

Code Figure.
- 0 = change of less than .04 inch.
- 1 = increase of .04 inch.
- 2 = decrease of .04 inch.
- 3 = increase of .06 inch.
- 4 = decrease of .06 inch.
- 5 = increase of .08 inch.
- 6 = decrease of .08 inch.
- 7 = increase of .10 inch.
- 8 = decrease of .10 inch.
- *9 = increase or decrease of .12 inch or more.

* Whether it is an increase or decrease can be determined by barometric tendency shown at surrounding stations.

Table XLIV.—Past Weather.

Information concerning occurrence of thunderstorms, high winds, and precipitation during the preceding 12 hours.

Code Figure.
- 1 = Thunderstorm without high winds and less than .06 inch precipitation.
- 2 = Thunderstorm without high winds and with .06 inch or more precipitation.
- 3 = Thunderstorm with high winds and less than .06 inch precipitation.
- 4 = Thunderstorm with high winds and .06 inch or more precipitation.
- 5 = Precipitation less than .06 inch.
- 6 = Precipitation from .06 to .16 inch inclusive.
- 7 = Precipitation more than .16 inch.
- 8 = High winds without thunderstorm and without precipitation in excess of .06 inch.
- 9 = High winds without thunderstorm and with precipitation in excess of .06 inch.
- 0 = No precipitation or high winds.

Table XLV.

To convert Inches into Millibars.

Inch.	mb.	Inch.	mb.	Inch.	mb.
27·50	931·2	**28·65**	970·2	**29·85**	1,010·8
27·55	932·9	**28·70**	971·9	**29·90**	1,012·5
27·60	934·6	**28·75**	973·6	**29·95**	1,014·2
27·65	936·3	**28·80**	975·3	**30·00**	1,015·9
27·70	938·0	**28·85**	976·9	**30·05**	1,017·6
27·75	939·7	**28·90**	978·6	**30·10**	1,019·3
27·80	941·4	**28·95**	980·3	**30·15**	1,021·0
27·85	943·1	**29·00**	982·0	**30·20**	1,022·7
27·90	944·8	**29·05**	983·7	**30·25**	1,024·4
27·95	946·5	**29·10**	985·4	**30·30**	1,026·1
28·00	948·2	**29·15**	987·1	**30·35**	1,027·7
28·05	949·9	**29·20**	988·8	**30·40**	1,029·4
28·10	951·6	**29·25**	990·5	**30·45**	1,031·1
28·15	953·2	**29·30**	992·2	**30·50**	1,032·8
28·20	954·9	**29·35**	993·9	**30·55**	1,034·5
28·25	956·6	**29·40**	995·6	**30·60**	1,036·2
28·30	958·3	**29·45**	997·3	**30·65**	1,037·9
28·35	960·0	**29·50**	999·0	**30·70**	1,039·6
28·40	961·7	**29·55**	1,000·7	**30·75**	1,041·3
28·45	963·4	**29·60**	1,002·4	**30·80**	1,043·0
28·50	965·1	**29·65**	1,004·0	**30·85**	1,044·7
28·55	966·8	**29·70**	1,005·7	**30·90**	1,046·4
28·60	968·5	**29·75**	1,007·4	**30·95**	1,048·1
		29·80	1,009·1		

WIRELESS STORM WARNINGS.

UNITED STATES OF AMERICA (ATLANTIC COAST).

Storm warnings are broadcast when necessary by the following stations, at the times indicated:—

W/T Station.	Call Sign.	Position. (Approx.) Latitude, Longitude.	Time. G.M.T.	Wavelength. (Metres.)
Jupiter, Fla.	NAQ	26° 57′ N. 80° 05′ W.	1630, 2300	1,621 (I.C.W.).
St. Augustine, Fla. ...	NAP	29° 53′ N. 81° 17′ W.	1700	1,621 (Spark).
Savannah, Ga.	NEV	32° 05′ N. 81° 06′ W.	1600, 2330	1,621 (I.C.W.).
Charleston, S.C. ...	NAO	32° 52′ N. 79° 58′ W.	1530, 2300	2,458 (I.C.W.).
Norfolk, Va.	NAM	36° 50′ N. 76° 18′ W.	0130, 0900, 1545, 2100.	2,458 (I.C.W.).
Washington (Arlington)	NAA	38° 52′ N. 77° 05′ W.	0300*	2,653, 4,409 A.C.W. simultaneously.
			1500*	18·6, 2,653 A.C.W. simultaneously.
Philadelphia	NAI	39° 53′ N. 75° 11′ W.	1545, 2200	2,883 (I.C.W.).
New York	NAH	40° 28′ N. 74° 00′ W.	1530, 2130	2,939 (C.W.).
Boston, Mass.	NAD	42° 21′ N. 70° 57′ W.	1600, 2200	2,939 (C.W.).

* In Part II of the Weather Bulletin.

Hurricane warnings are broadcast when necessary and repeated at 2-hour intervals by:—

Jupiter W/T Station, NAQ, until 0500 G.M.T.
St. Augustine W/T Station, NAP, until 2300 G.M.T.
Savannah W/T Station, NEV, until 0100 G.M.T.
Charleston W/T Station, NAO, for 24 hours.
Norfolk W/T Station, NAM, for 12 hours.

WIRELESS ICE WARNINGS.

CANADA, NOVA SCOTIA, NEWFOUNDLAND AND LABRADOR, ETC.

(Spark Issues.)

The following W/T stations broadcast ice warnings. Stations marked with an asterisk (*) are open during the season of navigation only.

W/T Station.	Latitude N. (approximate.)	Longitude W. (approximate.)	Call Sign.	Wave length (Metres).	G.M.T. of issue.
St. John, N.B....	45° 14′	66° 03′	VAR	600 (Spk.)	On request.
†Lurcher Lt.-V....	43° 49′	66° 32′	VDR	600 (Spk.)	On request.
Yarmouth ...	43° 46′	66° 07′	VAU	600 (Spk.)	0200 1400
Chebucto Head ..	44° 30′	63° 31′	VAV	600 (Spk.)	0130 1330
Sable Island ...	43° 56′	60° 02′	VCT	600 (Spk.)	On request.
North Sydney ...	46° 13′	60° 15′	VCO	600 (Spk.)	On request.
Grindstone Island	47° 24′	61° 51′	VCN	600 (Spk.)	On request.
*Fame Point ...	49° 07′	64° 36′	VCG	600 (Spk.)	0145 1345
*Father Point ...	48° 31′	68° 28′	VCF	600 (Spk.)	0200 1400
*Montreal ...	45° 34′	73° 38′	VCA	600 (Spk.)	On request.
*Clarke City ...	50° 11′	66° 37′	VCK	600 (Spk.)	On request.
*Heath Pt. Lt.-V.	49° 03′	61° 30′	VCI	600 (Spk.)	On request.
Cape Race ...	46° 39′	53° 05′	VCE	600 (Spk.)	0215 1415
Pt. Amour ...	51° 27′	56° 50′	VCL	600 (Spk.)	On request.
Belle Isle ...	51° 53′	55° 22′	VCM	600 (I.C.W.)	0230 1430

† The station keeps watch for the first half of every odd hour from 1200 to 0000, and from 0300 to 0330, G.M.T.

III. WIRELESS TIME SIGNALS.

CANADA (NOVA SCOTIA).

Spark Issue.

Chebucto Head D/F Station, Latitude 44° 30′ 01″ N., Longitude 63° 31′ 20″ W., call sign **VAV** broadcasts a time signal daily (Sundays excepted) at 14h. 00m. 00s., G.M.T., on a wavelength of 600 metres (spark).

The procedure is as follows:—

G.M.T.			Signal.
13 58 00	to	13 58 57	A dot (•) is transmitted at each second.
13 59 00			(•) Time signal.
13 59 03	to	13 59 50	A dot (•) is transmitted at each second.
14 00 00			(•) Time signal.

For the purpose of these signals the observatory at St. John (New Brunswick) is connected by land telegraph to Chebucto Head D/F Station.

UNITED STATES OF AMERICA (ATLANTIC COAST).

C.W. Issues.

Time Signals are broadcast according to the United States System (See Diagram of Washington—Annapolis W/T Time Signals below), from the following W/T Stations:—

Washington—Arlington, Latitude 38° 52′ 05″ N., Longitude 77° 04′ 47″ W., call sign **NAA** on wavelengths* of 24.9, 37.4, 74.7 and 2,653 metres (A.C.W.) on high power, at 3h. 00m. 00s., and 17h. 00m. 00s., G.M.T.

The time signals are broadcast daily and are controlled by the Naval Observatory, Washington. They are broadcast simultaneously on the above-mentioned wavelengths.

In case of error or failure the time signals will be broadcast 1 hour after the times given above. In the case of the time signal at 17h. 00m. 00s., if it is not possible to broadcast this at 18h. 00m. 00s., it will be sent at 19h. 00m. 00s. In the case of the 3h. 00m. 00s. signal, no further attempt will be made after 4h. 00m. 00s.

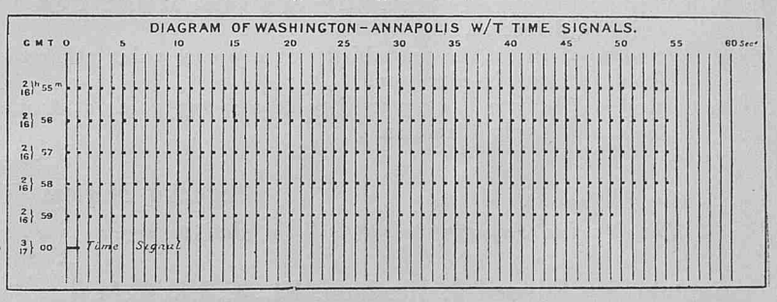
The error of the time signal is generally less than 0.1 second.

Washington—Annapolis, Latitude 38° 59′ 00″ N., Longitude 76° 27′ 00″ W., call sign **NSS,** on a wavelength of 17,040 metres (C.W.) at 3h. 00m. 00s., and 17h. 00m. 00s. G.M.T.

The time signals are relayed from the U.S. Naval Observatory and are broadcast on high power.

See Washington—Arlington for alternative broadcast times in case of failure.

The error of the time signal is generally less than 0.1 second.



The following W/T Stations broadcast a time signal at 17h. 00m. 00s., G.M.T., **only** when Washington—Arlington is out of action (Sundays and holidays excepted):—

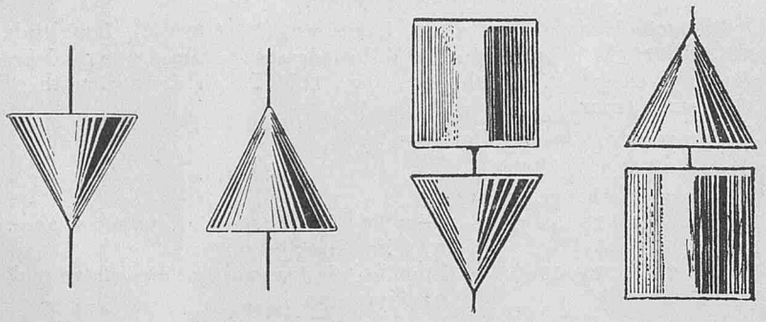
——	Latitude.	Longitude.	Call Sign.	Wavelength. Metres.
New York	40° 48′ 00″N.	73° 50′ 00″W.	NAH	2,939 (C.W.).
Norfolk	36° 49′ 33″N.	76° 17′ 46″W.	NAM	2,458 (I.C.W.).
Charleston	32° 51′ 36″N.	79° 57′ 49″W.	NAO	2,458 (I.C.W.).

* Sharp tuning to the transmitting wavelengths is necessary in order to receive satisfactorily.

IV. VISUAL STORM WARNINGS.

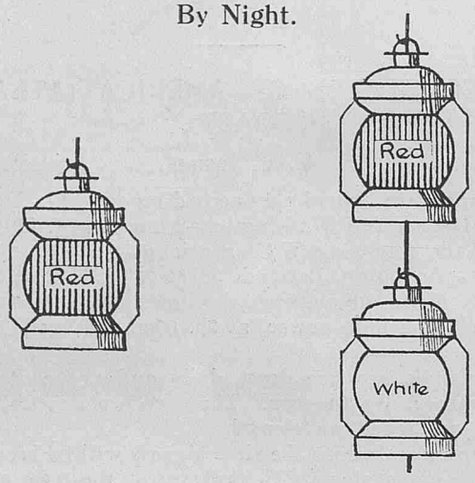
Canada.

By Day.



No. 1. No. 2. No. 3. No. 4.

By Night.



Nos. 1 or 3. Nos. 2 or 4.

Storm signals are hoisted on warning being received from the Meteorological Office, Toronto, at Camperdown (Halifax), Canso, Digby, Halifax, Liscomb, Liverpool, and Yarmouth, Westport (Brier island) in Nova Scotia; at Point Lepreau, St. Andrews, St. John in New Brunswick; Eastport (State of Maine), at several places on the coasts of Cape Breton island, New Brunswick, Prince Edward island, Quebec, Newfoundland and British Columbia.

Signification: Day or Night Signals.

No. 1, hoisted to indicate the probability of a gale; at first, from an easterly direction.

No. 2, hoisted to indicate the probability of a gale; at first, from a westerly direction.

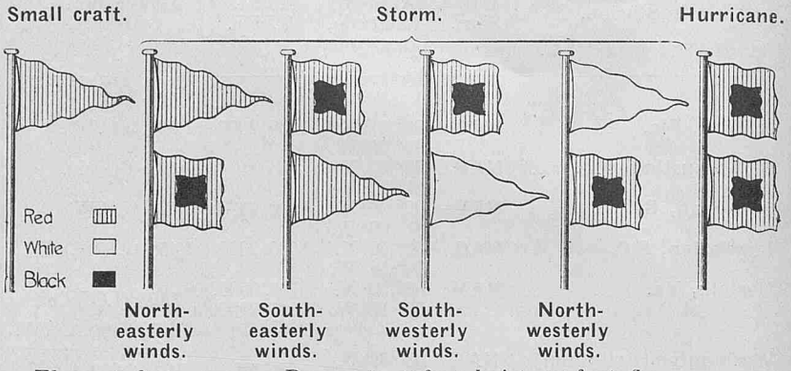
No. 3 hoisted to indicate the probability of a *heavy* gale; at first, from an easterly direction.

No. 4, hoisted to indicate the probability of a *heavy* gale; at first, from a westerly direction.

It must be borne in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

UNITED STATES OF AMERICA.

Visual, Small-Craft, Storm and Hurricane Warnings.



Flags, 8 feet square. Pennants, 8-foot hoist, 15-foot fly.

Storm warnings are displayed by the U.S. Weather Bureau at some 380 stations on the Atlantic, Gulf and Pacific coasts of the United States, and on the Great Lakes.

Explanation of Warnings.

The Small-Craft Warning.—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small-craft warnings is made.

The North-East Storm Warning.—A red pennant *above* a square red flag with black centre displayed by day, or two red lanterns, one above the other, displayed by night, indicate the approach of a storm of marked violence, with winds beginning from the *North-East.*

The South-East Storm Warning.—A red pennant *below* a square red flag with black centre displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *South-East.*

The South-West Storm Warning.—A white pennant *below* a square red flag with black centre displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *South-West.*

The North-West Storm Warning.—A white pennant *above* a square red flag with black centre displayed by day, of a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *North-West.*

Hurricane or Whole Gale Warning.—Two square flags, red with black centres, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane or of one of the extremely severe and dangerous storms which occasionally move across the Great Lakes.

Special Notices Regarding Personnel.

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

Captain Sir Edward J. Headlam, Kt., C.S.I., C.M.G., D.S.O., R.I.M.

The KING has been pleased to confer the order of knighthood upon the occasion of HIS MAJESTY'S birthday upon Captain EDWARD JAMES HEADLAM, C.S.I., C.M.G., D.S.O., Director of the Royal Indian Marine.

Captain HEADLAM is an old Conway and has taken a keen interest in the work of the British Corps of Voluntary Marine Observers. He was the first Royal Indian Marine Officer to become Director of that Service.

Commander R. A. Milne, R.D., R.N.R.

Commander R. A. MILNE, R.D., R.N.R., of the British India S.S. *Margha* has retired after 40 years' service afloat.

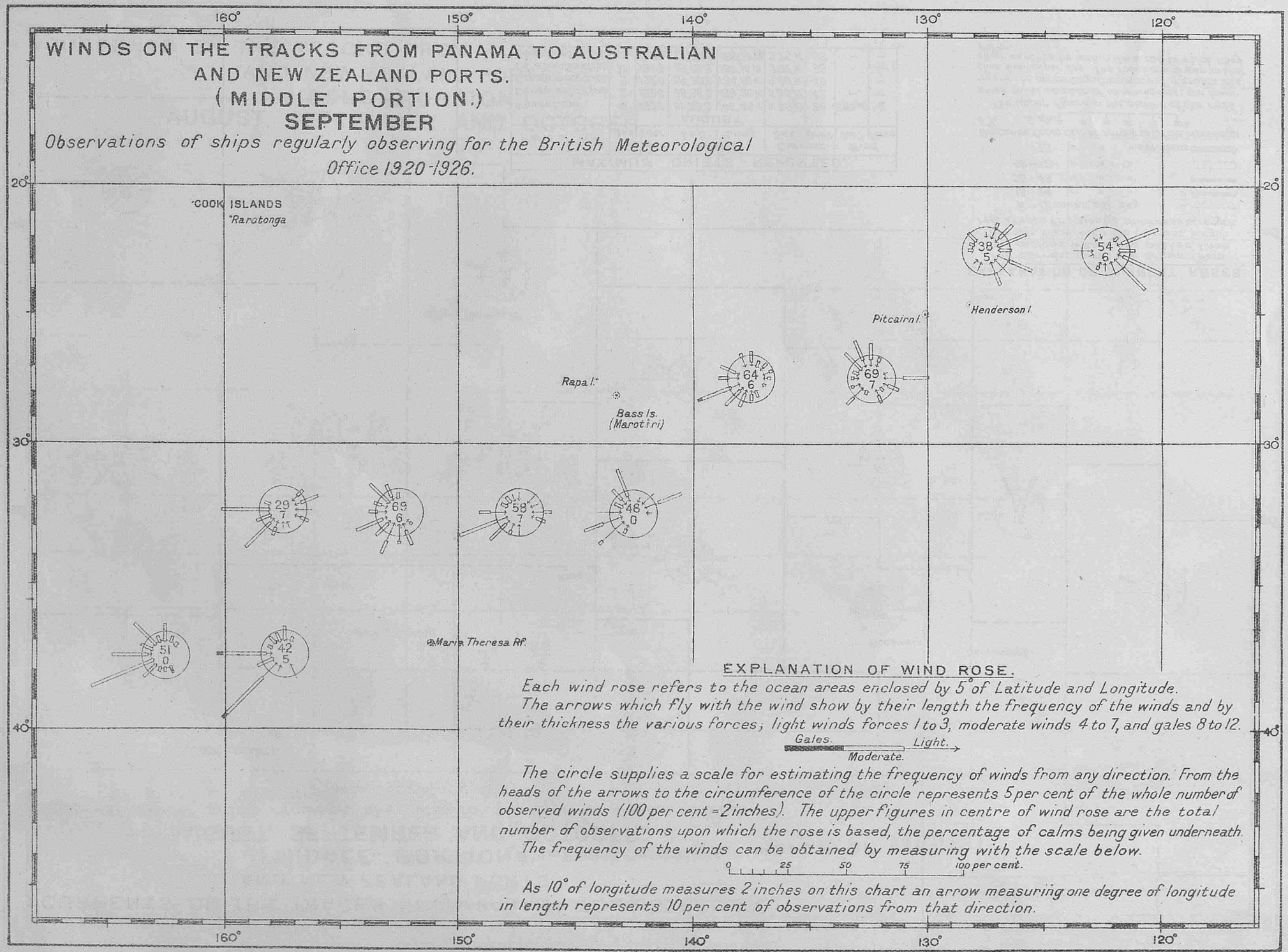
Captain MILNE first went to sea in 1888 as an apprentice in the Ship *Duntrune* of the DUNDEE CLIPPER LINE, employed chiefly in the Australian trade. On obtaining his 2nd mate's certificate in 1892 he sailed 2nd mate of the Barque *Countess of Derby*, also of Dundee. In January 1895, he transferred to steam, joining the BRITISH INDIA STEAM NAVIGATION COMPANY as a Junior Officer. Passing through the successive grades, Captain MILNE reached command in 1912, when he was appointed Master of the *Lalpoora* and has since had under his charge, seven vessels of the Company's Fleet.

