

VOL. IV. No. 44.

THE MARINE OBSERVER.

AUGUST 1927.

TABLE OF PRINCIPAL CONTENTS.

	PAGE
A Note in Season	147
Wireless Weather Signals	148
The Marine Observer's Log (with illustrations)	148
Wireless and Weather an Aid to Navigation :—	
Chapter VIII.—Wind and Set and Drift of Current (with illustrations)	152
Some Further Remarks on the use of the Marine Direction Finder as an aid to Navigation	158
Atmospherics and Typhoons at Sea	159
Local Winds, Atlantic Ocean, III, E. Coast of South America ...	160
Weather Signals, Canada, U.S.A. (Atlantic Coast) Bermuda :—	
II. Wireless Weather Bulletins and Storm Warnings ...	162
III. Wireless Time Signals	164
IV. Visual Storm Warnings	164

Lithographic Illustrations after page 166.

Charts XLIV to XLVIII—"Wireless and Weather" :—

XLIV. Ocean Currents, over the Globe. **January.**XLV. Ocean Currents, over the Globe. **July.**XLVI to XLVIII. Weather Charts, mornings of **August 25th, 26th and 27th, 1924, Western N. Atlantic.**

Charts of Currents on the Tracks to and from W. Indies and Panama, Eastern Portion. **August, September and October,** observations of ships regularly observing for British Meteorological Office, 1910-1925.

Chart showing Mean Sea Surface temperatures, South Atlantic, for month of **August,** from observations of British Ships, during the years 1855 to 1899 and 1855 to 1878.

A NOTE IN SEASON.

At about the time when this Number reaches observing ships at ports of call on their homeward passage a Mission which has been visiting the Dominions to assist with advice as to the nature of meteorological service and other matters desired in connection with Empire Air Communication will be returning as passengers by steamship to England.

The Commanders of the ships in which this mission travels have been asked beforehand, and where possible by personal call on board, to give the Meteorologist accompanying the Mission such facilities as they can, consistent with the work of the ship and in conformity with the customs of the Corps of Voluntary Marine Observers, for the study of Meteorological conditions during the time that he is a passenger on board.

This may give those responsible for the direction of British aerial navigation an opportunity of seeing the value of the work of seamen in general and the British Corps of Voluntary Marine Observers in particular.

By working along the lines advocated in the serial chapters on "Wireless and Weather an Aid to Navigation," more especially with regard to the form of report given in Chapter I, the times of observation and times and wave lengths for communication given in Chapter III, selected ships in making reports to shipping will at the same time be showing those examining the problems of air navigation how the

necessary information may be provided without inconveniencing the Merchant Service.

Steps have been taken to bring to the general notice of shipping the advantages to be gained by this voluntary system of reporting by selected ships, so that the deterrent mentioned by one of those officers who sent in their views which were published in the April 1926 number—"that the majority of shipping do not look out for these reports" is being removed. Only recently the Commander of a large steamer expressed his surprise and admiration for information received by wireless, made by selected ships, which gave him timely warning of a very heavy gale.

At this time when this system, built up purely on the voluntary efforts of British seamen is commencing to take hold, we cannot be too careful to avoid over-estimation of results. Any claims of an extravagant nature would only do harm. Desire for exact and detailed information of meteorological elements at sea have led to requests which would, if acceded to, have made the work incompatible with that of ship routine. It has been our duty in re-establishing the work since the Great War to adopt such methods as were consistent with those in common use at sea.

It cannot be too strongly emphasized that for the general success of meteorology and the supply of marine data to those who desire it, it is essential to develop marine meteorology as a branch of

seamanship; whereby, in working in the interest of his ship and shipping, the seaman may at the same time improve his knowledge and provide the better data for the meteorologist, the airman, and all who require such information.

In this number we publish another of Commander J. A. SLEE's interesting articles upon the Wireless Direction Finder. At this stage too much encouragement cannot be given to the study and use of this instrument; though here, too, any extravagant claims would do harm. We commend this article on the Direction Finder

to our readers for its soundness and moderation. Young officers, midshipmen, apprentices, and cadets undergoing training at the present time will do well to learn all they can of wireless telegraphy, and the Morse code, for use of the Direction Finder will undoubtedly become general, and in the interests of navigation it is essential that navigators should be able to take their own bearings or find their own position lines whatever instrument be used.

MARINE SUPERINTENDENT.

WIRELESS WEATHER SIGNALS.

WITH reference to the note which appeared in the July Number. According to the Board of Trade Notices to Mariners of June 1st, 1927, it appears that Cape d'Aguilar (VPS), W/T Station, no longer transmits the weather bulletins referred to, these now being broadcasted through Hong Kong Observatory (GOW) W/T Station.

Special attention is invited to the Board of Trade Notices to Mariners of June 1st, 1927, page 60.

When "Weather Signals" for the Far East are published next year, probably in the July "Marine Observer," it is hoped to include complete amendments of these signals.

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.

CURRENTS ON THE WEST INDIES AND PANAMA ROUTES.

THE following are extracts from some of the replies received in answer to a circular letter requesting information of general experience of currents on the West Indies and Panama routes.

Captain F. G. L. Willan. R.M.S.P. "Demerara."

"My experience has mostly been among the Windward and Leeward Groups and the islands of Trinidad and Tobago.

"Although that is some time past now, my memory is clear as to the fact that the description of the currents in those parts, given in the 'West India Pilot' is very reliable, provided always that a possible exception to any rule is never lost sight of.

"It appeared to me that from Galera Point, Trinidad, to the Virgin Islands, a current setting west to W.N.W. of an irregular rate may be looked for when the ship is anything up to 180 miles to the eastward of all these Islands, and in the channels separating them.

"There were, it is true, many occasions when there seemed to be no current at all, or one setting still more northerly, but generally speaking the current is there, setting more or less westerly throughout the year. But, as the 'Sailing Directions' say, caution must be used when making these Islands in rainy weather, in case the set allowed for is not met with, or too little has been allowed for it.

"It is but reasonable to expect that, during the Hurricane months, when the Trade wind is interrupted and uncertain, some change might occur in the surface drift—but it does not always follow.