Captain MILNE has been a regular member of the Corps of Voluntary Marine Observers since 1920, and Marine Observers will join with the Marine Division in wishing him long life and happiness in his retirement.

SOUTH PACIFIC.

WINDS ON THE TRACKS FROM PANAMA TO AUSTRALIAN AND NEW ZEALAND PORTS.
(MIDDLE PORTION.)
SEPTEMBER

Observations of ships regularly observing for the British Meteorological Office 1920-1926.



EXPLANATION OF WIND ROSE.

Each wind rose refers to the ocean areas enclosed by 5° of Latitude and Longitude.

The arrows which fly with the wind show by their length the frequency of the winds and by their thickness the various forces; light winds forces 1 to 3, moderate winds 4 to 7, and gales 8 to 12.

Gales. Moderate. Light.

The circle supplies a scale for estimating the frequency of winds from any direction. From the heads of the arrows to the circumference of the circle represents 5 per cent of the whole number of observed winds (100 per cent = 2 inches). The upper figures in centre of wind rose are the total number of observations upon which the rose is based, the percentage of calms being given underneath.

The frequency of the winds can be obtained by measuring with the scale below.

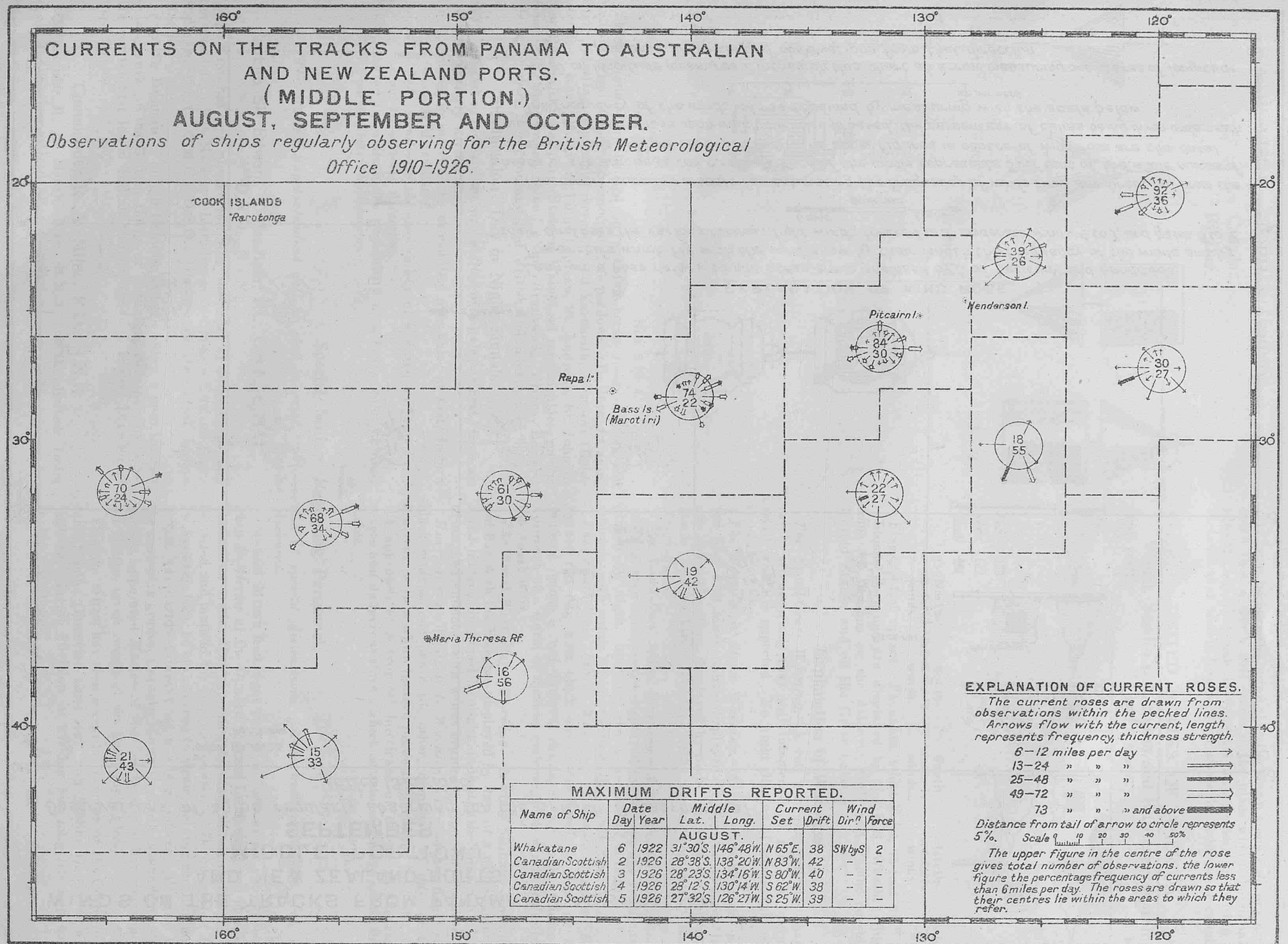
0 25 50 75 100 per cent.

As 10° of longitude measures 2 inches on this chart an arrow measuring one degree of longitude in length represents 10 per cent of observations from that direction.

SOUTH PACIFIC.

CURRENTS ON THE TRACKS FROM PANAMA TO AUSTRALIAN AND NEW ZEALAND PORTS.
(MIDDLE PORTION.)
AUGUST, SEPTEMBER AND OCTOBER.

Observations of ships regularly observing for the British Meteorological Office 1910-1926.



MAXIMUM DRIFTS REPORTED.

Name of Ship	Date Day	Date Year	Middle Lat.	Middle Long.	Current Set	Current Drift	Wind Dirn	Wind Force
			AUGUST.					
Whakatane	6	1922	31°30'S.	146°48'W.	N 65°E.	38	SWbyS	2
Canadian Scottish	2	1926	28°38'S.	138°20'W.	N 83°W.	42	–	–
Canadian Scottish	3	1926	28°23'S.	134°16'W.	S 80°W.	40	–	–
Canadian Scottish	4	1926	28°12'S.	130°14'W.	S 62°W.	38	–	–
Canadian Scottish	5	1926	27°32'S.	126°27'W.	S 25°W.	39	–	–

EXPLANATION OF CURRENT ROSES.

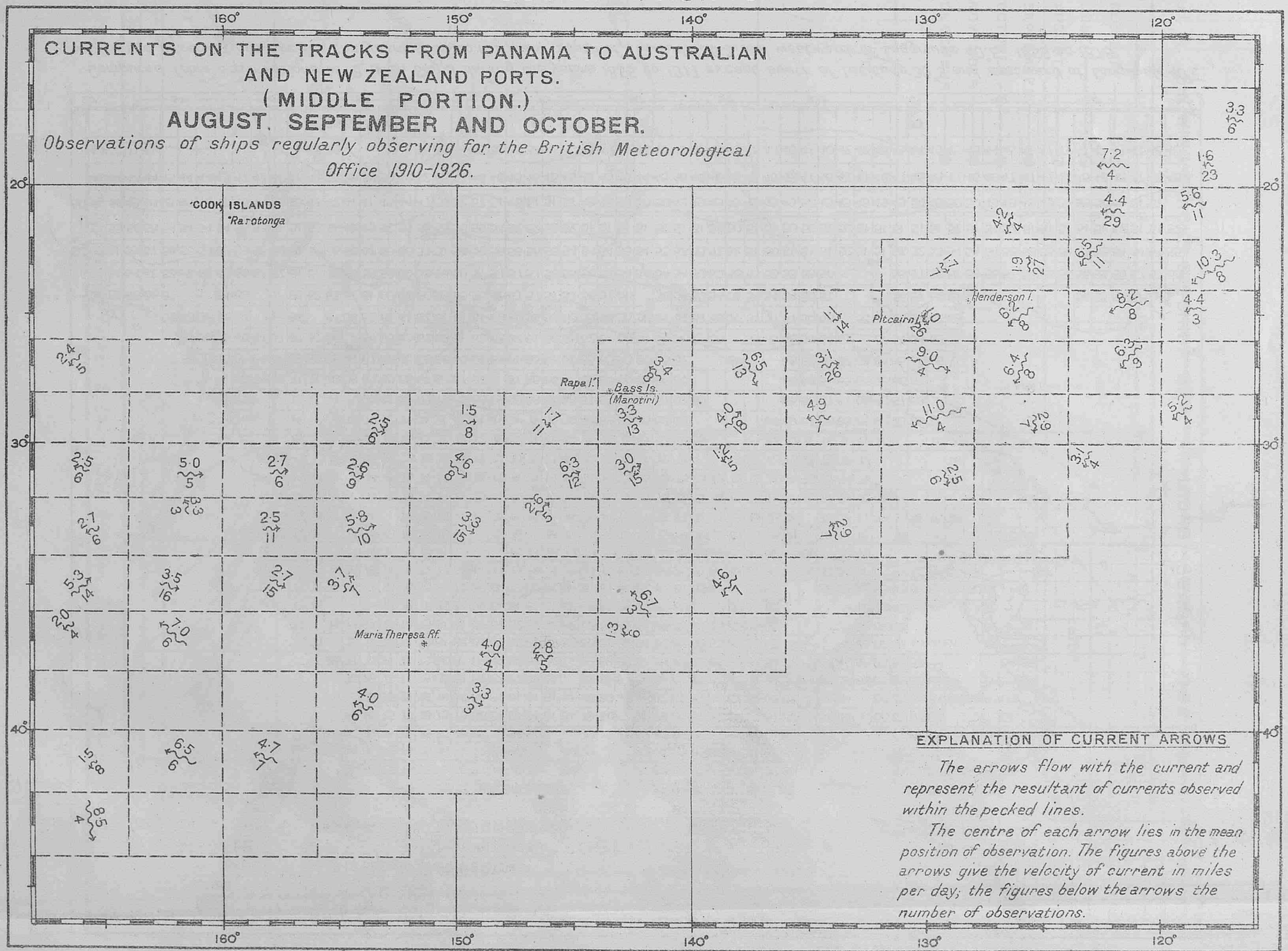
The current roses are drawn from observations within the pecked lines. Arrows flow with the current, length represents frequency, thickness strength.

6–12 miles per day
13–24 " " "
25–48 " " "
49–72 " " "
73 " " " and above

Distance from tail of arrow to circle represents 5%. Scale 0 10 20 30 40 50%

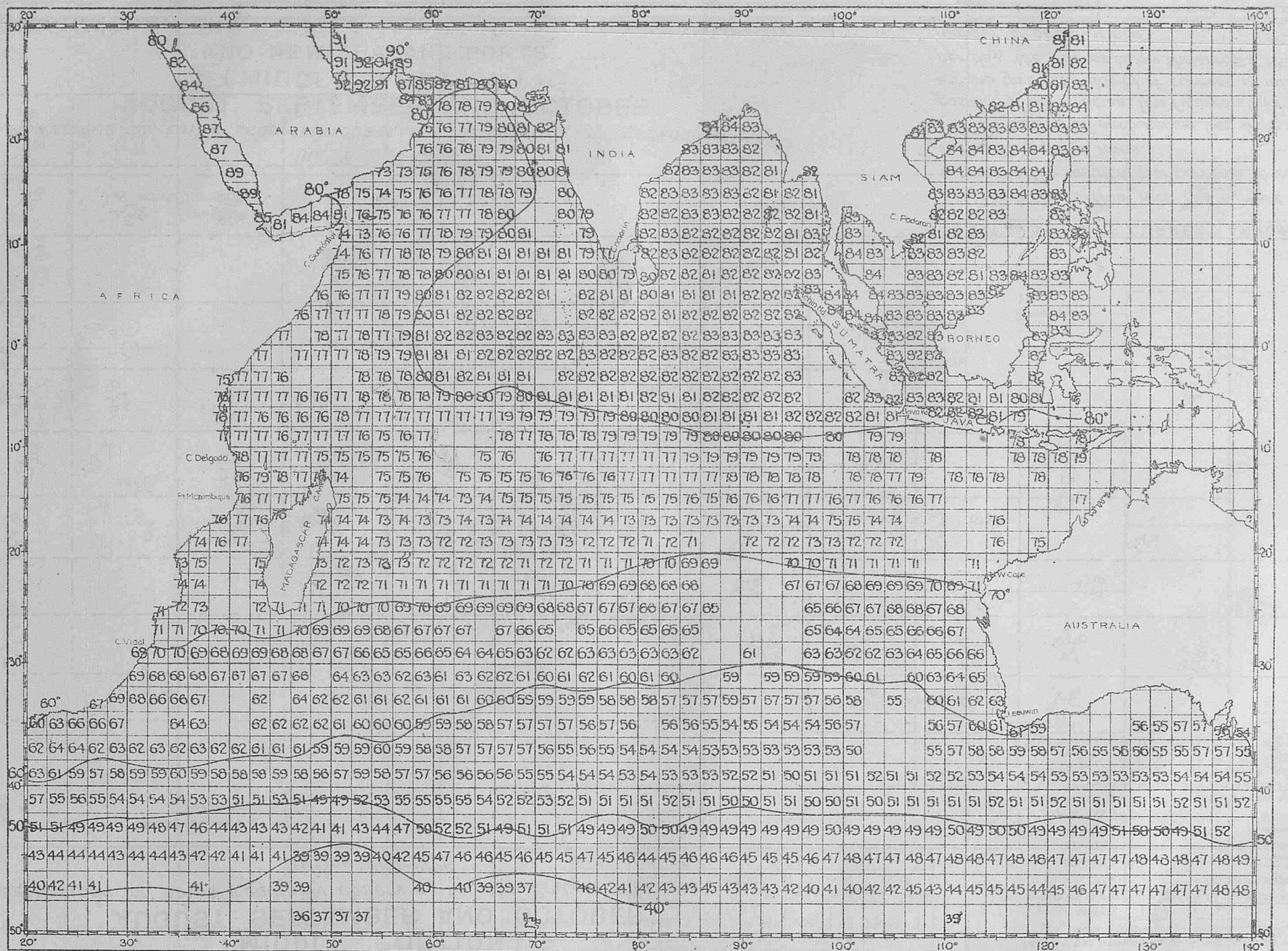
The upper figure in the centre of the rose gives total number of observations. the lower figure the percentage frequency of currents less than 6 miles per day. The roses are drawn so that their centres lie within the areas to which they refer.

SOUTH PACIFIC.



INDIAN OCEAN.

MEAN SEA SURFACE TEMPERATURES FOR MONTH OF AUGUST,

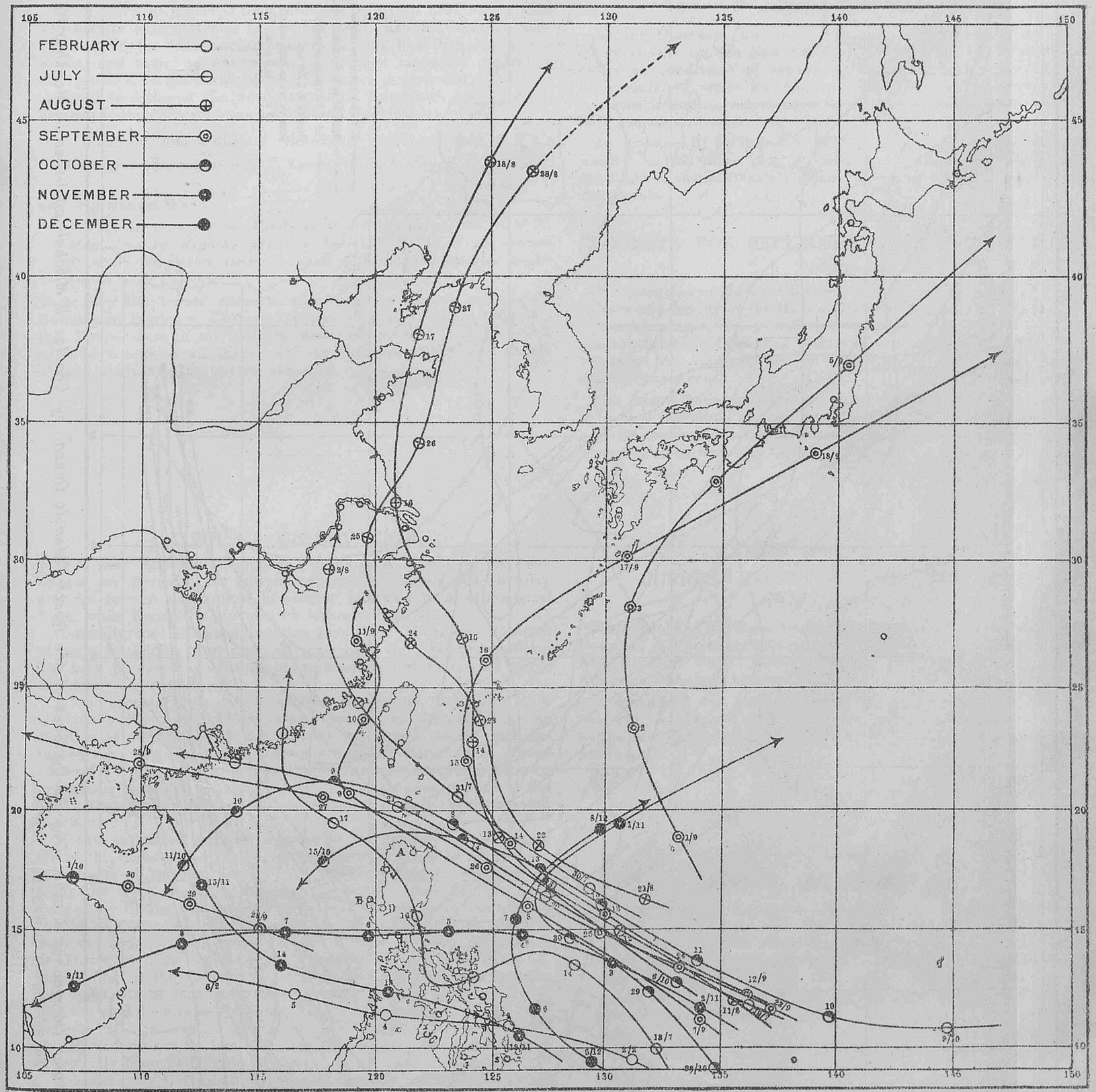


Computed from observations of British Ships during the years 1855 to 1917 except south of Latitude 30°S. and eastward of Longitude 40°E. where the observations are for the years 1855 to 1895; and south of Latitude 30°S. and westward of Longitude 40°E., 1855 to 1878.