"When coasting closely along the lee side of these Islands, a northerly and sometimes, but more rarely, a southerly current can be met with, with a rate of perhaps $\frac{1}{2}$ of a knot, especially off the larger islands such as Martinique, Guadeloupe and Dominica.

"In the offing between Galeota and Galera points, Trinidad, the current always sets northerly, at $\frac{1}{2}$ knot to $1\frac{1}{2}$ knots, striking the south coast of Tobago and turning naturally to the N.W. and west.

"Between Trinidad and Barbados it will set N.W. as a rule at about 1 knot.

"Between St. Lucia and St. Vincent, a much used channel, we used to find the current about west $\frac{1}{2}$ knot to 1 knot sometimes.

"In the Serpents Mouth, and the Dragon's Mouth, Trinidad, the rate can be anything up to $1\frac{1}{2}$ knots in or out. A glance at the Chart will show the probability of this.

"At any harbour situated in a bay in these Islands, as at Kingstown, St. Vincent, the set off the two horns of the bay may be in or out; while at an open roadstead such as Roseau in Dominica, or Basse Terre in Guadeloupe, the current will set up or down the coast.

"Possibly the eddies off the various points, and the counter-set up or down the lee side of these Islands are but to be expected when such a great stream is obstructed by so many small islands.

"I think that farther north towards the Island of Antigua the rate of the current is less, and the direction is more westerly and perhaps W. by S. sometimes.

"Of Jamaica, San Domingo and Porto Rico I have much less knowledge, but they are all under the influence of this current.

"If I may say so, the cautionary notice, printed in italics, on the Admiralty Charts of the Caribbean Sea gives the seaman in these waters the soundest advice and a true, if short description of the main current that will affect him there.

"In your letter you mention the route from the Channel to the West Indies. That taken by this Company's ships from Southampton to Barbados was usually when outward bound, on the rhumb line via St. Michaels in the Azores.

"But homeward, a great circle course from Barbados to Corvo, Azores, was steered, this taking the ship more northerly and more rapidly out of the influence of the N.E. Trade and any surface drift there might be."

Captain B. Shillitoe. R.M.S.P. "Lochkatrine."

Current Charts for the North Atlantic Routes. Channel to West Indies and Panama.

"When approaching the Azores I have never been able to rely on the current setting in any particular direction at any time of the year. I am of opinion that the prevailing winds are the chief factor in causing the current at any time in the vicinity of the Islands.

"The variable currents from the Azores to Mona Passage I have found very much as charted on U.S. pilot charts. The currents in the vicinity of Mona Passage I have found variable but generally a set to the N.W. between the western end of Porto Rico and Mona Island.

"The currents in the Caribbean Sea I have found as charted, varying in force with the strength and direction of the trade wind. The counter current in vicinity of Manzanilla (Panama) is very erratic; with the same weather conditions on different voyages it has varied from 2 knots easterly to a slight westerly set.

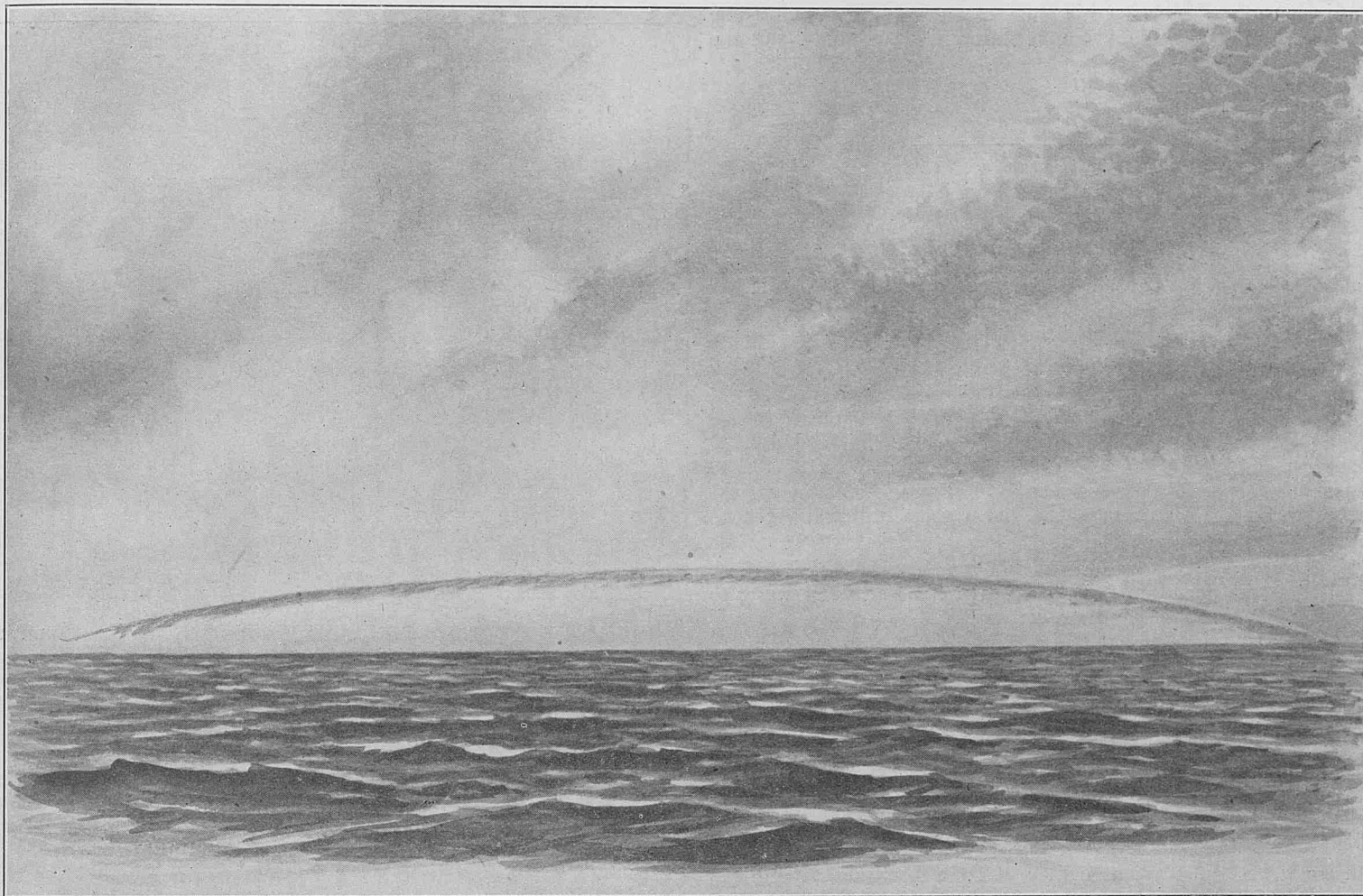
"I have not found it advantageous to take the G.C. track from England to Mona Passage when in a light ship and have experienced fine weather and generally favourable currents by taking the longer Mercator track.

"Homeward bound I have found the G.C. track the best, but if very bad weather reported to the north, have kept somewhat to the south of the track and have not experienced anything more than a slight southerly set when approaching Latitude 40° N., Longitude 40° W."

PICTURE OF CLOUD OF LINE SQUALL TYPE.

THE accompanying picture was received with the Meteorological Log of S.S. *Empress of Scotland*, Captain E. GRIFFITHS, Quebec to Southampton, Observer Mr. O. F. PENNINGTON, 3rd Officer.

"August 7th, 1926, in Latitude $53^{\circ} 24' N.$, Longitude $37^{\circ} 47' W.$, wind S.W., force 4, barometer 1021.3 mb. Dry bulb 53° , wet bulb 52° . Sky overcast with Ci-St and St-Cu. Extension of arc 160° summit bearing S.W. by S.



"First appearance of cloud resembled a line squall but on reaching the zenith no increase of wind or change of barometer or thermometer readings occurred, the arc consisted of small low filmy clouds of a Stratus nature."

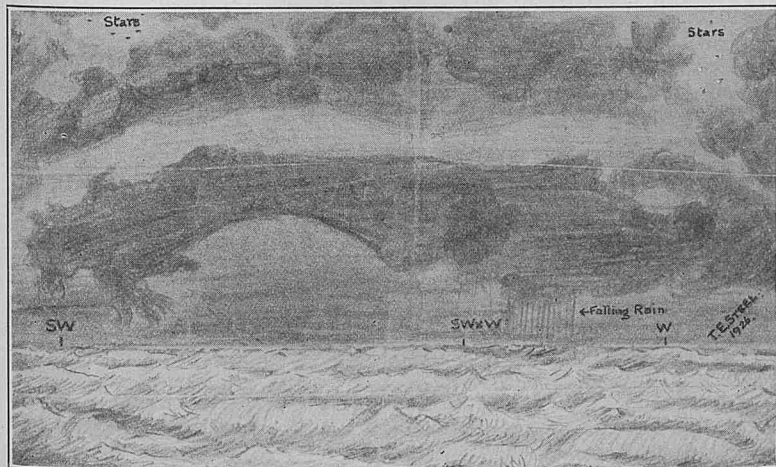
NOTE.—The original is beautifully executed in colour, it is only possible to reproduce in black and white in THE MARINE OBSERVER.

SQUALL.

Indian Ocean.

The following is an extract from the Meteorological Report of S.S. *Auditor*, Captain W. T. OWEN, Suez to Calcutta, Observer Mr. T. E. STEEL, 3rd Officer.

"On August 3rd, 1926, at 8 p.m. A.T.S. (1536 G.M.T.) when in Latitude $9^{\circ} 35' N.$, Longitude $67^{\circ} 38' E.$, wind W.S.W., force 4. Barometer corrected 29.79, mod. sea and rough confused swell—mainly overcast (Cu-Nb) and gloomy between S.W. and W.N.W.



"At 8.55 A.T.S., I observed a vivid flash of lightning to the E.N.E., then again at 10.15 a similar flash and at regular intervals of 50 seconds until 10.20 p.m.

"At 11.10 observed a Line Squall cloud, working up from S.W. by W., the air becoming perceptibly cooler.

"At 11.15 barometer read 29.815 (a rise of .025) (corrected), air temperature $77^{\circ} F.$, a fall of $4^{\circ} F.$; the squall passed over the vessel; wind increased—same direction—to force 6 with very heavy rain rendering visibility practically 1 mile at the most. The rain continued until 11.28 then fell light and wind resuming force 4. At 11.34 rain ceased—sky overcast—Nimbus clouds, temperature $81^{\circ} F.$ At 11.55 to midnight, large phosphorescent patches around the ship, the light given off being so intense as to render my eyes temporarily blind, at first being able to read the letters on the telegraphs quite easily."

PHOSPHORESCENCE IN SANDAKAN HARBOUR,

BRITISH NORTH BORNEO.

The following is an extract from the Meteorological Log of H.M.S. *Herald*, Lieutenant-Commander H. V. SILK, R.N., surveying, Australia to East Indies:—

"30th August, 1926. The ship was at anchor $2\frac{1}{2}$ cables S.E. of the Wharf. At 2130 (Local Time) a line of phosphorescence was observed just ahead of the ship resembling the beam of a searchlight as it would have appeared if projected across the harbour from the southern shore (distant from the ship about $2\frac{1}{2}$ miles).

"The ship was swung head E. by S. and the flood tide was just making from the eastward. Wind light from S. by W. Sky clear, no moon.

"Considerable phosphorescence around the ship was observed at the same time wherever the surface of the water was disturbed, as by the passage of a boat.

"In addition, the whole of the southern horizon (coastline) was fringed with white for a considerable distance on either side of the beam referred to above. It is considered that the beam of

phosphorescence was caused by a line of tide running across the harbour due to the flood tide which, as stated, was just making at the time.

"Temperatures were :—Air 81°. Sea water 87°."

CURRENT RIP.

Off East Coast of Australia.

THE following report by Captain P. L. MOLYNEUX, S.S. *Maheno*, has been received from Captain G. D. WILLIAMS, Deputy Director of Navigation and Marine Meteorological Agent at Sydney, N.S.W.

"I desire to bring to your notice that at 1 p.m. (A.T.S.) on 23rd August, 1926 in Latitude $33^{\circ} 45\frac{1}{2}'$ S., Longitude $155^{\circ} 50'$ E., Sydney Heads 269° , distance 225 miles, the above vessel en route from Auckland to Sydney, passed through an area of broken, swirling water, much resembling a heavy tide rip in appearance.