H.M. Stationery Office Press, Kingsway W.C.2.

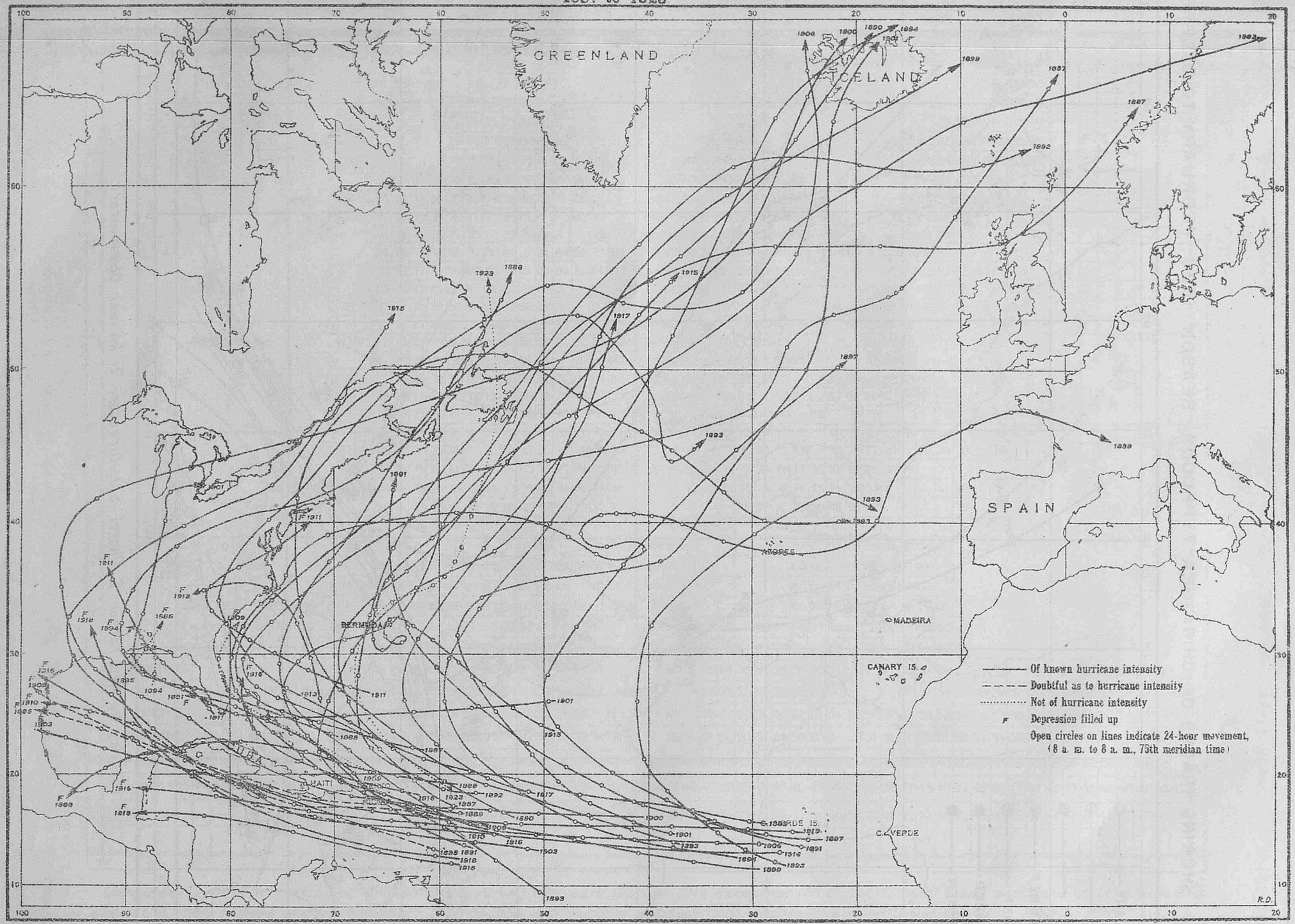
Ps. 973/1.10. W4.52 A. D.S. 1300. 6/28.

Chart A. SHOWING TRACKS OF CHINA SEA TYPHOONS, SEASON 1926, FEBRUARY TO DECEMBER.



Compiled by Rev. Father E. Gherzi S.J., Director, Zi-ka-wei Observatory.

Tracks of Tropical Cyclones of North Atlantic, August 1887 to 1923



From "West Indian Hurricanes & other Tropical Cyclones of the North Atlantic Ocean," by Charles L. Mitchell, published in "Monthly Weather Review," Supplement No. 24, of the U.S. Weather Bureau.

NOTICES.

VERY IMPORTANT.

Selected Ships' Routine Wireless Weather Reports.

Attention is invited to the standard form of report given in Chapter I of "Wireless and Weather an Aid to Navigation" and to the columns ruled at the end of the Meteorological Log, in the Original Note Book, and on Form 911, for recording reports made to "All Ships" and certain Stations.

If this form of report is used, unnecessary words need not be used and brevity with clearness is accomplished. Reports made by some "Selected Ships" intercepted at shore stations show that unnecessary words, and therefore unnecessary lengthened messages, are made. For instance, if the standard form of report is used and the correct sequence is followed the words Latitude, Longitude, etc., are unnecessary; thus everyone can understand the meaning of:—

Weather 3045 *N* 6146 *W Barometer corrected* 3009 *E.N.E.*3 *Cloudy Ci Str* 8 1300 *G.M.T. Twenty Eighth May.*

Cristales

and it is shorter than:—

Weather report from Cristales to All Ships at 1300 *G.M.T., May Twenty Eighth, position Latitude* 30 45 *N Longitude* 61 46.*W Barometer corrected* 3009 *E.N.E.*3 *sky clouded eight-tenths with Ci Str.*

These are the fewest elements required; the Course and speed, Barometric Tendency, Current experienced with positions **from** and **to**, Temperature of air and sea, and past weather, may be added with advantage to all ships receiving the report, but they should always be given in the correct sequence.

CURRENT OBSERVATION.

It is very desirable that good current data should be recorded. Spaces are provided for current experienced throughout the day and for current determined at shorter intervals in Meteorological Logs, while Form 911 provides for either or both.

Generally the difference between the *Dead Reckoning Position* at noon, reckoned from previous noon, and the *observed position* has been accepted as attributable to a single current for the whole 24 hours.

It is necessary to make careful distinction between *Dead Reckoning Position* and *Estimated Position*, the former being the position as reckoned from the last fix by courses steered and distances run, corrected for all known errors and disturbances *except* current. When a fix cannot be obtained, an estimation for current (when one is known generally to exist) is sometimes applied to the D.R.; the result may then be conveniently termed the *Estimated Position*.

If this estimated position is given in the Meteorological Log or Form 911, *it should be clearly stated*, otherwise it may be misleading.

Currents of varying velocity and direction may be experienced along the track made in 24 hours; therefore, when reliable fixes such as by Stellar observations at twilight are obtained, the current should be determined for the intervals, and all should be checked with the noon to noon result. Each of these currents determined at shorter intervals than 24 hours should be entered in the Meteorological Log in the appropriate column, and the time and latitude and longitude of each observation position should be given in the latitude and longitude columns. The times given on Form 911 indicate the interval. The period of short interval currents should usually not be less than, say, six hours. The best interval is probably from twilight to twilight.

It is desirable that whenever possible two methods of ascertaining the distance run through the water should be used, as recent investigation goes to show that with one means of measuring the speed the inclination has been to credit the ship. When possible it is recommended that both patent log and revolutions should be used.

For working out the set and drift of current the position *from* as well as the position *to* must always be *fixes*. Some observers have used an *estimated* position *from*, which makes the set and drift false. The same remarks apply to course allowances for set; the latter are naturally necessary to make an *estimated* course.

"WIRELESS AND WEATHER AN AID TO NAVIGATION."

Price Five Shillings.

This book, which provides full information and guidance in the modern application of Marine Meteorology, by means of Wireless Telegraphy, for general use of the officers of the Sea Service, can be purchased from H.M. Stationery Office, or through any bookseller.

SEA AND SWELL MEASUREMENTS.

Marine Observers are invited to make special efforts to obtain measurements of Sea and Swell in all parts of the Oceans and under all conditions of weather. These observations are required for completing scales for routine observation and for many other purposes including information upon which to base form of ship's hull and construction.

An article will be found in Volume II, No. 19, upon "Sea and Swell" and on pages 43-8, of "The Marine Observer's Handbook" 4th Edition, instructions are given. Form 684 may be obtained from the Agents.

REQUESTS FOR REPLACEMENTS OF INSTRUMENTS, ETC.

The attention of Marine Observers is invited to the list of Nautical Officers and Agents of the Marine Division, overleaf.

Correspondence, delay and inconvenience may be saved if the Commanders and Officers of observing ships will kindly make their requests for replacements of instruments, logs, etc., to the appropriate Agency.

The Agents have the necessary gear, information and instruction to supply the needs of regular observing ships and to give advice upon questions of Marine Meteorology to any officers of the Merchant Navy who may desire it.

CURRENT DATA REQUIRED FOR NEXT YEAR'S WORK.

The sections of the Main Trade Routes next to be charted for Ocean Currents will probably include Cape Horn to the River Plate, South Atlantic and Cape Howe, Victoria, to Cape Leeuwin, West Australia, Southern Ocean.

Commanders who have preserved accurate records of currents observed in these vicinities since 1910, which have not been returned to the Meteorological Office, are invited to send copies as soon as possible.

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 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.

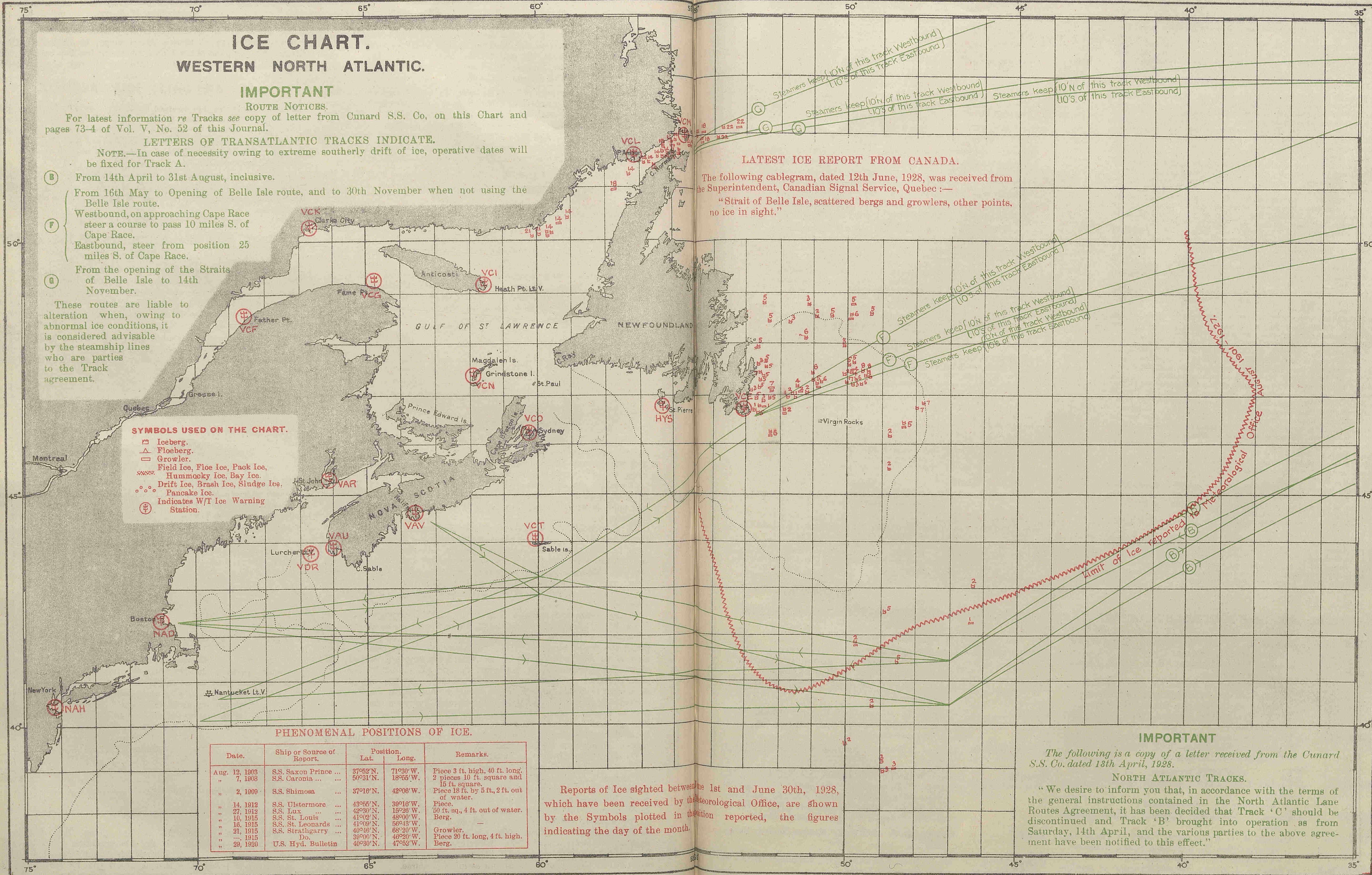
S.S...... *Captain*.....

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 CHART.

WESTERN NORTH ATLANTIC.

IMPORTANT

ROUTE NOTICES.

For latest information *re* Tracks *see* copy of letter from Cunard S.S. Co, on this Chart and pages 73–4 of Vol. V, No. 52 of this Journal.

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 14th April to 31st August, inclusive.

(F) From 16th May to Opening of Belle Isle route, and to 30th November when not using the Belle Isle route.
Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race.
Eastbound, steer from position 25 miles S. of Cape Race.

(G) From the opening of the Straits of Belle Isle to 14th November.

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.

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.

LATEST ICE REPORT FROM CANADA.

The following cablegram, dated 12th June, 1928, was received from the Superintendent, Canadian Signal Service, Quebec:—

"Strait of Belle Isle, scattered bergs and growlers, other points, no ice in sight."

Reports of Ice sighted between the 1st and June 30th, 1928, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position. Lat.	Long.	Remarks.
Aug. 12, 1903	S.S. Saxon Prince ...	37°52'N.	71°30'W.	Piece 3 ft. high, 40 ft. long.
" 7, 1908	S.S. Caronia	50°31'N.	18°55'W.	2 pieces 10 ft. square and 15 ft. square.
" 2, 1909	S.S. Shimosa ...	37°16'N.	42°06'W.	Piece 18 ft. by 5 ft., 2 ft. out of water.
" 14, 1912	S.S. Ulstermore ...	43°55'N.	39°16'W.	Piece.
" 27, 1912	S.S. Lux	42°30'N.	15°26'W.	50 ft. sq., 4 ft. out of water.
" 10, 1915	S.S. St. Louis ...	41°02'N.	48°00'W.	Berg.
" 16, 1915	S.S. St. Leonards ...	41°09'N.	56°43'W.	—
" 21, 1915	S.S. Strathgarry ...	40°46'N.	68°20'W.	Growler.
" —, 1915	Do.	39°00'N.	46°20'W.	Piece 20 ft. long, 4 ft. high.
" 29, 1920	U.S. Hyd. Bulletin	40°30'N.	47°52'W.	Berg.

IMPORTANT

The following is a copy of a letter received from the Cunard S.S. Co. dated 13th April, 1928.

NORTH ATLANTIC TRACKS.

"We desire to inform you that, in accordance with the terms of the general instructions contained in the North Atlantic Lane Routes Agreement, it has been decided that Track 'C' should be discontinued and Track 'B' brought into operation as from Saturday, 14th April, and the various parties to the above agreement have been notified to this effect."

Ps.979/1710. Wt.52A. O.9. 1100. 8/28.

H.M.S.O. Press, Kingsway, W.C.2.

NOTICES.

MARINE METEOROLOGY.

Co-operation of Shipowners, Masters and Mates.

The Director of the Meteorological Office is authorised to lend tested Instruments to Captains of British-owned ships who undertake to make 4 hourly observations and keep Meteorological Logs for the Office.

The instruments supplied for this purpose are one barometer, four thermometers with screen, two hydrometers and in some cases a Barograph and rain gauge is added to the equipment.

Tested instruments are also lent to a number of British Atlantic Liners which make special coded W/T weather reports to the Office.

The number of ships co-operating with the M.O. using official tested instruments on loan is limited.

Vessels observing regularly for the Meteorological Office to which office instruments are not lent, keep Form 911, Ship's Meteorological Report, using the ship's instruments, the barometer being compared with Standards. The number of ships regularly contributing approved forms of all descriptions to the Marine Division is limited to 500.

Captains and Officers who wish to co-operate with the Meteorological Office should apply *by letter to* The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2; or *in person* between the hours of 10 a.m. and 4 p.m., to the Marine Superintendent at the same address or to any of the gentlemen whose names and addresses are given below acting as agents at the respective ports. A waiting list is kept of the names of ships whose commanders have offered to regularly co-operate.

Marine Observers (*i.e.*, Captains and Officers who regularly observe for the Meteorological Office) will greatly assist if they will send in Meteorological Logs immediately on completion through the Port Meteorological Officer or Agent, at the same time notifying him of any possible instrumental defects.