"Large quantities of loose seaweed, and several very large sharks were observed on the outskirts of the disturbance, which covered an area of about one square mile.

"The sea temperature was taken and found to be 65° F., which showed little or no variation with temperatures ascertained, prior to and after passing through the disturbed area."

METEOR.

North Atlantic.

THE following report has been received from Mr. R. G. H. HOBSON, 2nd Officer S.S. *Athelbeach*, London to S. Africa.

"On August 12th, 1926, at 4.15 G.M.T. in Latitude $26^{\circ} 40'$ N., Longitude $17^{\circ} 15'$ W., I observed an exceptionally bright Meteor, bearing $S. 75^{\circ} W.$ (T), at an altitude of about 49 degrees. It was visible for 2.5 seconds and was heading apparently almost directly for the Planet *Jupiter*, disappearing just before reaching the Planet. The light given off by it was so bright that it lit up the vicinity like daylight and it left a very bright zig-zag trail, which was visible for 20 seconds after the Meteor had disappeared. I may mention that numerous falling stars were visible during the night, appearing in all points of the compass and travelling in all directions."

NOTE.—Once annually the Earth encounters a swarm of meteors which are known as the Perseids, or popularly as "The Tears of St. Lawrence." The bulk of these meteors are seen during the period 10th to 13th August. The majority of the meteors referred to in the above account were members of this swarm. They appear in all parts of the heavens and seem as if they were travelling in different directions, but if the tracks were projected backwards it would have been found that they all met at a point in the northern part of the constellation Perseus, the divergency of the tracks being only a matter of perspective. The bright meteor was probably a large Perseid, as the information given shows that it was also directed from the same part of the heavens. Many other regularly encountered meteor showers are known but most of them are not so easy of recognition. In many cases the character of the meteor belonging to a certain swarm is recognisable, the Perseids for example being swift-moving and leaving bright tracks for a short time. These remarks do not apply to the very large and brilliant "Fireballs" which are often not associated with any known swarm.

WATERSPOUT.

Western North Atlantic.

THE following is an extract from the Meteorological Report of S.S. *Canadian Inventor*, Captain F. W. BOULTON, Sydney C.B. to Colon, observer Mr. D. GREY, 3rd Officer.



"August 30th, 1926, 6 p.m. A.T.S., Latitude $27^{\circ} 54'$ N., Longitude $72^{\circ} 08'$ W. while southbound from Sydney C.B. to Panama observed a waterspout bearing $S. 10^{\circ} E.$ (T) 2 miles. The top was connected to the ragged edge of a heavy Cu-Nb cloud, the bottom being in a considerable disturbance in the water. The spout was straight up and down and moving with the cloud in a north-westerly direction and lasted 20 minutes, then faded away in the cloud. Height of spout approximately 500 feet. Wind S. to S.E. force 2. Clouds Cu and Nb, amount 4. Visibility 7, weather bc, slight S.E. swell, smooth sea.

S.W. MONSOON, COLOMBO TO PERIM TRACKS IN THE VICINITY OF SOKOTRA, AUGUST 1926.

THE following is an extract from a letter from Commander R. A. MILNE, R.D., R.N.R., S.S. *Margha*.

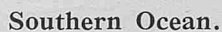
"Along with this I am enclosing a sketch by the Second Officer Mr. P. WRIGHT, and the Meteorological Log for the present voyage which I hope may be of interest to ships making the voyage from Colombo to the Gulf of Aden in the month of August. As you will observe the Masters of the *City of Hong Kong* and P. & O. *Padua* made a much more northerly crossing passing to the northward of Sokotra and I am much indebted to both those Masters for furnishing me with data from day to day which I have taken the liberty of enclosing.

"I found the current chart for the month of August in keeping with what I experienced and of much value.

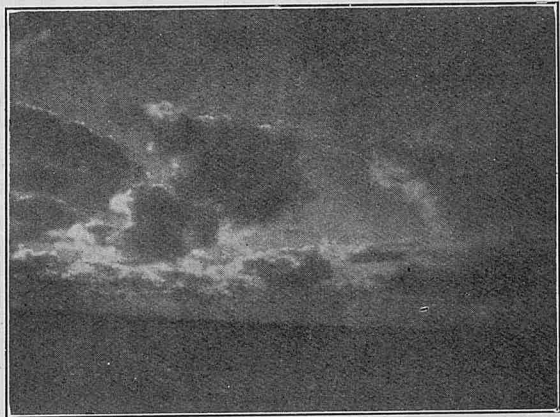
"The Direction Wireless Bearings from Guardafui were good, also the soundings before picking up Guardafui. Light good and as shown on the chart.

"Guardafui Light was seen a distance of fourteen miles although ordinary monsoon weather prevailed. After passing the light a course was steered keeping to the African side until in a position $11^{\circ} 45'$ N., $47^{\circ} 01'$ E., then a straight course steered for Aden as the current chart for August shows a favourable current inshore with an adverse current in the middle of the Gulf. I experienced by steering those courses a favourable current of twenty-three miles."

NOTE.—Routes recommended during the S.W. monsoon between Colombo and Aden, together with charts showing the mean current, sea, swell, wind, cloud amount and state of obscurity of the atmosphere during the months of July and August in the region of Sokotra and Cape Guardafui, were published in Volume I, No. 6 of this Journal.



THE accompanying photograph has been received from S.S. *Port Victor*, Captain L. H. SWAN, Cape Town to Melbourne, Observer Mr. L. M. R. BAYLY, 2nd Officer.

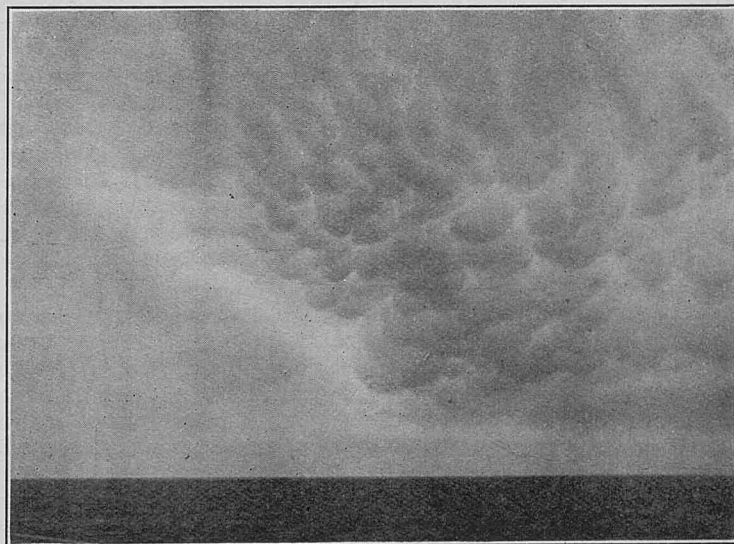


“ 16th August, 1925, 4.20 p.m., Latitude $46\frac{1}{2}^{\circ}$ S., Longitude $122\frac{3}{4}^{\circ}$ E.
Wind S.S.W., force 4. Swell S.W. rough. Cumulus bearing N.W.
Barometer 29.41 in. Temperature 41° F.



"16th August, 1925, 4.25 p.m. St-Cu, bearing of clouds being West.

“ 11.55 a.m. A.T.S. 29th August, 1926, Latitude $41^{\circ} 42' S.$, Longitude $130^{\circ} 23' E.$ Wind W.N.W. light, barometer falling, blue-green sky visible to south-east, weather ugly, overcast and drizzle, clouds Cu-Nb, Nimbus, and Stratus.

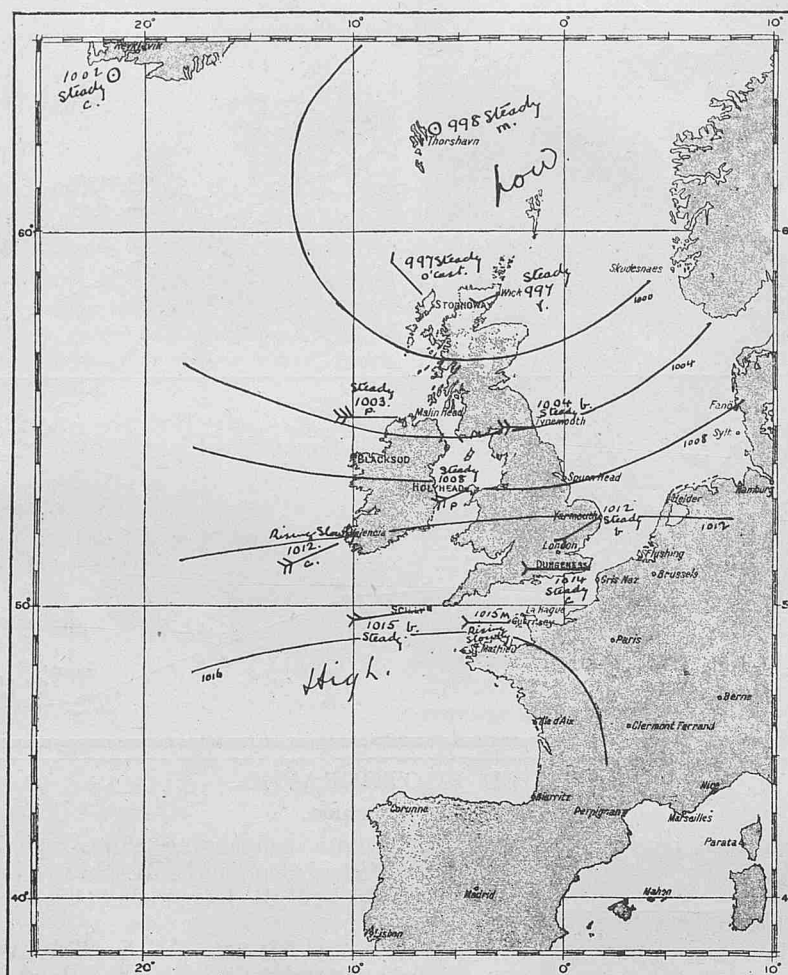


NOTE.—This is a fine photograph of Mammato-Cumulus cloud, which is so named from the rounded projections, or pap-like protuberances which hang from the under surface of the cloud. A name sometimes given is Festoon cloud. It occurs during the disturbed atmospheric conditions at the close of a thunderstorm. The difference from ordinary Cumulus is that the latter bulges upward while the mammato form bulges downward. More rarely some degree of mammato formation is observed on clouds of higher type such as Alto-Cumulus.

WEATHER CHART MADE AT SEA.

One of a series of weather charts made at sea by Captain G.H. Brown, s.s. "Dotterel," Home Trade, Liverpool to Hamburg.

August 14th, 1926, at 0700 G.M.T.



WIRELESS AND WEATHER, AN AID TO NAVIGATION.

CHAPTER VIII.

WIND, AND SET AND DRIFT OF CURRENT.

In the chapter on this subject in the First Edition the following quotation was made from Lord Kelvin's lecture on Navigation given on page 184 of the Ninth Edition of "Lecky's Wrinkles."

"There are in fact certain currents of ten miles and upwards per day, due to wind (it may be wind in a distant part of the ocean) which the navigator cannot possibly know at the time he is affected by them."

And we went on to say, when Lord Kelvin said this there was no means of long distance communication at sea. It is the purpose of this Chapter to suggest how wireless may be applied to fill that breach more fully than at present, having regard to the smallness of our knowledge. As an aid to the prediction of current a table of frequency of components of current per 10 observations with the wind from the different octants of the compass for the route from the Channel to Latitude 40° N., off the West Coast of Portugal with wind and current roses were given as an experiment. This latter has not proved a success, probably, because there were insufficient observations upon which to base the table and wind and current roses, but also because it is necessary to associate the set and drift of current not only with the wind at the place of observation, but with the wind over a very large area and with all other causes. Since then the Quarterly Charts of current along the main trade routes in the North and South Atlantic have been nearly completed, and some progress has been made in current investigation. Also, as might be expected, more questions have been asked with regard

to current and more interest has been shown in this branch of Marine Meteorology by the Corps of Marine Observers as a whole than in any other.