Defective instruments will then be replaced and new Log Books, etc., provided.

In London and at base ports where there is not an Agency, notification of defects should be sent to headquarters on arrival, with the Meteorological Log.

Vessels making voyages of less than two months' duration are requested to retain their logs until nearly filled up, but the log should be returned in all cases at least twice yearly.

W/T Registers and Forms 911 should in all cases be sent directly to the Meteorological Office, London. The Port Meteorological Officer at Liverpool and the Visiting Officer in London board vessels co-operating with the Meteorological Office, and the agents visit ships at their ports when circumstances permit.

Postage abroad incurred on behalf of the Meteorological Office in returning logs will be refunded. Postage from British Empire ports need not be prepaid, if the envelope is marked O.H.M.S., and addressed to the Director, Meteorological Office, London.

Captains and Officers whether they observe regularly for the Meteorological Office or not are urged to report exceptional phenomena in air or sea. Reports of weather experienced in or near Tropical Cyclones or hurricanes, also abnormal currents are specially desired.

Ships on the List of Voluntary Observers to the Meteorological Office which have a mercurial barometer are indicated by the letters M.L., W.T. and M.

These are selected ships for reporting weather observations made at specified times by W/T to "All Ships," and they are *invited* to perform this service, which is for the benefit of all shipping fitted for W/T reception.

For sample weather report message see page 18 of Vol. V., No. 49.

THE MARINE OBSERVER is sent monthly to all ships regularly contributing Logs, Forms and W/T Registers to the Meteorological Office. It is hoped that each ship will preserve *all* her copies. Personal copies of Numbers are sent to those whose special contributions are published in them. A suitable cover may be obtained from H.M. Stationery Office, price 2s.

LATE PRESS.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position. Latitude.	Position. Longitude.	Description.
	NORTH SEA.		
16.6.28	Sandette 23°, dist. 6 miles.		Large spar, about 2 ft. in diameter, floating upright, awash. Dangerous to navigation.
17.6.28	51°53′N.	2°30′E.	Spar projecting about 4 ft., apparently attached to submerged wreckage.
	ENGLISH CHANNEL.		
6.6.28	48°42′N.	7°30′W.	Heavy log about 40 ft. in length.
14.6.28	5 mls. off C. Gris Nez		Mast projecting above water.
20.6.28	49°33′N.	0°23′W.	Large black unlighted buoy.
21.6.28	50°23′N.	0°45′W.	Spar, apparently attached to submerged wreckage.
	BRISTOL CHANNEL.		
9.6.28	51°26′N.	5°02′W.	Derelict vessel.
	NORTH ATLANTIC.		
1.6.28	39°50′N.	60°53′W.	Wreckage, about 50 ft. long, the lower end of which was painted white with some pieces of sail and rigging attached.
2.6.28	34°39′N.	75°29′W.	Spar, about 50 ft. long and 2 ft. in diameter.
2.6.28	42°03′N.	43°55′W.	Red bell buoy with black superstructure.
3.6.28	42°43′N.	43°25′W.	Log, about 30 ft. long, covered with marine growth.
3.6.28	26°32′N.	74°17′W.	Heavy spar, apparently broken mast, projecting about 4 ft. out of water and covered with marine growth.
4.6.28	40°18′N.	61°30′W.	Log, about 30 ft. long, covered with marine growth.
4.6.28	40°13′N.	47°11′W.	Log, about 60 ft. long, covered with barnacles.
9.6.28	39°00′N.	73°42′W.	Two heavy broken spars, probably fast to submerged wreckage, one upright and projecting 5 ft. out of water, and the other horizontal and showing 25 ft.
10.6.28	21°46′N.	63°23′W.	Large conical whistle buoy, with whistle working.
11.6.28	45°30′N.	54°40′W.	Log, projecting about 4 ft. out of water.
12.6.28	46°22′N.	55°47′W.	Capsized schooner, with 20 ft. of the hull showing out of water; hull was painted black and spars were floating alongside.
12.6.28	44°32′N.	51°12′W.	Gas and whistle buoy.
12.6.28	34°45′N.	48°38′W.	Round buoy, about 10 ft. in diameter, with an eyebolt and shackle on top; the buoy was rusty with barnacles at the water line.
12.6.28	49°09′N.	10°15′W.	Barnacled log about 50 ft. in length, 5 ft. in diameter. Dangerous to navigation.
13.6.28	41°34′N.	56°06′W.	Red conical buoy, showing about 5 ft. out of water.
13.6.28	39°47′N.	48°39′W.	Large gas and whistle buoy.
14.6.28	48°53′N.	19°07′W.	Floating red buoy.
14.6.28	44°31′N.	48°38′W.	Tree trunk about 40 ft. long with branches.
17.6.28	49°57′N.	8°53′W.	Heavy log, about 40 ft. long.
17.6.28	40°30′N.	26°10′W.	Tree, about 30 ft. long and 2 ft. diameter, with roots exposed.
21.6.28	48°59′N.	8°29′W.	Red buoy, with top mark.
	GULF OF MEXICO.		
4.6.28	25°28′N.	85°20′W.	Upright spar, about 20 inches in diameter, and projecting 8 ft. out of water.
	NORTH PACIFIC.		
2.6.28	7°09′N.	81°43′W.	Tree trunk, about 50 ft. long and 4 ft. in diameter, with roots attached.
3.6.28	7°50′N.	83°15′W.	Large tree trunk about 120 ft. long and 6 ft. in diameter, with roots showing above water, which gave at a distance the appearance of the sail of a vessel.

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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 reports received, are given with the date and description of last log, register or report 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 reports 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.

Unless otherwise stated, vessels on the following list are s.s.

M.L. = Equipped with tested Instruments for keeping Meteorological Log.

W.T. = Equipped with tested Instruments for making coded W/T reports to the Meteorological Office, London.

No. = Keeps Ships' Meteorological Report Form 911 with ship's instruments. Letter M after No. indicates ship's barometer Mercurial; A. ship's barometer Aneroid.

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

The numbers which appear before the names of ships equipped for making coded W/T reports to the Meteorological Office, London, are used for the purpose of identification when the observations are re-transmitted in synoptic messages by Wireless or Cable.

Selected Ships.

Those ships in this list which have the letters M.L., W.T. or M. after their names in the equipment column are "Selected ships" invited to make by W/T, standard form reports of observations taken at arranged G.M. Times to "All Ships." See "Wireless and Weather an aid to Navigation."