In an endeavour to give information of what was being done, what was essential in the way of observation, and what might be done at sea, at the invitation of Captain C. BROWN, of the Royal Technical College, Glasgow, last October, I addressed a large meeting of Captains and Officers upon the subject, and as this address was specially compiled for the information of navigators it is repeated here.

Ocean Currents and Navigation.

Of recent years the findings of Courts of Enquiry into the strandings of ships alone—if it is necessary—prove the importance of the study of currents to the navigator.

The Court which investigated at Vancouver, the stranding and loss of S.S. *Tuscan Prince* on February 15th, 1923, on Village Island, Barkley Sound, British Columbia, found this stranding and loss due to an abnormal current setting to the northward during weather conditions so bad as to be almost unprecedented in those waters.

They accepted as corroborating other evidence of abnormal velocity of current, the drift of the waterlogged and burning *Niko* which had caught fire and had been abandoned. The *Niko* drifted in a waterlogged state 56 miles in 22 hours, or at an average speed of $2\frac{1}{2}$ knots. She was seen to pass Village Island by the shipwrecked crew of the *Tuscan Prince*.

Tuscan Prince's D.R. differed 50 miles with her position of stranding.

On this occasion no less than four steamers stranded within a few miles of each other on the same date, there being a southerly gale with heavy snow.

More recently, on June 15th, 1926, the stranding and loss of S.S. *City of Naples* on the coast of Japan was found by a Naval Court of Inquiry at Yokohama to be due to an abnormal set and drift of current caused by the weather conditions at the time, a strong gale with high confused sea and heavy rain squalls, while the Board of Trade Inquiry held in London, in July 1926, found the cause of S.S. *Otranto* striking the rocks at or near Cape Grosso on May 11th, 1926, was a current which set the vessel to the northward of her course; and there are many others. Current observations at the time of accidents are not always the best for establishing information of currents, in fact they must often be unreliable since had there been reliable observations with which to fix the vessel's position, no accident would have happened.

The more one knows of currents both from experience at sea in navigation and from studying them from the great number of observations we are collecting, the more difficult it is to explain their causes or indeed to associate correctly with them conditions which may affect them. In fact I might say that with increased knowledge begot by experience we are the more cautious, for so often theories which with limited data appear correct, are exploded when more observations are applied to them and so do not let me mislead you in anything that I may say in which I suggest causes. We can only deal with surface currents, that is currents to the depth of the draught of a ship.

There are a number of forces at work which produce currents in the ocean, some internal, others external.

Of internal forces there are differences in temperature, specific gravity, defect due to evaporation or excess due to rain, rivers and melting ice at different parts of the ocean. These all contribute their quota while pressure has effect.

Of external forces the rotation of the earth influences and controls currents from whatsoever cause they occur. Difference of atmospheric pressure has a twofold effect, one direct upon the surface waters transmitted to the depths but probably small in its contribution, the other indirect causing wind which by friction induces motion in the surface layers of the water.

The Charts of Mean Pressure and Wind accompanying Chapter VI.

CHARTS XXV. and XXVI. show the pressure of the atmosphere or height of the barometer all over the world on the average in the months of January and July. It will be noted that the wind blows from regions of high to regions of low barometer but not directly; it takes a spiral course.

For example, in July there is a region of high barometer centred S.E. of Mauritius in the Indian Ocean while the barometer is low over N.W. India.

In the Indian Ocean the S.E. trade is composed of air out of the anticyclone which upon crossing the Equator in its race to the area of low barometer, is turned to the N.E. and so becomes the S.W. monsoon. This is due to the rotation of the earth and friction. At sea we are all familiar with the general wind systems of the globe, let us compare them with the general surface current circulation.

CHARTS XLIV. and XLV. show the general current circulation in January and July.

By these charts it will be seen that generally the current runs clockwise round the anticyclones in the northern hemisphere and anti-clockwise in the southern hemisphere. That is, it flows before the prevailing wind. As I have said, there are many other causes of current than wind. The experience of the navigator is sufficient to prove that the set and drift of current is often influenced by wind prevailing at the place of observation and at distant places.

Sometimes we experience current which sets right against the wind and in many other directions but by taking a great many observations of set and drift of current in regions away from the great stream currents, and comparing them with the wind at the time of observation, it is proved that on the average the surface current runs before the wind at an angle of about 45° to the right in north latitude and to the left in south latitude.

This is also due to the rotation of the earth.

RELATION OF CURRENT TO WIND.

North Atlantic, Lat. 47° to 53° N., Long. 10° to 30° W.

Summer Months, 1908-1920.

If the wind arrow is slewed to fly with the wind, the frequency of current in any direction is given by the length of the arrow of the rose in that direction.

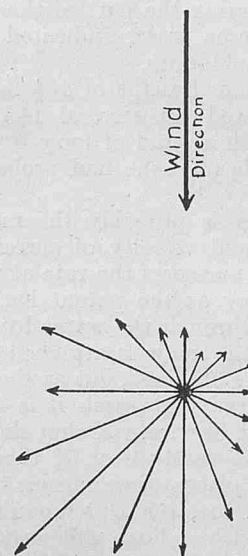


Figure 34.

509 observations.

Frequency of set in relation to wind when the sea amount by scale is approximately the same as the wind force on the Beaufort scale.

The currents of the sea perform offices in the terrestrial economy which are stupendous in their effect, but when all is said and done the working of the Divine Creator in the laws which he has bestowed upon Nature in the Ocean are so little understood that we know positively of no definite laws yet, by which the variation of the set and drift of currents may be foretold. Current is extraordinarily fickle and the navigator requires information of its vagaries as well as its general flow.

I propose to deal first with information and last with its application.

To provide information of currents, observation is of the first importance.

Observation.

There are four methods of observation of the set and drift of current which we must consider.

(1) Set and drift obtained by drift bottles, derelicts, or floating wreckage have disadvantages as well as advantages.

If a bottle or floating object is released at a certain position at sea and is picked up at some place on a distant coast in a few months, we only know that it has travelled a not less distance than that between the place of release and the place of finding; and even if the bottle is seen to come ashore, we can only say that it has travelled at a rate of not less than so many miles a day. It may have made a circulative track and so have travelled a greater distance in the time, of which we have no proof.