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received
Aba	Williams, T. E. ...	S. J. Bristowe, O. E. Jones, A. H. Perkins.	M.L.	Elder Dempster ...	Met. Log. 14.10.27 to 10.2.28... ...	16.3.28
Abinsi	Millson, H. E. ...	G. M. de la Cour	No. A.	„ „ ...	Form 911 21.3.28 to 29.4.28	5.5.28
Achilles	Dodds, R	J. Powell, L. Hutchinson, G. M. Kirk, F. W. Hilton.	M.L.	A. Holt	Met. Log. 31.1.28 to 7.5.28	11.5.28
Actor	Haylett, E. ...	E. Pearce, F. M. Eales, G. Morrice.	„	Harrison	„ 15.1.28 to 23.4.28	9.5.28
Adda	Toft, J. T.	A. E. Longlen, J. S. Turner, A. Kay.	M.L.	Elder Dempster ...	Form 911 6.7.27 to 3.11.27	14.12.27
50 *Adriatic* ...	Hickson, V. W., Lieut.-Commr. R.N.R.	O. V. Lucas, R. H. Shaw ...	W.T.	White Star	W T. Reg. 30.4.28 to 19.5.28	22.5.28
Aeneas	Wallace, W. K. ...	E. R. Owen	No. A.	A. Holt	Form 911 2.3.28 to 9.5.28	12.5.28
Agapenor	Ramsay, J. ...	S. G. Ellams	„ A.	„	„ 24.3.28 to 7.6.28	14.6.28
Aidan	Evans, L.	R. A. Broad	„ A.	Booth	„ 9.2.28 to 25.3.28	2.4.28
Alban	Barlow, F. P.... ...	E. M. Lyons	„ A.	„	„ 16.5.28 to 31.5.28	14.6.28
Alipore	Smith, H. E., R.D., Lt.-Commr., R.N.R.	C. H. Stokes	„ M.	P. and O.	„ 9.1.28 to 19.3.28	11.4.28
Almanzora ...	Clarke, E. C.	J. W. Smith	„ A.	R.M.S.P.	„ 21.4.28 to 4.6.28	8.6.28
63 *Alsatic*	Bolton, S., D.S.C., R.D., Commr., R.N.R.	J. W. Paine, W. Hill E. Smith.	W T.	White Star	W.T. Reg 7.5.28 to 26.5.28	29.5.28
Alondra	Scott, L. S.	H. Peters	No. A.	Yeoward	Form 911 19.5.28 to 9.6.28	14.6.28
Alynbank	Clayton, W. E. ...	R. Ardley	„ A.	A. Weir & Co. ...	„ 26.2.28 to 12.4.28	8.5.28
Ambuscade... ...	Abbay, A. T. N., D.S.O., Commr. R.N.	F. G. Bullock	M.L.	His Majesty's Ship...	... ...	...
Ampetco ...	Vandenkerckhove, A.	... ...	No. A.	American Petroleum	Form 911 21.4.28 to 1.6.28	14.6.28
Andalucia ...	Thomas, R. J. ...	R. A. Brock	„ M.	Blue Star	„ 13.3.28 to 3.4.28	18.4.28
Anchises	Woodgett, R. J. ...	R. Fountain, G. Brown ...	„ A.	A. Holt	„ 25.3.28 to 13.4.28	8.5.28
Andes	Smith, W. E., D.S.O., R.D., Capt. R.N.R.	H. Whittle	M.L.	R.M.S.P. Co.	„ 21.1.28 to 5.3.28	7.3.28
Antillian	Hannaford, W. T. ...	... ...	No. A.	Leyland	... .	...
Antilochus ...	Salter, G. H.	O. P. H. Wynne	„ A.	A. Holt	„ 20.5.28 to 31.5.28	8.6.28
Aorangi	Crawford, R. ...	G. H. Kime, E. Anderson, E. V. Bilger, W. J. Weber.	M.L.	Canadian-Australasian	Met. Log. 11.1.28 to 27.4.28	29.5.28
30 *Aquitania* ...	Diggle, E. G., R.D., Capt. R.N.R.	J. L. Croasdaile, J. Locke, D. MacLean.	W.T.	Cunard	W.T. Reg. 29.4.28 to 15.5.28	17.5.28
					„ 20.5.28 to 4.6.28	7.6.28
62 *Arabic*	Bulman, J. B. ...	W. Jackman, T. W. Wills, W. N. Jenkins.	„	White Star	„ 20.5.28 to 8.6.28	11.6.28
Arafura	Diamond, S. L. ...	F. O. Colvin, F. R. Miller, C. Stratford.	M.L.	Eastern and Australian	Met. Log. 28.10.27 to 3.3.28	8.6.28
Arawa	Summers, W. G. ...	A. Chrystal, A. C. Jones, G. Campbell.	„	Shaw, Savill and Albion	„ 13.12.27 to 17.4.28... ...	30.4.28
Archimedes ...	Downs, E. B. ...	... ...	No. A.	Lamport & Holt ...	Form 911 10.10.27 to 5.1.28	18.1.28
Argyllshire ...	Wallace, J. ...	J. C. Robinson	„ M.	Federal	„ 11.4.28 to 20.5.28	6.6.28
Ariguani	Scudamore, J. H. H., D.S.C., R.D., Commr., R.N.R.	G. McKee, A. J. J. Moar, J. W. Dodd, W. Ireland.	M.L.	Elders & Fyffes ...	Met. Log. 12.2.28 to 29.4.28	3.5.28
Ariosto	Biggins, R. L.	F. E. Whitfield	No A.	Ellerman Wilson ...	Form 911 25.12.27 to 21.1.28... ...	13.2.28
Armadale Castle ...	Imlah, C. B. ...	E. Roach, G. D. Pennick, E. Fullick.	M.L.	Union Castle	Met. Log. 12.11.27 to 4.3.28	8.3.28
Arracan	Duncan, S. S.	J. Summers, J. Henderson, C. C. Weir.	„	P. Henderson ...	„ 2.11.27 to 27.3.28	23.4.28
Arundel	Short, H.	Mr. Hill...	C.C.	Southern Rly. ...	Telegraphic Report 14.6.28	14.6.28
Arundel Castle ...	Knight, A.	A. G. Bidwell	No. A.	Union Castle ...	Form 911 31.3.28 to 20.5.28	23.5.28
Astronomer ...	Richards, J. ...	A. Browne, C. C. Heaton, H. W. FitzSimons.	M.L.	Harrison	Met. Log. 28.10.27 to 7.1.28	13.1.28
Ascanius	Wilson, C. A.	T. Robb, J. B. Marshall, W. Cook.	„	A. Holt	„ 31.10.27 to 5.3.28	14.3.28
Athenic	Binks, J. W.	W. Hill	No. A.	White Star	Form 911 20.2.28 to 7.3.28	9.3.28
Atreus	Rundle, G. G. ...	H. Nicholas	„ A.	A. Holt	„ 13.5.28 to 28.5.28	8.6.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
Atsuta Maru ...	Narui, N.	Y. Osada	No. A.	Nippon Yusen Kaisha	Form 911 16.3.28 to 16.4.28	24.4.28
Auditor	Owen, W. T. ...	L. A. Bennett, W. Moore ...	„ M.	Harrison	„ 19.1.28 to 18.4.28	5.5.28
Autolycus	Dunlop, J. K. ...	... ...	„ A.	A. Holt...	„ 10.4.28 to 25.4.28	29.5.28
Ausonia	Stafford, W., D.S.C., R.D., Lt.-Commr., R.N.R.	J. J. Wiseman	„ A.	Cunard	„ 21.8.27 to 8.10.27	11.10.27
Avon	Spriddell, F. G., R.D., Commr., R.N.R.	R. H. East	„ M.	R.M.S.P.	„ 17.2.28 to 28.3.28	29.3.28
Balmoral Castle ...	Chave, Sir B., K.B.E.	... ...	„ A.	Union Castle	„ 6.4.28 to 23.4.28	24.4.28
Balranald	Townshend, W. P., Commr., R.N.R.	C. Hannen, F. Ward, R. E., Cowell, J. C. Davis. L. S. Bailey.	M.L.	P. & O. Branch ...	Met. Log. 9.6.27 to 13.10.27	22.11.27
51 *Baltic*	White, E. R., R.D., Commr., R.N.R.	F. L Kean, A. Thompson, E. P. Hughes.	W.T.	White Star ...	W.T. Reg. 13.5.28 to 2.6.28	6.6.28
					Form 911 13.5.28 to 2.6.28	12.6.28
Bampton Castle ...	Hutchings, A. H. ...	... ...	No. A.	Union Castle	„ 17.9.27 to 14.10.27... ...	24.10.27
Banffshire	Wynne, R. H.... ...	J. P. Malley	„ A.	Turnbull Martin ...	„ 26.3.28 to 14.4.28	19.4.28
Baradine	Rollo, W.	C. B. Roche, B. H. Pollitt, D. F. Lambard, G. C. Case.	M.L.	P. & O. Branch ...	Met. Log. 26.1.28 to 1.6.28	4.6.28
Barpeta ...	Chandler, H.	B. R. Faithfull	No. M.	British India	Form 911 25.4.28 to 23.5.28	12.6.28
	Strachan, J.					
Barrabool	Rhodes, H. R. ...	G. S. B. Collard...	„ M	P. & O. Branch ...	„ 2.2.28 to 20.4.28	15.5.28
Baychimo	Cornwall, S. A. ...	W. H Deans	„ A	Hudson's Bay Co. ...	„ 7.7.27 to 14.9.27	13.10.27
59 *Belgenland* ...	Morehouse, W. A. ...	... ...	W T.	Red Star ...	Met. Log. 14.12.27 to 26.4.28... ...	1.6.28
					Form 911 3.5.28 to 10.5.28	12.5.28
Beltana	Allin, C. H. C. ...	D. M. Stafford	No. M.	P. & O. Branch ...	„ 23.3.28 to 7.4.28	8.6.28
Benalder	Fairweather, J. J. ...	A. J. Leckie	„ A.	Ben Line	„ 4.4.28 to 20.4.28	24.4.28
Benalla	Sheepwash, J. ...	S. W. Du Fosse...	„ M.	P. & O. Branch ...	... ...	...
Bendigo	Nicholl, R. N. C. ...	R. M. Richardson	„ M.	„ „ ...	„ 17.2.28 to 3.4.28	11.4.28
Benefactor	Jones, C. W.	... ...	„ M.	Harrison	„ 25.4.28 to 26.5.28	14.6.28
Bengloe	McCorquodale, A. ...	G. Davidson	„ A.	Ben Line	„ 11.4.28 to 21.5.28	8.6.28
31 *Berengaria* ...	Rostron, Sir A. H., K.B.E., R.D., Capt. R.N.R.	J. A. Myles, W. C. A. Robson, S. A. T Bullock.	W.T.	Cunard ...	W.T. Reg. 6.5.28 to 21.5.28	23.5.28
					„ 27.5.28 to 12.6.28	14.6.28
Berrima	Short, C. E.	A. Hughes	No. M.	P. & O. Branch ...	Form 911 9.12.27 to 13.4.28	16.4.28
Bogota	Pape, E. R.	... ...	„ M.	R.M.S.P. Co.	„ 6.3.28 to 30.3.28	11.4.28
Brenda	Lamont, A.	N. Ross	„ A.	Scottish Fishery Board.	„ 11.5.28 to 30.5.28	4.6.28
Brighton	Hill, A.	Mr. Munton	C.C.	Southern Railway ...	Telegraphic Report 15.6.28	15.6.28
British Colonel ...	Taylor, R. J.	S. H. Chaplain	No. M.	British Tankers ...	Form 911 26.1.28 to 15.3.28	21.3.28
British Consul ...	Putt, R. O.	C. H. Humphries	„ M	„ „ ...	„ 23.3.28 to 9.5.28	14.5.28
Bronte	Crapper, J. S.... ...	J. B. Scott	„ A.	Lamport & Holt ...	„ 25.3.28 to 26.4.28	8.6.28
Bruyere	Birch, A.	R. B. Langley	„ A.	„ „ ...	„ 19.4.28 to 8.5.28	24.5.28
Bulysses M.V. ...	Head, B. P.	A. J. Clatworthy	„ M.	Anglo-Saxon Petroleum Co	„ 30.3.28 to 8.5.28	21.5.28
Cambria	Copland, C. P. ...	O. W. Ll. Jones	C.C.	L.M. & S. Rly	Telegraphic Report 13.6.28	13.6.28
Cameronia	Gemmell, W.	... ...	M.L.	Anchor	Form 911 25.3.28 to 16.4.28	18.4.28
Camito	Forrester, W. T., O.B.E.	H. H. Dunning, W. E. Grant, C. M. Schofield. G. M. Roberts.	„	Elders & Fyffes ...	Met. Log. 30.1.28 to 27.5.28	7.6.28
Canadian Importer	Forson, A.	... ...	No. A.	Canadian Gov. Mercantile Marine.	Form 911 15.4.28 to 16.5.28	29.5 28
Canadian Inventor	Boulten, F. W. ...	O. D. Alcorn	„ A.	„ „ „	„ 17.9.27 to 30.10.27... ...	19.11.27
Canadian Scottish	Wallace, C.	... ...	„ A.	„ „ „	„ 26.5.27 to 11.7.27	19.8.27
Canadian Winner	Hocking, N. P. ...	R. J. Watson	„ M.	„ „ „	„ 21.3.28 to 24.4.28	8.5.28
Canonesa	Brodie, W. H. ...	T. Wetherall	„ M.	Furness Houlder ...	„ 13.2.28 to 3.4.28	11.4.28
Cape of Good Hope	Lamont, J.	J. J. Lewis	No. A.	Lyle S.S. Co.	„ 31.3.28 to 15.5.28... ...	8.6.28
35 *Carmania* ...	Brown, F. G., R.D., Capt., R.N.R.	W. M. Stewart, E. Taylor, V. P. Britten.	W.T.	Cunard ...	W.T. Reg. 13.5.28 to 1.6.28	4.6.28
					Form 911 7.8.27 to 26.8.27	30.8.27
Carnarvon Castle ...	Strong, H., R.D., Commr., R.N.R. Stanley, W. F., R.D., Commr., R.N.R.	H. A. Deller. E. Fullick, W. G. Smith, J. B. McReynolds.	M.L.	Union Castle ...	Met. Log. 2.9.27 to 27.2.28	6.3.28
34 *Caronia*	Hossack, W. H., R.D., Capt., R.N.R.	H. G. Hayward, D. McMillan, T. Parry.	W.T.	Cunard ...	W.T. Reg. 29.4.28 to 18.5.28	22.5.28
					Form 911 30.4.28 to 18.5.28	22.5.28
Casanare	Browne, S.	H. A. Tilley	No. A.	Elders & Fyffes ...	„ 23.1.28 to 26.5.28	30.5.28
Cavina	Riseley, A. D.... ...	R. L. Stevenson...	„ A.	„ ...	„ 23.4.28 to 27.5.28	4.6.28
52 *Cedric*	Smith, R. G.	N. E. Banks, H. A. Daman, S. Fieldwood.	W.T.	White Star ...	W.T. Reg. 21.5.28 to 10.6.28	12.6.28
					Form 911 7.5.28 to 10.6.28	14.6.28
53 *Celtic*	Berry. G.	W. Davies, D. K. Crawford, A. R. Stevens.	„	„ „ ...	W.T. Reg. 7.5.28 to 28.5.28	1.6.28
					Form 911 9.4.28 to 29.4.28	5.5.28
Centaur	Rose, A. F.	E. D. Potts, N. L. Thompson, J. Cockburn.	M.L.	A. Holt & Co. ...	Met. Log. 21.8.27 to 6.2.28	26.4.28
Ceramic	Musgrave, T.	... ...	No. A.	White Star	Form 911 22.1.28 to 10.5.28	15.5.28
Changte	Gambrill, F. C. ...	— Thomas, — Tyer, — Allan.	M.L.	Yuill & Co.	Met. Log. 16.12.27 to 6.4.28	16.5.28
Changuinola ...	Thorburn, R. A., R.D., Commr., R.N.R.	W. G. Chanter, A. E. Leech...	No. A.	Elders & Fyffes ...	Form 911 18.4.28 to 19.5.28	30.5.28
Chindwin	Esslemont, C. ...	... ...	„ A.	Henderson	„ 24.12.27 to 8.3.28	28.3.28
Chinkiang	Stringer, C.	... ...	M.L.	China Navigation Co	... ...	...
Chirripo	McColm, F.	H. Rawston, R. Laycock ...	No. A.	Elders & Fyffes ...	„ 14.4.28 to 20.5.28	4.6.28
City of Baroda ...	McMillan, J.	A. Beaton, T. C. Hodgkinson.	M.L.	Ellerman	Met. Log. 5.3.28 to 20.5.28	6.6.28
City of Benares ...	Anderson, W. W. ...	F. Forsyth	No. A.	„	Form 911 15.3.28 to 16.4.28	19.4.28
City of Brisbane ...	Seaborne, F. O., D.S.C	R. Jones	„ A.	„	„ 3.2.28 to 1.4.28	10.4.28
City of Canterbury	Bremner, D. M. ...	R. H. Hodgson	„ A.	„	„ 2.4.28 to 4.6.28	8.6.28
City of Carlisle ...	Mordue, J. A. ...	... ...	„ A.	„	„ 13.4.28 to 5.5.28	29.5.28
City of Chester ...	Letton, F. W. ...	C. C. Duncan, A. J. Barnett, R. Mowbray.	M.L.	„	Met. Log. 22.10.27 to 26.2.28	21.3 28
City of Edinburgh	Wyper, J.	G. Hummell	No. M.	„	Form 911 22.2.28 to 1.4.28	21.5.28
City of Hong Kong	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	... ...	„ A.	„	„ 18.2.28 to 9.3.28	24.4.28
City of London ...	Parker, F. W., R.D., Commr., R.N.R.	H. H. Asher	No. A.	„	Form 911 4.2.28 to 22.4.28	27.4.28
City of Osaka ...	Smith, W. H.	... ...	No.	„	... ...	...
City of Rangoon ...	Jones, P.	E. R Wildermath, R. W. May, R. H. Stewart.	M.L.	„	Met. Log. 4.7.27 to 5.1.28	1.2.28
City of Venice ...	Lee, A.	... ...	No. A.	„	Form 911 18.2.28 to 1.3.28	12.3.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
City of Yokohama	Singleton, J. G. ...	R. Willott Leese	No. A.	Ellerman	Form 911 2.2.28 to 15.2.28	2.3.28
Clan Alpine ...	Lyall, A. B.	K. M. Banks	„ A.	Clan	„ 1.3.28 to 27.3.28	5.5.28
Clan Lamont ...	Urquhart, P., D.S.C.	P. de Gruchy	„ A.	„	„ 25.1.28 to 27.4.28	8.5.28
ClanLindsay ...	Giles, H. J., R.D., Commr., R.N.R.	E. P. Smith	„ A.	„	„ 22.3.28 to 19.4.28	14.5.28
Clan MacBean ...	Worthington, J. H. ...	J. E. Clayton	„ A.	„	„ 2.3.28 to 17.3.28	16.4.28
Clan Macbeth ...	Horn, R.	T. A. Watkinson	„ A.	„	„ 1.4.28 to 27.4.28	21.5.28
Clan Macfadyen ...	Stenson, F. J. R.D., Capt. R.N.R.	A. Dowds	„ A.	„	„ 30.4.28 to 18.5.28	8.6.28
Clan Macfarlane ...	Redford, L. F. ...	... ...	„ A.	.. ..	„ 18.4.28 to 9.5.28	4.6.28
Clan Macgillivray	Law, A.	J. Garis	„ A.	„	„ 16.12.27 to 7.4.28	10.4.28
Clan Macindoe ...	Holman, W. G. ...	D. McAllister	„ A.	„	„ 30.1.28 to 12.5.28	29.5.28
Clan Mackellar ...	Smith, W. P.	G. A. A. Grant	„ A.	„	„ 20.3.28 to 27.4.28	16.5.28
Clan Macphee ...	Gourlay, J. B. ...	G. Short, B. Edgar, E. Mowatt.	M.L.	„	Met. Log. 21.11.27 to 18.4.28... ...	17.5.28
Clan Macnaughton	Simpson, A. W. ...	J. W. Fox	No. A.	„	Form 911 26.3.28 to 20.4.28	14.5.28
Clan Mactaggart ...	Makepeace. F. ...	E. A. Hewson	„ A.	„	„ 3.3.28 to 22.4.28	5.5.28
Clan Macwhirter ...	Waterhouse, J. ...	W. A. Robbie, E. A. Brown. S. W. Brown.	M.L.	„	Met. Log. 1.10.27 to 26.4.28	30.4.28
Clan Malcolm ...	Neill, G. A.	D. A. Stark, H. V. Wightman. M. Carlton.	„	„	„ 28.8.27 to 24.12.27... ...	11.2.28
Clan Morrison ...	Porterfield, W. M. ...	H. R. Crosscombe	No. A.	„	Form 911 5.3.28 to 11.4.28	30.4.28
Clan Murdoch ...	Neill, G. A.	W. J. Jones	„ A.	„	„ 12.4.28 to 1.5.28	4.6.28
Clan Ranald ...	Laird, C.	F. D. Bonney, T. O. Marr ...	„ A.	„	„ 10.12.27 to 29.3.28... ...	10.4.28
Clan Ross	Openshaw, L. G. ...	R. K. Phillips	„ A.	„	„ 11.4.28 to 12.5.28	8.6.28
Clan Sinclair ...	Taylor, P. V.	J. H. Dennis	„ A.	„	„ 29.5.28 to 10.6.28	14.6.28
Clan Urquhart ...	Baker, E. W.	W. A. Shewan	„ A.	„	„ 8.3.28 to 21.3.28	26.3.28
Comorin	Borland, J. Mc.I., C.B., D.S.O., R.D., Capt., R.N.R.	E. C. White	„ M.	P. & O.	„ 20.3.28 to 6.5.28	23.5.28
Corinthic	Lloyd, W.	E. M. Burt, M. Bennett, I. A. Macnaughton.	M.L.	White Star	Met. Log. 4.2.28 to 18.5.28	22.5.28
Cornwall	Wilde, H. J.	H. M. Knight	No. A.	Federal	Form 911 27.3.28 to 9.5.28	15.5.28
Crawford Castle ...	Morgan, A. O., R.D., Commr., R.N.R.	J. A. Wilson	„ A.	Union Castle	„ 30.10.27 to 1.12.27... ...	15.12.27
Culebra	Rathkins, C.E., R.D., Commr., R.N.R	P Cooper, R. N. Fletcher, W. S. Thomas.	M.L.	R.M.S.P. Co.	Met. Log. 4.2.28 to 12.4.28	20.4.28
Cumberland ...	Macmillan, D. ...	J. Marks	„	Federal...	Form 911 25.2.28 to 3.4.28	24.4.28
Cyclops	Cosker, W.	... ...	No. A.	A. Holt	„ 25.12.27 to 28.2.28... ...	16.3.28
Daga	Wiles, N.	... ...	No. A.	P. Henderson... ...	... ...	...
Dakotian	Robb, J.	... ...	„ A.	Leyland	... ...	...
Dardanus	Clarke, J. W.	R. Millar	„ A.	A. Holt	Form 911 4.2.28 to 11.4.28	18.4.28
Darian	Masters, W.	... ...	„ A.	Leyland	„ 12.11.27 to 24.11.27	5.12.27
Darro	Matthews, G. P. ...	A. T. Walker	„ M.	R.M.S.P. Co.	„ 9.3.28 to 23.4.28	5.5.28
Demerara	Willan, F. G. L., R.D., Capt., R.N.R.	F Jeyes	„ M.	„	„ 20.2.28 to 12.4.28	16.4.28
Demosthenes ...	Ogilvy, A.	... ...	„ M.	Aberdeen	„ 14 3.28 to 23.4.28	28.4.28
Denis	Harris, F. C. P. ...	A. Blewett	„ A.	Booth	„ 19.5.28 to 30.5.28	8.6.28
Deseado	Hannam, F. S. ...	... ...	„ M.	R.M.S.P. Co.	„ 17.3.28 to 9.4.28	25.5.28
Desna	Green, J.	L. G. Peterson	„ M.	„	„ 2.4.28 to 24.5.28	6.6.28
Deucalion	Melling, C. F.... ...	... ...	„ A.	A. Holt	„ 19.4.28 to 4.5.28	8.6.28
Dieppe	Marmery, S.	Mr. Parsons	C.C.	Southern Railway ...	Telegraphic Report 11.6.28	11.6.28
Dimboola	Roy, C. M.	H. L. Price	No. A.	Melbourne S.S. Co. ...	Form 911 13.4.28 to 9.5.28	8.6.28
Discoverer	Ling, J. T.	H. W. Gostage	„ M.	Harrison	„ 8.4.27 to 9.7.27	12.7.27
Domala, M.V. ...	Kitson, A. G.	J. G. Wallace	„ M.	British India	„ 8.7.27 to 18.9.27	10.10.27
Dominia, C.S ...	Campos, V., O.B.E., Lt.-Commr., R.N.R.	H. Hutchins, T. J. C. Dexter, J. Dyer.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 4.1.28 to 24 1.28	1.3.28
Dominic	Saxton, C.	J. A. Moon	No. A.	Booth	Form 911 14.3.28 to 1.5.28	8.5.28
Doric	Freeman, C. P., R.D., Commr., R.N.R.	G. T. Kavanagh	„ M.	White Star	Form 911 6.5.28 to 28.5.28	30.5.28
Dorington Court ...	Clarke, E. J.	P. Jones	„ A.	Haldin & Co.	„ 28.10.27 to 28.2.28... ...	14.3.28
Dromore Castle ...	MacMahon, J., R.D., Commr., R.N.R.	D. P. Klasen	„ A.	Union Castle	„ 11.3.28 to 11.4.28	30.4.28
Dryden	Major, T. W.	E. W. Hardie	„ M	Lamport & Holt ...	„ 6.4.28 to 1.5.28	5.5.28
Dunaff Head ...	Milner, T. F. R.D., Lt.-Commr., R.N.R.	S. Duff	„ A.	Ulster S.S. Co. ...	„ 2.2.28 to 15.2.28	26.3.28
Dundrum Castle ...	Goodacre, R.W., R.D., Commr., R.N.R.	A. R. J. Tilston	„ A.	Union Castle	„ 13.4.28 to 11.5.28	21.5.28
Dunluce Castle ...	Jackson, C. R. ...	F. O. Wilbraham	„ A.	„ „	„ 26.4.28 to 16.5.28	18.5.28
Dunrobin	Ramsay, J. D. ...	C. H. Kendall	„ A.	Glen & Co.	„ 6.3.28 to 23.4.28	5.5.28
Duquesa	Owen, R.	C. G. Adlard	„ M.	Furness Withy ...	„ 22.1.28 to 15.3.28	19.3.28
Durenda	Beeching, P. H. ...	F. E. Liles	„ M.	British India	„ 31.3.28 to 21.4.28	21.5.28
Edinburgh Castle	Owen, S. H.	G. H. Mayhew	„ A.	Union Castle	„ 13.4.28 to 3.6.28	8.6.28
Egori	Sola, P., D.S.O. ...	R. W. Pattinson	„ A.	Elder Dempster ...	„ 15.4.28 to 4.5.28	21.5.28
El Paraguayo ...	Fletcher, G.	F. F. Feint, D. Murray ...	„ M.	Houlder Bros. ...	„ 23.10.27 to 15.12.27 ...	20.12.27
Elpenor	Gordon, A. L.... ...	M. Robertson, C. Kavanagh	M.L.	A. Holt	Met. Log. 8.9.27 to 23.12.27	4.1.28
Elysia	Duncan, A. R. ...	A Laidlaw, G. S. Sinclair, H. M. Sanders.	„	Anchor	„ 15.2.28 to 19.4.28	28.4.28
Empress of Asia ...	Hailey, A. J., Lt.-Commr., R.N.R.	R. H. Foley, L. C. Hogg, D. Smith.	„	Canadian Pacific ...	„ 14.10.27 to 12.2.28... ...	19.3.28
Empress of Canada	Robinson, S., C.B.E., R.D., Commr., R.N.R.	A. G. Simmons	„	„ „ ...	„ 4.11.27 to 4.3.28	12.4.28
Empress of France	Griffiths, E.	E. Roberts, L. Outram, W. Griffith.	„	„ „ ...	„ 7.1.28 to 25.4.28	10.5.28
Empress of Russia	Hosken, A. J.... ...	L. C. Barry, R. A. Leicester. J. S. Clarke, J. H. Reich.	„	„ „ ...	„ 19.5.27 to 9.11.27	16.12.27
Endeavour	Law, E. F. B., Commr., R.N.	C. S. E. Lansdown, A. Jones, M. L. Harrison, W. H. Dickinson.	„	His Majesty's Ship ...	„ 15.11.27 to 13.3.28... ...	16.4.28
Essequibo	Kirkwood, J. H. ...	J. H. E. Evans	No. M.	R.M.S.P. Co.	Form 911 23.3.28 to 7.5.28	21.5.28
Eumaeus	Read, J. W.	... ...	„ A.	A. Holt	„ 16.1.28 to 22.4.28	30.4.28
Euripides	Collins, P. J., O.B.E.	K. D. Fisher, P. Congdon, A. J. Parry.	M.L.	Aberdeen	Met. Log. 17.9.27 to 24.1.28	2.2.28
Euryades	Findlay, J.	... ...	No. A.	A. Holt	Form 911 4.4.28 to 9.5.28	8.6.28
Explorer	Ling, J. T.	A. M. Hughes	„ M.	Harrison	„ 6.8.27 to 4.11.27	15.11.27
Explorer	Allan, J.	F. O. Sheehy	„ A.	Scottish Fishery Board.	„ 1.5.28 to 31.5.28	4.6.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
Ferndale	Daniel, F.	...	No. M.	Commonwealth Govt.	Form 911 9.3.28 to 9.4.28	21.4.28
Flandria	Maars, L.	C. Van Otterloo	„ M.	Holland Lloyd	„ 24.2.28 to 15.4.28	16.4.28
Francisco	Scales, H.	F. Elgin	„ A.	Ellerman Wilson	„ 18.3.28 to 23.4.28	27.4.28
Freya	Angus, W.	J. M. Murray	„ A.	Scottish Fishery Board.	„ 1.5.28 to 27.5.28	8.6.28
Gaika	Jackson, C. R.	L. G. May	„ A.	Union Castle	„ 11.9.27 to 4.11.27	7.11.27
Galtymore	Yeoman, J. T.	...	„ M.	Furness Withy	„ 25.9.27 to 24.11.27	1.12.27
Gascoyne	Johnson, L.	...	M.L.	A. Holt & Co.	...	...
Gelria	Veldkamp, C. J.	...	No. M.	Holland Lloyd	Form 911 22.3.28 to 9.5.28	12.5.28
Glamorganshire	Clayton, R. G., D.S.C., R.D., Lt.-Commr., R.N.R.	K. H. Whitaker	No. M.	R.M.S.P. Co.	Form 911 24.2.28 to 12.5.28	18.5.28
Glenamoy, M.V.	Homan, C. E.	R. H Bishop, R. W. Emerson, F. S. Howell.	M.L.	Glen Line	Met. Log. 5.12.27 to 16.4.28	29.5.28
Glengarry	Angier, J.	F. C. White	No. M.	„	Form 911 16.3.28 to 18.5.28	12.6.28
Glenluce	Kennett, W. H.	H. B. Porter	„ A.	„	„ 8.5.28 to 22.5.28	24.5.28
Glenshane	Neil, P. G.	...	„ A.	„	„ 19.2.28 to 25.5.28	8.6.28
Glentworth	Kilgour, H. A.	...	No.	R. S. Dalgleish	...	...
Gloucestershire	Robin, E.	C. F. Hicks	„ A.	Bibby	„ 28.1.28 to 24.3.28	10.4.28
Gloxinia	Pool, F. G.	...	„ A.	Stag Line	„ 13.3.28 to 3.4.28	12.4.28
Grantully Castle	Whitfield, G. T.	R. Wren	„ A.	Union Castle	„ 3.6.27 to 14.8.27	17.8.27
Halesius	Samuels, C.	R. W. Cook	„ A.	R. P. Houston	„ 28.1.28 to 2.3.28	26.3.28
Haliartius	Marsh, L. V.	W. H. Upton	„ A.	„ „	„ 5.2.28 to 29.2.28	2.4.28
Harmonides	Hughes, W. F.	K. T. Roper	„ A.	„ „	„ 13.3.28 to 29.5.28	8.6.28
Hatimura	Lane, S. R., R.D., Capt., R.N.R. Hannaford, J.	...	„ M	British India	„ 27.11.27 to 6.1.28	6.2.28
Hauraki, M.V.	Norton, A. T.	T. Marshall, R. B. Denniston, F. C. Cochran.	M.L.	Union S.S. Co., N.Z.	Met. Log. 29.11.27 to 5.3.28	1.6.28
Henry Holmes, C.S.	Bicker Caarten, A.	M. A. Green	No. M	W. I. & Panama Telegraph Co.	Form 911 8.4.28 to 27.4.28	25.5.28
Herald	Haselfoot, F.E.B., Capt., R.N.	D. G. V. Williams	M.L.	His Majesty's Ship	Met. Log. 18.10.27 to 19.11.27	31.1.28
Herefordshire	Mann, R. P.	M. D. Louttill	No. A.	Bibby	Form 911 14.1.28 to 21.3.28	26.3.28
Herminius	Roberts, T. V.	D. W. MacGregor	„ A.	Shaw, Savill & Albion	„ 17.4.28 to 27.5.28	4.6.28
Herschel	Watson. W. W.	J. F. Maurey	„ A.	Lamport & Holt	„ 13.2.28 to 6.5.28	25.5.28
Hertford	Urquhart, D.	J. R. Ricketts	„ A.	Federal	„ 3.3.28 to 10.4.28	14.4.28
Hibernia	Roberts. W. Ivor, M.B.E.	R. Woodall, A. Marsh	C.C.	L.M. & S. Railway	Telegraphic Report 9.6.28	9.6.28
Highland Laddie	Jones, T. J.	E. F. Smart	No. A.	Nelson	Form 911 31.1.28 to 23.3.28	16.4.28
„ *Piper*	Collings, D.	S. E. Jackson, R. G. Owen, A. Southgate.	M.L.	„	Met. Log. 13.5.27 to 4.11.27	1.12.27
„ *Pride*	Robinson, R. H.	...	No. A.	„	Form 911 24.3.28 to 19.5.28	22.5.28
„ *Prince*	Davis, J.	J. Harrison	„ A.	Prince	„ 13.5.28 to 25.5.28	8.6.28
„ *Rover*	Ashby Graves, F.	...	„ A.	Nelson	„ 9.4.28 to 25.5.28	8.6.28
Hildebrand	...	...	„ A.	Booth	„ 12.3.28 to 25.4.28	28.4.28
Hobson's Bay	Kydd, O. J.	R. Pearce, H. Benson, A. McLeod, K. McKenzie.	M.L.	Commonwealth Govt	Met. Log. 7.2.28 to 18.5.28	7.6.28
Holbein	Gough, W. A.	S. Ranson	No. A.	Lamport & Holt	Form 911 3.3.28 to 23.5.28	29.5.28
54 *Homeric*	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	H. G. Morgan. S. B. Morfee, W. T. Poustie.	W.T.	White Star	W.T. Reg. 17.5.28 to 1.6.28	4.6.28
Hororata	Holland, E.	A. E. Bamforth	No. A.	New Zealand S.S. Co.	Form 911 29.10.27 to 8.3.28	12.3.28
Hubert	Briscoe, W.	E. C. McGuinness	„ A.	Booth	„ 27.3.28 to 9.4.28	14.5.28
Huntingdon	Ashworth, W.	H. G. Letts	„ A.	Federal	„ 8.3.28 to 15.4.28	18.4.28
Huntsman	Russell, H.	J. Richardson	„ M.	Harrison	„ 6.12.27 to 14.2.28	23.2.28
Hurunui	Upton, E. C. S.	J. Oxnard, F. Longheed, G. R. Hogg, K. Goldsworthy.	M.L.	New Zealand S.S. Co.	Met. Log. 12.8.27 to 5.2.28	10.2.28
Hydaspes	Williams, —	...	No. M.	R. P. Houston	...	...
Ingoma	Barrow, R. K.	W. P. Baker	„ M.	Harrison	Form 911 5.4.28 to 18.5.28	24.5.28
Inkum	Meetham, J. T.	...	„ A.	J. H. Welsford	„ 28.3.28 to 12.4.28	28.4.28
Iris, C.S.	Hughes, H. R.	L. V. Vicker, D. MacDonald	M.L.	Pacific Cable Board	Met. Log. 25.8.27 to 3.10.27	21.3.28
Iroquois	Jackson, A. L. Commr., R.N.	H. L. Jenkins	„	His Majesty's Ship	„ 2.8.27 to 21.11.27	31.1.28
Ixion	Reed, G. C.	C. W. A. Murphy	No. A.	A. Holt	Form 911 5.1.28 to 27.3.28	10.4.28
Javanese Prince	Marshall, F.	W. Venn	„ A.	Prince	„ 28.3.28 to 27.4.28	9.6.28
Jervis Bay	Chaplin, W. R.	R. W. Laycock	„ M.	Commonwealth Govt.	„ 20.12.27 to 23.4.28	14.5.28
Justin	Bush, H.	G. E. Thomas	„ A.	Booth	„ 21.4.28 to 6.5.28	4.6.28
Kaisar-i-Hind	Manley, G.	R. H. Hand	„ M.	P. & O.	„ 14.4.28 to 5.6.28	12.6.28
Kalyan	Cornewall Jones, B.	S. Gerrans	„ M.	P. & O.	„ 18.2.28 to 13.5.28	15.5.28
Kamo Maru	Enya, S.	...	„ A.	Nippon Yusen Kaisha	„ 17.2.28 to 18.3.28	8.2.28
Kangaroo	Buckeridge, G. Kavanagh, J. Norris, H. C.	E. Hutchinson, J. Kavanagh, H Brackenridge.	M.L.	State Service Australia.	Met. Log. 7.9.27 to 6.3.28	22.5.28
Karapara	Miller, A. C.	J. Ruddiman, J. Miln	No. M.	British India	Form 911 11.4.28 to 25.5.28	12.6.28
Kashmir	Mallalue. R., R.D., Lt.-Commr., R.N.R.	A. J. McHattie	„ M.	P. & O.	„ 8.3.28 to 17.4.28	24.4.28
Kenilworth Castle	Chave, Sir B., K.B.E.	R. C. Longman, L. A. J. Keeble, W. Dryden, W. Wyeth.	M.L.	Union Castle	Met. Log. 18.4.27 to 8.8.27	19.10.27
Kent	Matthews, C.	W. C. Wilkinson	No. A.	Federal	Form 911 21.12.27 to 24.1.28	31.1.28
Khiva	Stringer, R. H., O.B.E., R.D., Commr., R.N.R.	G. W. Wood, D. Meakle, V. A. Nicolls, A. Robson.	M.L.	P. & O.	Met. Log. 13.10.27 to 14.4.28	23.4.28
Khyber	Hester, C. W., R.D., Commr., R.N.R.	C. S. Pirie	„	P. & O.	„ 16.12.27 to 24.3.28	2.4.28
Knight Companion	Cox, B. T., D.S.O., R.D., Lt. Commr., R.N.R.	J. H. Isherwood	No. M.	A. Holt	Form 911 20.4.28 to 18.5.28	12.6.28
Koolinda, M.V.	Buckeridge, J.	...	„ M.	State Service, Australia.	„ 27.3.28 to 22.4.28	29.5.28
Kovno	Dossor, W. A.	A. Snowdon, S. N. Stokes, N. W. Glendenning, S. Butcher.	M.L.	Ellerman Wilson	Met. Log. 18.6.27 to 20.12.27	6.1.28
37 *Laconia*	Britten, E. T., R.D., Commr., R.N.R.	J. Ashcroft, E. W. Connell, J. O. Chambers.	W.T.	Cunard	W.T. Reg. 23.4.28 to 20.5.28 Form 911 22.4.28 to 20.5.28	23.5.28 23.5.28
Laguna	Mander, T.	...	No. A.	Pacific S.N. Co.	Form 911 21.2.28 to 14.3.28	2.4.28
Lahore	Gordon, L. M., R.D., Commr. R.N.R.	E. B. Elcoate	„ M.	P. & O.	„ 25.2.28 to 11.3.28	11.4.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
Lalande	Hamill, H.	A. E. Warburton	No. A.	Lamport & Holt ...	Form 911 16.2.28 to 13.5.28	29.5.28
Lancashire	Crumplin, W. E. ...	R. Allen	„ A.	Bibby	„ 12.2.28 to 18.4.28	24.4.28
36 *Lancastria* ...	Oram, B.B., R.D., Commr., R.N.R.	L. R. Sharp, F. G. Russell, P. L. Williams.	W.T.	Cunard ...	W.T. Reg. 21.5.28 to 6.6.28	11.6.28
					Form 911 20.5.28 to 7.6.28	12.6.28
Laomedon	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	H. A. Standfield	No. A.	A. Holt...	„ 12.4.28 to 4.5.28	9.6.28
La Paz, M.V. ...	Benson, C. W... ...	J. W. Richards	„ M.	Pacific S.N. Co. ...	„ 31.1.28 to 10.5.28	16.5.28
Laplace	Hickman, V. G. ...	A. L. Murray, R. D. Cottam	„ A.	Lamport & Holt ...	„ 15.4.26 to 28.6.27	30.8.27
55 *Lapland*	Harvey, H.	L. A. Williams, J. Flett ...	W.T.	Red Star ...	W.T. Reg. 14.5.28 to 1.6.28	4.6.28
					Form 911 13.5.28 to 2.6.28	6.6.28
64 *Laurentic* ...	Trant, E. L., R.D., Commr. R.N.R.	J. W. Peters, E. A. A. Crowley	„	White Star ...	W.T. Reg. 29.4.28 to 20.5.28	26.5.28
					Form 911 29.4.28 to 21.5.28	29.5.28
Lautaro, M.V. ...	Dunn, R. E., O.B.E....	... ...	No. M.	Pacific S.N. Co. ...	„ 24.11.27 to 11.3.28... ...	29.3.28
Leicestershire ...	de Legh, P.	R. S. Evans H. G. Walton, J. K. Gemmell, D. Burt.	M.L.	Bibby	Met. Log. 24.3.28 to 30.5.28	4.6.28
Leighton, M.V. ...	Lindesay, J. M. ...	R. L. Hagley	No. A.	Lamport & Holt ...	Form 911 4.1.28 to 21.1.28	9.2.28
Leitrim	Kemp, E. R.	C. R. Brown	„ A.	Dowie, J., & Co. ...	„ 2.11.27 to 17.11.27... ...	23.11.27
Limerick	Molyneux, P. L. ...	... ...	„ M.	Federal...	... ...	...
Linaria	Robinson, J. J. ...	... ...	„ A.	J. Robinson	„ 10.3.28 to 11.4.28	31.5.28
Llandaff Castle ...	Gilbert, E. F.... ...	R. Bayer	„ A.	Union Castle	Form 911 19.4.28 to 8.5.28	9.6.28
Llandovery Castle	Kerbey, J. H. ...	C. H. Williams, G. Moon, E. M. Betts.	M.L.	„ „	Met. Log. 15.12.27 to 20.2.28... ...	1.3.28
Loch Katrine ...	Buret, T. J. C. ...	R. A. Stenhouse, E. E. Collins.	No. A	R.M.S.P. Co.	Form 911 1.3.28 to 25.5.28	4.6.28
Logician	Gibbings, W.	... ...	No.	Harrison	... ...	...
London Commerce	Young, H. J., D.S.C....	W. Edmonds	„ A.	Furness Withy ...	„ 19.8.27 to 19.9.27	26.9.27
London Importer ...	Fowler, W. H. ...	F. F Feint, J. H. Metcalfe, J. G. Freeman.	M.L.	„ „ ...	Met. Log. 8.1.28 to 31.3.28	14.4.28
Lord Antrim ...	Jarvis, F. E.	... ...	No. A.	Ulster S.S. Co. ...	Form 911 8.5.28 to 19.5.28	14.6.28
Loriga, M.V. ...	Clapham, E. C. ...	R. W. Gill	„ A.	Pacific S.N. Co. ...	„ 23.12.27 to 17.2.28... ...	20.2.28
Losada, M.V. ...	Ross, J....	D. Beamer	„ M.	„ „ ...	„ 3.4.28 to 20.4.28	8.5.28
Macedonia	Potter, H. W., R.D., Commr., R.N.R.	C. J. L. Hayward	„ M.	P. & O.	„ 28.4.28 to 8.5.28	30.5.28
Macharda	Hanna, R. G.... ...	T. Johnston	„ M.	Brocklebank	„ 4.3.28 to 31.3.28	16.4.28
Mahia	McIntosh, A.... ...	... ...	M.L.	Shaw, Savill & Albion	... ...	...
Mahronda	Addy, M. J.	J. Kettlewell	No. M.	Brocklebank	„ 18.3.28 to 13.4.28	14.5.28
Maihar	Charlton, W. L. ...	J. W. B. Robertson, C. Cadwallader, S. S. Slade.	M.L.	„	Met. Log. 27.1.28 to 21.4.28	7.6.28
Maimyo	Smith, G. C.	H. M. Drummond	No. A.	„ ...	Form 911 16.7.27 to 8.10.27	11.10.27
Maiwara	Blain, A. W.	J. J. Skinner, A. M. Stanton	No. A.	Burns Philp	„ 14.2.28 to 3.3.28	26.4.28
58 *Majestic*	Metcalfe, G. R., Lt.-Commr, R.N.R.	W. W. Pearson, L. Thompson, W. T. Fitz Gerald, A. H. Young.	W.T.	White Star ...	W.T. Reg. 3.5.28 to 17.5.28	19.5.28
					„ 24.5.28 to 7.6.28	11.6.28
Makalla	Maugham, J. W. ...	J. B. Newman	No. M.	Brocklebank	Form 911 28.3.28 to 24.4.28	14.5.28
Makambo ... }	Blain, A. W.	R. Perry, R. W. Holmes, T. MacRae.	M.L.	Burns Philp	Met. Log. 20.8.27 to 22.1.28	20.3.28
Makura	Brown, T. M.... ...	A. Champion, D. Burgess, A. Gell.	„	Canadian-Australasian	„ 6.10.27 to 21.1.28	20.3.28
Malabar	Hillman, E. J. ...	... ...	„	Burns, Philp & Co. ...	Met. Log. 11.5.27 to 22.11.27... ...	29.2.28
Malakuta	Adamson, F. L. ...	N. Grayson	No. M.	Brocklebank	Form 911 26.2.28 to 23.4.28	28.4.28
Malancha	Whitham, F.... ...	R. Humble	„ M.	„ ...	„ 30.1.28 to 27.2.28	9.3.28
Malda	Gray, T. N.	S. G. James	„ M.	British India ...	„ 8.2.28 to 16.3.28	26.3.28
Maloja	Warner, S. C.... ...	A. D. Dennis	„ M.	P. & O.	„ 22.12.27 to 26.1.28... ...	31.1.28
Malwa	Norman, W. A. ...	... ...	„ M.	„	„ 13.4.28 to 3.5.28	12.6.28
Mamari	Falconer, H.	B. Rudkin	„ A.	Shaw, Savill & Albion	„ 11.2.28 to 21.3.28	14.5.28
Manchester Brigade	Stott, C. H.	W. S. Eustance	M.L	Manchester Liners ...	„ 10.1.28 to 18.2.28	23.2.28
Manchester Corporation	Williams, H.	... ...	No. A.	„ „ ...	„ 16.1.28 to 2.3.28	19.3.28
Manchester Hero ...	Riley, J. E.	H. Anderton, J. H. Emmett, A. W. Hanchett.	M.L.	„ „ ...	Met. Log. 6.9.27 to 18.2.28	23.2.28
Manchester Producer	Struss, F.	J. W. Moss	No. A.	„ „ ...	Form 911 5.5.28 to 3.6.28	9.6.28
Manchester Regiment	Foale, J. R.	P. D. Barr	„ A.	„ „ ...	Form 911 4.2.28 to 9.3.28	14.3.28
Manipur	Cochran, G. N. ...	R. Penston, G. B. Falconer ...	No. M	Brocklebank	„ 23.1.28 to 21.2.28	12.3.28
Manistee	Steidelmann, H. ...	... ...	M.L.	Elders & Fyffes ...	... ...	...
Manora	Hudson, H. T., R.D., Commr., R.N.R.	W. H. Cruse	No. M.	British India... ...	Form 911 9.1.28 to 14.3.28	3.4.28
Mantua	Randell, G. G. ...	... ...	„ M.	P. & O.	Form 911 27.3.28 to 2.5.28	8.5.28
Marella	Mortimer, S.	A. G. Hill, R. Duddell, A. G. Thomas.	M.L.	Burns Philp	Met. Log. 1.10.27 to 30.1.28	1.6.28
Marengo	Curle, J.	H. Bryan, J. Ford, F. Barnard.		Ellerman Wilson ...	„ 2.12.27 to 12 3.28	16.3.28
Maresfield	Berry, V.	T. Connolly	No. A.	Woods, Tyler & Brown	Form 911 3.5.28 to 19.5.28	9.6.28
Margha	Hughes, C. G... ...	P. Wright, P. B. Moore, W. E. Jones, W. G. Jones.	M.L.	British India... ...	Met. Log. 11.3.28 to 3.6.28	11.6.28
Marquesa	Smiles, R. S.	E. Monckton	No. M.	Furness Houlder ...	Form 911 28.1.28 to 23.3.28	4.4.28
Matakana	Thurston, H. P. ...	J. Hart, J. Dickson, C. E. Mayer.	M.L.	Shaw, Savill & Albion	Met. Log. 17.10.27 to 27.2.28... ...	2.3.28
Matheran	Ison, W. A.	... ...	No. M.	Brocklebank	Form 911 10.4.28 to 29.4.28	6.6.28
Matiana	Green, F. V.	J. R. Precious	No. M	British India... ...	Form 911 20.12.27 to 12.2.28... ...	20.2.28
Matra	Cornish, N. P. ...	W. Gibson, R. E. Johnson ...	„ M.	Brocklebank	„ 6.4.28 to 20.5.28	25.5.28
Maunganui	Davey, A. H.	F. Gibson, V. Knight, H. Kemp.	„ M.	Union S.S. Co. of N.Z	„ 29.4.27 to 22.7.27	5.9.27
32 *Mauretania* ...	McNeil, S.G.S., R.D., Capt., R.N.R.	J. A. Quarrie, C. B. Osborne, B. J. P. Tuck.	W.T.	Cunard	W.T. Reg. 13.5.28 to 28.5.28	30.5.28
Megantic	Trant, E. L., R.D., Commr., R.N.R.	... ...	No. A.	White Star	Form 911 30.7.27 to 20.8.27	24.8.27
22 *Melita*	Stewart, A.	J. Shearer, T. Gillette ...	W.T.	Canadian Pacific ...	W.T. Reg. 16.4.28 to 8.5.28	14.5.28
Memnon	Dougall, W. T. ...	... ...	No. A.	A. Holt...	Form 911 6.4.28 to 25.4.28	29.5.28
21 *Metagama* ...	Freer, A., Capt., R.N.R.	A. M. Watt, W. P. Haines, S. Keay.	W.T.	Canadian Pacific ...	W.T. Reg. 25.4.28 to 12.5.28	18.5.28
Middlesex	MacRae, A., D.S.C., Lt.-Commr., R.N.R.	C. Roberts	No. M.	Federal...	Form 911 23.3.28 to 7.5.28	12.5.28
Minna	Mackenzie, G. G. ...	A. M. Campbell	„ A.	Scottish Fishery Board.	Form 911 21.2.28 to 2.4.28	4.4.28
Minnesota	Finch, E.	... ...	„ M.	Atlantic Transport...	„ 13.5.28 to 3.6.28	9.6.28
Minnetonka ...	Gates, T. F., C.B.E. ...	H. E. McCartney	„ M.	„ „ ...	„ 20.5.28 to 9.6.28	14.6.28
Minnewaska ...	Claret, F. H., C.B.E., Commr., R.N.R.	F. J. C. Dexter	„ M.	„ „ ...	„ 6.5.28 to 27.5.28	6.6.28
Mirror, C.S. ...	Jones, T., M.B.E. ...	J. G. West	„ M.	Eastern Tel. Co. ...	„ 13.2.28 to 18.3.28	10.4.28
Mississippi	Wylie, J. T. J.... ...	... ...	No. A.	Atlantic Transport ...	Form 911 6.11.27 to 15.11.27... ...	23.11.27
Modasa	Gilchrist, J. W. ...	R. E. T. Parsons	„ M.	British India	„ 18.2.28 to 10.5.28	25.5.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received
Moldavia	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	W. L. Dobbin	No. M.	P. & O.	Form 911 18.4.28 to 30.5.28	6.6.28
Mongolia	Furlong, G. H. S., R.D., Capt., R.N.R.	E. Allen	„ M.	„	„ 2.2.28 to 15.5.28	18.5.28
Mongolian Prince	Edwards, W.... ...	V. E. Palmer	„ A.	Prince	Form 911 26.3.28 to 30.3.28	14.5.28
24 *Montcalm* ...	Hamilton, G.	F. H. Steel, M. Williams, L. Thornton.	W.T.	Canadian Pacific ...	W.T. Reg. 29.4.28 to 19.5.28	22.5.28
25 *Montclare* ...	Griffiths, J. N. ...	A. Mansey, F. E. Bevis, C. Draper.	„	„ „ ...	„ 13.5.28 to 1.6.28	4.6.28
27 *Montnairn* ...	Notley, A. H., R.D., Commr., R.N.R.	K. Hutchings, E. A. Shergold, W. S. Roberts.	W.T.	Canadian Pacific {	W.T. Reg. 19.5.28 to 12.6.28 ... ... Form 911 19.5.28 to 12.6.28	14.6.28 14.6.28
Montoro	Williams, D. J. ...	J. Campbell	M.L.	Burns, Philp & Co. ...	Form 911 31.1.28 to 6.3.28	10.4.28
26 *Montrose* ...	Landy, E.	A. Watt	W.T.	Canadian Pacific ...	W.T. Reg. 25.12.27 to 12.1.28... ...	17.1.28
20 *Montroyal* ...	Freer, A.. R.D., Capt., R.N.R.	A. Mackie	„	„ „ ...	„ 17.5.28 to 1.6.28	4.6.28
Moresby ... {	Edgell, J. A., O.B.E., Capt., R.N. Henderson, D. A., Commr., R.N.	W. H. Martin	M.L.	His Majesty's Australian Ship.	Met. Log. 29.8.27 to 15.12.27... ...	23.1.28
Morvada	Mills, T. L., O.B.E., R.D., Commr., R.N.R.	H. J. O'Donohoe	No. M.	British India	Form 911 24.3.28 to 28.4.28	29.5.28
Mulbera	Steadman, W. R. ...	J. Rose	„ M.	„	„ 8.2.28 to 12.3.28	21.3.28
Nagara	Foster, E.	C. K. Brown	„ M.	R.M.S.P. Co.	„ 26.8.27 to 21.1.28	26.1.28
Nagoya	Bedwell, L. A. ...	T. A. Sergeant	„ M.	P. & O.	„ 26.3.28 to 3.5.28	19.5.28
Naldera	Dayas, C. T. E. ...	C. H. Hand, W. T. Banks, H. M. Askin.	M.L.	„	Met. Log. 19.11.27 to 23.2.28... ...	29.2.28