Then, there may be a skim of surface current quite different to that at, say, half the draught of a ship, which latter is really what the navigator wants to know. For example, I have seen, and no doubt many of you have too, a boat at sea near the ship in a calm in the vicinity of ice, set in an entirely different way to the ship, indicating that there was a surface current setting the boat with her draught of about 2 feet in quite a different direction to the general set at half the ship's draught of, say, 20 to 30 feet.

Even the drift of derelicts may be quite misleading as an indication of set and drift of current, unless they are waterlogged with decks awash, and the drift of a ship not making way through the water may also give a misleading impression of current.

There are two cases to my knowledge which, I think, go to prove this.

In September, 1922, before the German S.S. *Hammonia* foundered off the coast of Portugal, when the *Kinfauns Castle* and other British ships made such gallant rescues, she drifted with engines stopped, according to observation, S. 29° W., 38 miles in 8.2 hours, or $4\frac{1}{2}$ knots, on September 9th, 1922, when there was a fresh N.E. gale. The P. & O. S.S. *Nore* found a current of only $\frac{1}{2}$ a knot setting to S. by W.

when steaming in the vicinity the next day when the N.E'ly wind was still prevailing.

In June, 1924, S.S. *Archimedes*, whilst broken down with propeller gone, drifted 78 miles in the North Atlantic, by observation, between June 24th and 26th, the wind being S.W., a fresh breeze for the most part, but light N.N.E. during the part of the time when other ships steaming through the same water indicated that the current did not amount to more than 30 miles.

Archimedes had a mean draught of 16½ feet and displaced 8,297 tons, her broadside showed an area of 14,750 square feet above the water line upon which a wind of force 5 would exert a pressure of about 9 tons when abeam; she had probably sailed 48 miles to leeward.

(2) The current meter is probably the most accurate means of obtaining the direction and velocity of current both at the surface and in the depths, for it measures the rate at which the water passes it in much the same way as the patent log measures the rate at which it is being towed through the water by a ship. The direction is indicated by means of a compass attached to the meter, and thus positive measurements are obtained, but as the use of this instrument is only practicable in surveying vessels it is no good advocating its adoption in the Merchant Service. A ship should be anchored when she uses it, and it is too costly even if there are occasions when merchant ships anchor in places where current observation is desirable.

(3) When at anchor, too, the Dutchman's log may be used to advantage. A drogue with a float will ensure that the current is indicated by the drift of the float. Cable vessels at their mark buoys have obtained very good observations by this method.

(4) The method by which the largest amount of suitable data can be obtained is the old time one of difference between observed and D.R. positions at the end of a run.

The set and drift obtained between noon and noon by this method is valuable, but over the distance traversed by a fast ship in 24 hours there may be entirely different sets of current.

Stellar navigation is most valuable for current observation, and probably the best observations of current can be obtained on the run between twilight stellar fixes. Some young navigators obtain the set and drift between star sights taken before sunrise and the noon position, but there is an objection to this.

If the ship's position is fixed by position lines from, say, 4 star altitudes on opposite bearings with a good horizon at daylight in the morning, a good navigator can usually be confident that his fix is a dead fix, and after a run of, say, 12 hours, if the dead reckoning is accurately kept, by fixing his ship by the same method with evening twilight stars, he can say with confidence that the difference between the last observed position and the D.R. position is the set and drift of current in the interval.

But supposing that having got an exact stellar fix at daylight in the morning he takes the difference of the D.R. from this position, at noon, and the position obtained with the sun's meridian altitude and sun's position line obtained by altitude in the forenoon transferred by D.R. to noon, his second position is really only a running fix and may be in error to the extent of as much as 3 miles. The interval may only be 6 or 7 hours and the error in the last position alone would be accounted as half a knot of current or 12 miles in a day.

What is wanted on every possible opportunity, when the D.R. is considered reliable and sights accurate, is the set and drift over the noon to noon run, and the set and drift between morning and evening stars and evening and morning stars; the two latter provide the information required and the first provides a check.

When coasting, the set and drift obtained at suitable intervals between cross-bearings are most desirable, and upon all occasions when the current can be determined with fair reliance, it should be entered in the log. In large deep draught ships of high speed the revolution of the propellers, if careful allowance for slip is made, will probably give the best indication of distance run through the water; but where possible, and particularly in small slow ships, the patent log should be used also, if only as a check.

Leeway is a matter of judgment, and if sound, with well adjusted compasses, careful allowance for deviation and variation, and good steering, it will be safe to assume that the course steered is made through the water. Experienced commanders and officers will forgive my dwelling at length upon matters which are simple to them, but the fact is, returns made, show that there are some young officers who do require advice upon this very simple but important matter.

It is good that more attention is now being paid by the navigation schools to sound teaching as regards the position line, a clear understanding of which is so essential in modern navigation.

The encouragement of current observation is in the interest of every commander and of the shipowner even if only as an incentive to accurate navigation and good steering.

Not only should the set and drift be entered in the Meteorological Log and Ship's Meteorological Report so that data may be provided for research work and the making of charts, but I would ask Marine Superintendents and Commanders to require these entries to be made in the ship's log; for the careful recordings of them is an inestimably good habit, it reflects well upon the navigation of a ship, and no navigator ever knows when he may require such documentary proof in preserving the cleanness of his certificate.

Information.

Information of two kinds is desirable.

First.—Information of the general set and drift of current in each locality and its variations compiled from past experience.

Second.—Information at the time when a vessel is approaching a locality, and if possible what changes may be expected during the time she is passing through that locality.

For the first, charts are required. The second may in part be provided by selected ships in the locality reporting the set and drift they have experienced to "All ships" by wireless, and by doing this possibly by-and-by prediction may follow.

The Admiralty current charts were drawn from information prepared under the superintendence of my predecessors long ago. They plotted all the observations of set and drift upon large working sheets and then arrows to represent the general flow of the current were drawn by eye at the Admiralty. This gave a general idea of the circulation of the surface water for each month all over the Oceans, but it did not give the variations of the current in each locality, and I think that with modern observations and by calculation we can give more reliable resultants from these observations as well as showing the variations. We have learnt through the work of these old time Oceanographers, and this is what we are doing in THE MARINE OBSERVER, and when the tracks are charted for each quarter over each ocean in this manner I hope that they may be combined and so provide improved atlases.