Nardana	Moth, F. L.	S. C. T. Smith	No. M.	British India	Form 911 17.3.28 to 20.4.28	30.4.28
Nellore	Hignett, A. H., R.D., Lt.-Commr., R.N.R.	A. J. Brown	„ M.	P. & O.	„ 30.12.27 to 6.4.28	11.4.28
Nerbudda	Williams, B. N. ...	J. H. Robotham	„ M.	British India	„ 25.1.28 to 27.2.28	5.3.28
Nestor	Houghton, G. K. ...	A. Caird, N. Anderson, R. T. Dryden.	M.L.	A. Holt	Met. Log. 8.1.28 to 13.5.28	24.5.28
Newby Hall ...	Storey, J. K.	... ...	„	Ellerman	„ 16.4.27 to 14.10.27... ...	1.12.27
Newfoundland ...	Westgarth, W. A., D.S.C.	R. F. Handley, E. Sainty, E. B. Burke.	„	Furness Withy ...	„ 6.10.27 to 11.2.28	29.2.28
Niagara	Hill, T. V.	R. N. Turner, V. Knight, L. B. Ehlert.	„	Canadian-Australasian	„ 14.12.27 to 30.3.28... ...	28.4.28
Ningchow	Beale, H. E.	M H. Vincent	No. A.	A. Holt...	Form 911 7.4.28 to 7.5.28	17.5.28
Norfolk	Robinson, F. W. ...	E. M. Foster	„ A.	Federal	„ 14.1.28 to 28.2.28	9.2.28
Norna	Wright, J. W.... ...	T. R. Ness	„ A.	Scottish Fishery Board	„ 1.5.28 to 31.5.28	9.6.28
Norseman, C.S. ...	Douglas, W.	R. W. Greenfield	„ M.	Western Tel. Co. ...	„ 5.5.28 to 12.5.28	12.6.28
Northumberland ...	Upton, H. L., D.S.C., R.D., Lt.-Commr. R.N.R.	A. J. Robertson, A. Weatherall, J. F. Clements.	M.L.	Federal	Met. Log. 30.10.27 to 25.3.28... ...	17.4.28
Nova Scotia ...	Furneaux, S.	... ...	No. A	Furness Withy ...	Form 911 4.5.28 to 1.6.28	4.6.28
Nowshera	Rowe, S. N.	W. D. L. Reeves	„ M.	British India	„ 16.4.28 to 24.5.28	29.5.28
Nubian	Watmough, T. M. ...	... ...	„ A.	Leyland	„ 19.8.27 to 30.10.27... ...	11.11.27
Nuddea	Morrison, N. C. ...	... ...	„ M.	British India... ...	„ 11.3.28 to 29.3.28	8.5.28
Oaklands Grange	St. Clair, C., D.S.C. ...	C. F. Foxwell	„ A.	Houlder Bros. ...	Form 911 1.4.28 to 28.4.28	30.4.28
57 *Olympic*	Marshall, W., C.B., D.S.O., R.D., Commodore, R.N.R.	A. Fisher, H. J. C. Day, A. E. Weller.	W.T.	White Star ... {	W.T. Reg. 10.5.28 to 24.5.28 ... ... Form 911 9.5.28 to 25.5.28	28.5.28 29.5.28
Orama	Matheson, C. G., D.S.O., R.D., Capt., R.N.R.	W. Elliot, C. K. Blake, J. M. M. Swanson.	M.L.	Orient	„ 4.3.28 to 7.6.28	14.6.28
Oranian	Hoskins, W.	.. ..	No. A.	Leyland	„ 9.3.28 to 29.5.28	4.6.28
Orbita	Dominy, R. H., C.B.E., Commr., R.N.R.	J. Lloyd Jones	„ M.	R.M.S.P. Co.	„ 7.2.28 to 15.4.28	30.4.28
Orcoma	Pearse, A. W.	W. M. Horsfall, J. N. Laylor, D. L. Jones.	M.L.	Pacific S.N. Co. ...	Met. Log. 21.9.27 to 16.2.28	27.2.28
Orduna	Daniel, T.	R. D. Eckford	No. M.	R.M.S.P. Co.	Form 911 7.1.28 to 22.3.28	28.3.28
Orestes	Flynn, G. A.	... ...	„ A.	A. Holt...	„ 5.10.27 to 20.10.27... ...	14.11.27
Orita	Duncan, E. E. ...	D. W. Hutchinson, H. D. Griffiths.	M.L.	Pacific S.N. Co. ...	Met. Log. 21.12.27 to 24.5.28... ...	4.6.28
Ormonde	Rice, W. V., D.S.O., D.S.C., Commr. R.N.	H. P. Price	,	His Majesty's Ship ...	„ 30.10.27 to 26.2.28... ...	2.5.28
Ormonde	Sarson, M. J.	... ...	No. A.	Orient	Form 911 8.10.27 to 30.10.27... ...	5.12.27
Oronsay	Shelford, W. S., Lt.-Commr., R.N.R.	... ...	M.L.	„	Met. Log. 5.2.28 to 8.5.28	12.5.28
Oroya	Ridyard, A.	P. H. Ray	No. M.	Pacific S.N. Co. ...	Form 911 22.2.28 to 30.4.28	8.5.28
Orsova	Cameron, E. P., R.D., Commr., R.N.R.	H. Schofield, L. J. Vesty, A. Croft Cohen, H. A. Whittle, A. Addison.	M.L.	Orient	Met. Log. 11.12.27 to 13.3.28... ...	20.3.28
Orvieto	O'Sullevan, F. R. ...	J. G. Goldsworthy, G. L. Carter, T. Fox Russell, N. Smith	„	„	„ 25.12.27 to 27.3.28... ...	16.4.28
Osterley	Sarson, M. J.	A. F. C. Gray	No. A.	„	Form 911 19.2.28 to 23.5.28	2.6.28
Otaki	McNish, R.	J. McCulloch	„ A.	New Zealand S.S. Co.	„ 30.3.28 to 7.5.28	12.5.28
Otira	Wood, C., D.S.C. ...	S. Winton	„ M.	Shaw, Savill & Albion	„ 22.3.28 to 28.4.28	8.5.28
Otranto	Staunton, H. G., C.B.E., R.D., Commr., R.N.R.	O. C. Davies	„ M.	Orient	„ 29.1.28 to 30.3.28	14.4.28
Oxfordshire ...	Foster, W. L.	E. A. Insley	„ A.	Bibby Bros.	„ 4.2.28 to 11.4.28	18.4.28
Pacific Shipper, M.V.	Fairclough, H. ...	... ...	„ A.	Furness Withy ...	„ 27.12.27 to 22.3.28... ...	16.4 28
Pacuare	Sapsworth, S. A. ...	V. R. Watkins	„ A.	Elders & Fyffes ...	„ 17.12.27 to 20.1.28... ...	24.1 28
Pakeha	W. P. Clifton Mogg, Lt.-Commr., R.N.R.	H. C. Smith, G. Almond, G. Lindsay	M.L.	Shaw, Savill & Albion	Met. Log. 20.1.28 to 25.5.28	1.6.28
Pancras	Peregrine D.	... ...	M.L.	Booth	... ...	...
Pareora	Evans, J. O.	J. Greenaway	No. A.	Hain S.S. Co.	Form 911 13.1.28 to 11.2.28	10.4.28
Paris	Cook, C. L.	Mr. Biles	C.C.	Southern Rly. ...	Telegraphic Report. 31.7.27 ...	31.7.27
Patia	Makepeace, S. ...	R. W. King	No. A.	Elders & Fyffes ...	Form 911 3.3.28 to 8.4.28	12.4.28
Peisander	Slater, H.	D. L. Hoare	„ A.	A. Holt...	„ 19.2.28 to 1.5.28	5.5.28
65 *Pennland*... ...	Doughty, G.	C. J. Murray, E. Cornellie, Lewis.	W.T.	Red Star	W.T. Reg. 2.4.28 to 21.4.28	23.4.28
Peshawur	Wilding, H. G. ...	J. C. Mellonie. S. H. Baldwin, A. M. Tolfree.	M.L.	P. & O.	Met. Log. 19.11.27 to 25.3.28... ...	11.4 28
Piako	Kettlewell, C. R. ...	P. J. Connolly, T. K. McDonald, H. N. Lawson.	„	New Zealand S.S. Co.	Met. Log. 3.7.27 to 5.12.27	12.12.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
Polycarp	Jackson, T. H. ...	G. H. Clark	No. A.	Booth	Form 911 31.3.28 to 21.5.28	9.6.28
Port Adelaide ...	Swan, L. H.	E. N. Rogerson, F. J. Lavers, L. H. Potter.	M.L.	Commonwealth & Dominion.	Met. Log. 20.8.27 to 17.12.27... ...	28.1.28
„ *Albany* ...	Needham, R.	G. W. Horton	„	„ „ „	„ 1.6.27 to 25.11.27	8.12.27
„ *Auckland* ...	Durham, R. S. ...	G. L. Hazlewood, C. F. Post, J. H. Sloan, H. E. Braine.	„	„ „ „	„ 10.9.27 to 25.1.28	15.2.28
„ *Bowen* ...	Hearn, G. W.	W. R. Johnston	No. A.	„ „ „	Form 911 28.10.27 to 15.12.27 ...	6.1.28
„ *Campbell* ...	Reynolds, P. J. ...	J. G. Thom	„	„ „ „	„ 6.1.28 to 13.5.28	18.5.28
„ *Caroline* ...	Hoad, A. C.	L. M. Bayly, R. Forrest, J. Stannard.	M.L.	„ „ „	Met. Log. 4.12.27 to 31.3.28	30.4.28
„ *Darwin* ...	Sawbridge, I. R. ...	S. Hearn, E. M. Fenton, J. S. Moare.	„	„ „ „	„ 13.8.27 to 9.1.28	13.1.28
„ *Denison* ...	Ferris, J.	E. T. N. Lawrey, G. W. B. Lovegrove, P. J. Howe, L. W. Cady.	„	„ „ „	„ 23.7.27 to 25.2.28	28.2.28
„ *Dunedin* ...	Farmar, F.	E. G. Jones, H. M. Post, N. M. Muzzell.	„	„ „ „	Met. Log. 5.11.27 to 1.3.28	14.3.28
„ *Fremantle*, M.V.	Kearney, F. J. ...	A. G. Rhind	No. A.	„ „ „	Form 911 25.2.28 to 30.3.28	21.5.28
„ *Gisborne*, M.V.	Craven, R.	R. D. Elson	„ A.	„ „ „	„ 28.1.28 to 23.5.28	4.6.28
„ *Hobart* ...	Hayter, S. W.... ...	R. Carter, L. Copeland, G. G. Langford, C. L. Webb.	M.L.	„ „ „	Met. Log. 1.1.28 to 28.4.28	15.5.28
„ *Hunter* ...	Cottell, S. C.	J. C. Goddard, A. McClounan. J. T. Weldin.	„	„ „ „	„ 7.1.28 to 11.5.28	16.5.28
„ *Huon*	Compton, J.	... ...	No. A.	„ „ „	Form 911 20.3.28 to 17.4.28	24.4.28
„ *Melbourne* ...	Hudson, J. J.	A. R. Martin, L. H. B. Bloye, W. E. Simpson.	M.L.	„ „ „	Met. Log. 12.11.27 to 1.4.28	10.4.28
„ *Nicholson* ...	Jack, J.	J. G. Lewis, G. L. H. Dean, A. G. Newbury, W. B. Hopkins.	M.L.	„ „ „	Met. Log. 17.9.27 to 17.1.28	6.2.28
„ *Pirie*	Kippins, T.	W. G. Jones, J. F. Martin, E. O. Round.	„	„ „ „	„ 12.10.27 to 27.3.28... ...	12.4.28
„ *Sydney* ...	Higgs, W. G.	T. L. Kidwell, E. E. Roswell, K. D. Morgan.	„	„ „ „	„ 21.9.27 to 3.3.28	8.3.28
„ *Victor* ...	Williams, R.	R. Stannard, J. B. Watson, A. Brown.	„	„ „ „	„ 16.7.27 to 28.11.27... ...	15.12.27
„ *Wellington* ...	Jones, C.	D. F. Morgan	No. A.	„ „ „	Form 911 26.1.28 to 25.2.28	21.3.28
President Jackson	Griffith, J.	... ...	„ A.	Pacific Mail S.S. Co...	„ 3.4.28 to 23.4.28	29.5.28
President Jefferson	Nichols, F. R	C. H. Moen, S. Hansson ...	„ A.	Admiral Oriental Line	„ 5.1.28 to 29.1.28	20.2.28
Protea, H.M.S.A.S.	Dalgliesh, J., Lt.-Commr., S.A.N.S.	A. C. Matson	M.L.	South African Naval Service.	„ 1.2.28 to 10.5.28	12.6.28
Protesilaus	Nelson, T. B.	... ...	„	A. Holt	Met. Log. 8.4.27 to 7.9.27	11.10.27
Pyrrhus	Elford, W. J.	R. E. Wilks	No. A.	„	Form 911 30.4.28 to 14.5.28	9.6.28
Ranpura	King, A. M., D.S.C. ...	E. J. Spurling	No. M.	P. & O.	„ 21.4.28 to 10.5.28	12.6.28
Rawalpindi ...	Thornton, E. J. ...	A. G. Stansfield...	„ M.	„	... ...	...
60 *Regina*	Davies, E.	R. S. Walker, J. C. Boyce, R. Conway.	W.T.	White Star - Dominion	„ 6.2.28 to 26.2.28	27.2.28
					W.T. Reg. 20.5.28 to 9.6.28	12.6.28
Reindeer	Pitman, R. R.... ...	... ...	C.C.	G.W. Railway ...	Telegraphic Report 23.2.28	23.2.28
Remuera	Cameron, J. J. ...	H. Horwood	No. A.	New Zealand S.S. Co.	Form 911 17.2.28 to 2.6.28	9.6.28
Rhexenor	Stout, G. I.	A. Yarwood	„ A.	A. Holt...	„ 5.1.28 to 25.3.28	2.4.28
Rhodesian Transport.	Bullock, F. W. H. ...	F. D. Betts	„ A.	Houlder Bros. ...	„ 3.12.27 to 17.3.28	10.4.28
Rimutaka	Hemming, F. A. ...	H. A. Fryer, M. A. D. Stewart, G. C. Saul, H. Vernon.	M.L.	New Zealand S.S. Co.	Met. Log. 11.11.27 to 15.3.28... ...	21.3.28
Ripley Castle ...	Morgan, A. O., R.D., Commr., R.N.R.	T. E. Wilford	No. A.	Union Castle	Form 911 2.3.28 to 4.5.28	8.5.28
Risaldar	Matthews, E. G. ...	R. H. Friedlander	No. M	Asiatic S.N. Co. ...	„ 4.11.27 to 19.11.27... ...	12.12.27
Rona... ...	Wallis, J. A.	... ...	No.	Colonial Sugar Refining Co.	... ...	...
Rother	Woodhead, T. H. ...	S. Duckels	No. A.	Goole Steam Shipping	„ 27.4.28 to 9.6.28	14.6.28
Rotorua	Hunter, J. L. B. ...	E. Lawrence, L. Griffiths, T. M. Devitt.	M.L.	New Zealand S.S. Co.	Met. Log. 21.1.28 to 8.5.28	23.5.28
Royal Transport ...	Dove, J.	R. W. Wass	No. A.	Houlder Bros. ...	Form 911 7.5.27 to 15.8.27	19.8.27
Ruapehu	McKellar, A. W., R.D., Capt., R.N.R.	A. Landles, D. M. Lambert, W. J. Newton.	M.L.	New Zealand S.S. Co.	Met. Log. 19.1.28 to 14.5.28	23.5.28
St. Albans	Smith, G. L., Commr., R.A.N.R.	W. McIntyre, J. Kavanagh, R. L. Harry, B. W. Dun.	„	Eastern and Australian.	„ 30.9.27 to 16.2.28	7.5.28
St. Helier	... ...	C. Bell	C.C.	G.W. Railway ...	Telegraphic Report 2.6.28	2.6.28
St. Julien	Richardson, L. ...	C. W. Sanderson	„	„ „ ...	„ „ 14.6.28	14.6.28
St. Andrew ...	Bearpark, E. W. ...	E. E. Moodie	No. A.	Rankin Gilmour ...	Form 911 21.3.28 to 20.5.28	9.6.28
38 *Samaria*	Malin, R. G., Lieut.-Commr., R.N.R.	C. S. Williams, W. B. Tanner, D. E. Sibson.	W.T.	Cunard	„ 7.5.28 to 28.5.28	30.5.28
					W.T. Reg. 7.5.28 to 27.5.28	30.5.28
Sardinian Prince ...	Brown, J. F.	W. O. Young	No. A.	Prince	Form 911 19.1.28 to 24.3.28	10.4.28
Saxon	Gardner, G. F., O.B.E.	R. May	„ A.	Union-Castle	„ 23.3.28 to 14.5.28	15.5.28
Scholar	Whyte, D. L.	... ...	„ M.	Harrison	„ 11.4.28 to 27.5.28	30.5.28
Scotia	Prichard, S. D., M.B.E.	W. T. Griffith	C.C.	L.M. & S. Railway ...	Telegraphic Report 12.5.28	12.5.28
33 *Scythia*	Prothero, W.	R. Sell, G. H. Morris, J. G. Bradley.	W.T.	Cunard	W.T. Reg. 14.5.28 to 4.6.28	7.6.28
					Form 911 8.4.28 to 6.5.28	12.5.28
Sheaf Mount ...	Whitfield, G. A., O.B.E.	... ...	No. A.	W. A. Souter	„ 22.4.28 to 24.5.28	29.5.28
Sheaf Spear ...	„ „ „	S. J. Dring, T. B. Fishley ...	M.L.	„	Met. Log. 4.2.27 to 25.7.27	17.9.27
Shropshire, M.V. ...	Adamson, B. W. ...	W. L. Whiteside, R. Cuming, W. H. Brittain, L. McDermott.	„	Bibby	„ 31.12.27 to 9.3.28	13.3.28
Socrates	Taylor, F. C.	W. E. Jordan	No. A.	Lamport & Holt ...	Form 911 1.10.27 to 21.12.27... ...	27.1.28
Somerset	Howell Price, J. ...	W. Redwood	„ A.	Federal...	„ 8.2.28 to 17.3.28	27.4.28
Spero	Montgomery, H. ...	D. Millward	M.L.	Ellerman Wilson ...	Met. Log. 9.7.27 to 31.12.27	6.1.28
Statesman	Mowat, J.	... ...	No. M.	Harrison	... ...	...
Stephen	Evans, L. G.	R. Lugg	No. A.	Booth	Form 911 1.3.28 to 19.4.28	24.4.28
Stockwell	Smith, W.	R. A. Kneen	„ A.	Brocklebank	„ 1.5.28 to 19.5.28	29.5.28
Surrey	Lamb, C. B.	S. C. Bradley	„ A.	Federal...	„ 26.1.28 to 3.3.28	12.3.28
Suwa Maru	Gotoh, M.	... ...	„ A.	Nippon Yusen Kaisha	„ 29.4.28 to 27.5.28	4.6.28
Sylvafield, M.V ...	Biddick, E.	A. Sully	„ A.	Hunting & Son ...	„ 6.4.28 to 6.5.28	19.5.28
Tainui	Elford, H. C.	L. J. Hopkins	„ A.	Shaw, Savill & Albion	„ 16.2.28 to 22.3.28	28.3.28
Tahiti ...	Aldwell, B M. ...	C. R. Carlyon	„ A.	Union S.S. Co. of N.Z.	„ 21.3.28 to 11.5.28	30.5.28
	Martin, W.					
Taiping	Frame, A. M.	F. Stratford, S. Moore, A. C. Kennedy, R. Bargent.	M.L.	Yuill & Co.	Met. Log. 11.6.27 to 4.11.27	4.1.28
Takada	Baird, S. K.	... ...	No. M.	British India... ...	... ...	...
Talthybius	Wilson, R. J.	G. D. Jones	„ A.	A. Holt	Form 911 3.4.28 to 19.4.28	22.5.28
Tamaroa	Hartman, W. H. ...	F. W. Lutyens	„ M.	Shaw, Savill & Albion	„ 21.1.28 to 26.2.28	5.3.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.6.28.	Date Received.
Tanda	Pilcher, E. T., Lieut.-Commr., R.N.R.	G. C. Smith, H. Munday, J. W. Kavanagh, R. Millington.	M.L.	E. & A. S.S. Co. ...	Met. Log 2.9.27 to 31.1.28	3.4.28
Taranaki	Kershaw, W. A. R. ...	... ...	„	Shaw, Savill & Albion	... ...	...
Tarantia	Munro, D.	... ...	No. A.	Anchor	Form 911 10.3.28 to 5.4.28	14.4.28
Teiresias	Wilkinson, W. H. ...	... ...	„ A.	A. Holt & Co.	„ 2.3.28 to 2.5.28	29.5.28
Tekoa	Barnett, H.	... ...	„ M.	New Zealand S.S. Co.	„ 19.2.28 to 17.3.28	28.3.28
Telamon	Willcox, J. H.... ...	F. A. Brown	„ A.	A. Holt	„ 20.2.28 to 14.3.28	2.4.28
Tetela	Brice, E. H.	E. Swale	„ A.	Elders & Fyffes ...	„ 5.5.28 to 9.6.28	14.6.28
Teucer	Dodds, R.	J. M. Kirk	„ A.	A. Holt	„ 21.3.28 to 4.4.28	10.5.28
Themistocles ...	Young, A. D.	H. C. Howe	„ M.	Aberdeen	„ 4.2.28 to 22.2.28	16.4.28
Theseus	Jones, E.	W. A. Fyffe	„ A.	A. Holt	„ 16.4.28 to 4.5.28	21.5.28
Titan	Power, J.	D. Hey, D. MacTavish, G. W. Best, C. F. Bailey.	M.L.	„	Met. Log. 17.9.27 to 6.1.28	18.1.28
Tongariro	Burton Davies, J. ...	F. C. Pretty, A. E. Williams, E. A. Quick, D. Baldwin.	„	New Zealand S.S. Co.	Form 911 18.9.27 to 28.1.28	2.2.28
Transylvania ...	Bone, D. W.	P. Middleton	No. A	Anchor	„ 26.5.28 to 3.6.28	9.6.28
Traveller	Worthington, B. ...	E. L. Stockley	„ M.	T. & J. Harrison ...	„ 3.12.27 to 29.2.28	5.3.28
Trefusis	Cordy, C.	R. H. Silley	„ A.	Hain S.S. Co.	„ 9.3.28 to 31.3.28	28.4.28
Trematon	Evans, B.	J. Jenkyn, C. Warren, R. Kitson.	M.L.	Hain S.S. Co.	Met. Log. 25.1.28 to 5.5.28	11.5.28
Turakina	Hamilton, E. S. ...	J. D. B. Fisher	No. M.	New Zealand S.S. Co.	Form 911 3.4.28 to 23.4.28	12.6.28
11 *Tuscania*	Rome, W.	... ...	W.T.	Anchor	W.T. Reg. 7.5.28 to 26.5.28	4.6.28
					Form 911 7.4.28 to 29.4.28	8.5.28
Tyndareus	Christie, W.	A. F. Barclay, T. R. Phillips. F. H. Gray.	M.L.	A. Holt	Met. Log. 29.11.27 to 23.4.28... ...	1.6.28
Ulimaroa	Wylie, W. J.	A. N. Robertson	No. M.	Huddart Parker, Ltd.	Form 911 3.2.28 to 27.2.28	11.4.28
Ulysses	Owen, R. D., O.B.E....	W. E. Ford	„ A.	A. Holt	„ 1.5.28 to 14.5.28	9.6.28
Umvolosi	Barnes, E. W.... ...	R. Dyns	„ A.	Bullard King	„ 6.4.28 to 16.5.28	9.6.28
Valacia	Inch, F....	... ...	„ M.	Cunard	„ 26.3.28 to 13.5.28	17.5.28
Vardulia	Gronow, S.	W. H. Barker	„ A.	„	„ 22.3.28 to 19.5.28	4.6.28
Vigilant	Simpson, E. S. S. ...	J. Hunter	„ A.	Scottish Fishery Board.	„ 4.5.28 to 30.5.28	4.6.28
Waiotapu	Todd, D.	A. J. McKenzie	„ M.	Canadian - Australasian.	„ 9.2.28 to 9.4.28	28.4.28
Wairuna	Ryan, J.	J. E. Broughton, R. Tulloch, J. Ritchie.	M.L.	Union S.S. Co. of N.Z.	Met. Log. 14.10.27 to 20.1.28... ...	20.3.28
Walmer Castle	Lang, T. W.	A. E. Denn	No. A.	Union Castle	Form 911 30.9.27 to 20.11.27... ...	22.11.27
	Stuart, C. B.					
Wangaratta ...	Scutt, W.	T. W. Wordingham, S. R. Millard, A. G. Brooks, M. Harvey.	M.L.	British India	Met. Log. 2.10.27 to 29.2.28	2.3.28
Warfield	Steel, R.	... ...	No. A.	„ „	Form 911 2.3.28 to 9.3.28	26.3.28
War Nizam ...	Moncrieff, T.	F. J. Marshall	„ M.	British Tankers ...	„ 24.3.28 to 1.5.28	8.5.28
Westmoreland ...	Gardner, H. W. ...	G. A. Shepherd, K. S. Phillips, R. L. Warren.	M.L.	Federal...	Met. Log. 22.1.28 to 2.6.28	7.6.28
William Scoresby, R.S.S.	De la Motte, J. B. B., Lieut., R.N.	... ...	„	Falkland Islands Government.	... ...	...
Windsor Castle ...	Chave, Sir B., K.B.E.	A. J. Tweddell, J. Montgomery, P. G. McIver, A. G. Bedwell.	„	Union Castle	„ 15.10.27 to 5.2.28	15.2.28
Winifredian ...	Harrocks, W.... ...	A. Crone	No. M.	Leyland	Form 911 30.10.27 to 22.12.27 ...	6.1.28
Wonganella ...	Williamson, A. D. ...	G. F. Phillips	„	W. Crossby & Sons ...	„ 17.3.28 to 10.4.28	21.5.28
Woodarra	Reilly, J. V.	H. Goater, L. J. C. Simpson, G. F. Alexander J. McPhail.	M.L.	British India... ...	Met. Log. 1.1.28 to 25.5.28	1.6.28
Yorkshire	Millson, G. E.... ...	W. M. C. Higginson, R. Allen	No. A.	Bibby	Form 911 23.4.27 to 4.7.27	9.7.27
Zent	Roberts, H.	J. B. Wookey	„	Elders & Fyffes ...	„ 28.4.28 to 3.6.28	9.6.28
Conway, H.M.S ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets	Cadets' M.L.	... ...	Cadets' Met. Log. 22.1.28 to 31.3.28	11.4.28
Pangbourne Nautical College	Tracy, A. F. G., Commr., R.N.	„ „	„	... ...	Cadets' Met. Log. 18.1.28 to 27.3.28	13.4.28
Worcester, H.M.S.	Sayer, M.B., C.B.E., A.D.C., R.D., Capt., R.N.R.	„ „	„	... ...	Cadets' Met. Log. 20.1.28 to 11.4.28	16.4.28
Abaco	... ...	The Keepers	Lighthouse Register.	... ...	Lighthouse Register 1.7.26 to 20.10.26	20.4.27
Cay Lobos	... ...	„	„	... ...	Lighthouse Register 1.1.27 to 11.7.27	29.9.27
Double Headed Shot	... ...	„	„	... ...	Lighthouse Register 4.9.27 to 29.2.28	24.4.28
Inagua	... ...	„	„	... ...	Lighthouse Register 4.7.27 to 13.1.28	24.4.28
Sombrero	... ...	„	„	... ...	Lighthouse Register 1.7.27 to 31.12.27	7.2.28
Watling Island ...	... ...	„	„	... ...	Lighthouse Register 21.7.27 to 31.12.27	24.4.28
Cape Pembroke ... (Falkland Is.).	... ...	„	„	... ...	Lighthouse Register 1.7.27 to 31.12.27	21.2.28

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 31.5.28.	Date Received.
Dakotian	Robb, J.	... ...	Leyland	Water Samples	...
Darro	Matthews, G. P.	A. F. Walker	R.M.S.P. Co.	„ „	4.5.28
Deseado	Hannon, F. S....	J. N. Duncan	„	„ „	17.5.28
Hildebrand...	... ...	A. G. Malcolm	Booth	„ „	2.5.28
Oranian	Hoskins, W.	... ...	Leyland	„ „	...

LIST OF SOME OF THE PUBLICATIONS PUBLISHED BY THE AUTHORITY OF THE METEOROLOGICAL COMMITTEE AND BY THE HYDROGRAPHIC DEPARTMENT OF THE ADMIRALTY.

MARINE METEOROLOGY, ATLASES AND MEMOIRS.

CHARTS :—

ATLANTIC :—

Monthly Current Charts for the Atlantic Ocean, from information collated and prepared in the Meteorological Office. (No. 132, 1897) (22½ × 18 in.) (Published by the Admiralty.)

Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. (No. 27, 1876) 24*s.* (17 × 20 in.)

ATLANTIC (NORTH) :—

Meteorological Charts of the North Atlantic for each month of the year, giving normals of Pressure, Air and Sea Surface Temperature and Ocean Currents, with Frequencies of Winds, also Ice Limits. (No. 149A, 1923) 1*s.* each (35 × 22½ in.). Sold by J. D. Potter, 145, Minories, E.1.

Synchronous Weather Charts of the North Atlantic and the adjacent Continents, 1st August, 1882, to 3rd September, 1883. Parts I to IV (33 sheets each). (No. 71, 1886) 17*s. each* Part. (26 × 22 in.)

Charts of Meteorological Data for Square 3, Lat. 0°-10° N., Long. 20°-30° W. (20 × 13½ in.) and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. (17 × 16½ in.) (No. 20, 1874). 20*s.*

Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the eleven days ending 8th February, 1870. With Charts (No. 13, 1872). 5*s.* (4to.)

ATLANTIC (SOUTH) :—

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. (No. 159, 1902.) (27 × 20½ in.) (Published by the Admiralty.)

The relation between Pressure, Temperature, and Air Circulation over the South Atlantic Ocean. By M. W. Campbell Hepworth, C.B., Commander R.N.R., Marine Superintendent. (No. 177, Second Edition, 1917.) 1*s.* (8vo.)

BAFFIN BAY AND DAVIS STRAIT :—

Monthly Meteorological Charts of Baffin Bay and Davis Strait. (No. 221, 1917.) 8*s.* (30 × 25½ in.)

INDIAN OCEAN :—

Meteorological Charts of the East Indian Seas for each month of the year, giving Normals of Pressure, Air and Sea Temperatures and Ocean Currents, with Frequencies of Winds. (No. 181A, 1923.) 1*s* each. (35 × 22½ in.) Sold by J. D. Potter, 145, Minories, E.1.

Monthly Current Charts for the Indian Ocean, from information collated and prepared in the Meteorological Office. (No. 124, 1896.) (20 × 24½ in.) (Published by the Admiralty.)

CHARTS :—*continued.*

MEDITERRANEAN SEA :—

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