Referring to the Current Chart North Atlantic Tracks, February to April, given in Volume III No. 27 of "The Marine Observer."

On these charts are grouped observations of the set and drift of current experienced in February, March and April, from 1910 to 1924, by British and Dutch ships.

To the right are arrows giving the resultant current worked out from all the observations in the squares shown. These show the general movements of the water at half the draught of ships.

To the left are current roses constructed from the same observations.

Current is extraordinarily fickle, and these roses show the frequency of direction and the frequency of the different velocities, in fact its vagaries.

For example, in the Gulf Stream between Longitude 62° and 66° W. the resultant current is E.N.E. 21 miles per day, but the current is nil or less than 6 miles per day on 12 out of 100 occasions. It sets E.N.E. on 35 occasions out of 100, and on these 35 occasions it ran at the rate of 6 to 12 miles 4 times; 13 to 24, 7 times; 25 to 48, 15 times and from 49 miles to 72 miles per day, 9 times.

Then on 3 occasions in 100 it set due West once at the rate of 25 to 48 miles in the day and twice at 13 to 24 miles, and so on; which is a very different thing to the old charts, which only indicated the current as running in one way.

With the observations worked up and charted in this way not only can these charts be used by the navigator, but they should be of assistance in revising the sailing directions, and so we are anxious for your support in furthering this work, which we believe will contribute to safer navigation.

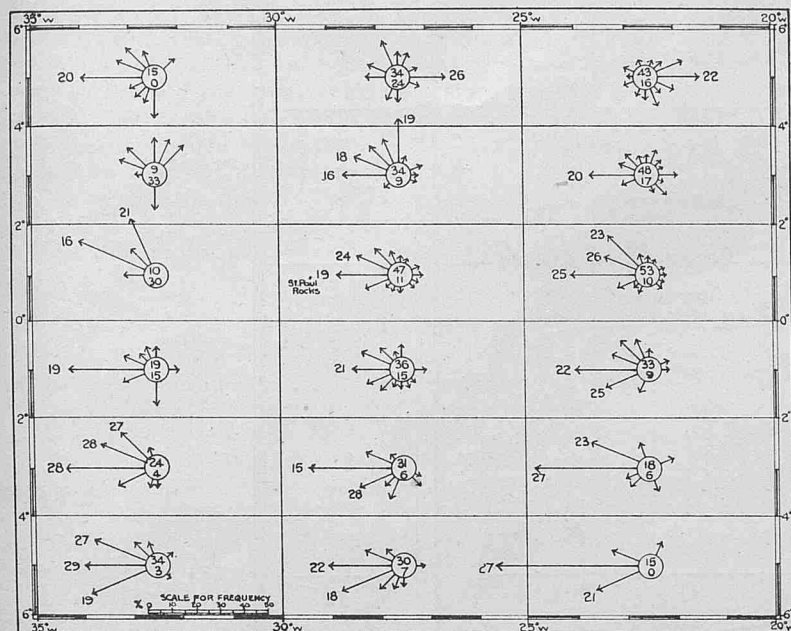
Application.

A case which impressed us very much was reported by Captain J. B. HALL of S.S. *Tudor Star* in June, 1921, and this has had considerable influence upon the progress of the work.

On May 24th, 1921, when on a voyage from Liverpool to the Plate *Tudor Star* found a set and drift of N81°E, 32 miles, in 24 hours near the

Equator where the Equatorial Current usually sets to the westward. He reported this set and drift by wireless to S.S. *Balzac*, Captain T. JAMES, who was in the vicinity bound south, who replied that he had experienced a current of N 87° E, 39 miles, still continuing, Latitude 2° 38' S., Longitude 31° 17' W. S.S. *Narenta* and other steamers reported much the same. We sent a circular letter to ships on the same run and received a number of observations in return.

Figure 35. Current Frequency, May, in the vicinity of St. Paul Rocks.



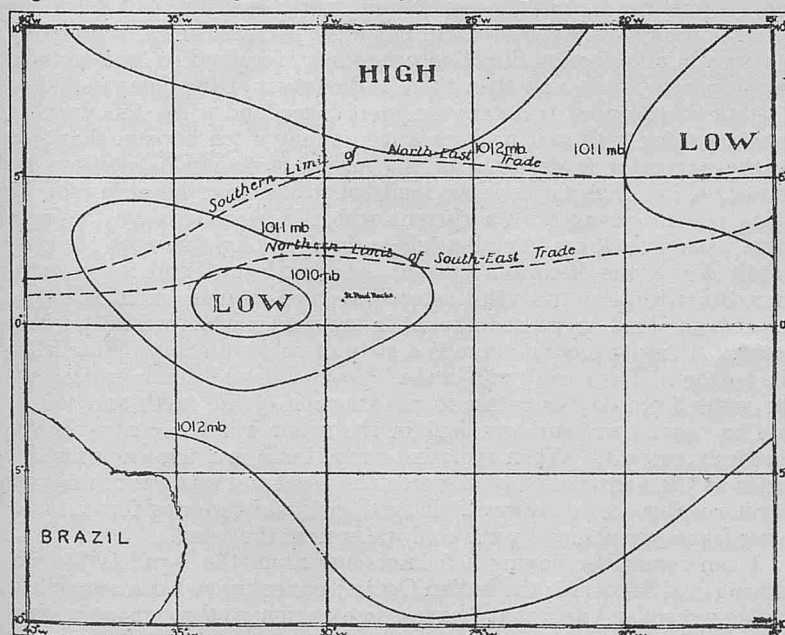
Based on figures given in the "Charts of Meteorological Data for Nine Ten-degree Squares, Lat. 20° N. to 10° S., Long. 10° to 40° W."

Explanation:—

Current Roses.—The arrows show by their length the frequency of current experienced in any direction. The figures at the ends of the arrows show the mean velocity of the current in miles per day in the direction of maximum frequency. The figures in the upper portion of the circle give the total number of observations, those in the lower part, the percentage of observations of no current (less than 5 miles per day).

This chart shows the variations of current between Latitude 6° N. and 6° S. from Longitude 20° W. to 35° W., and is based on Captain TOYNBEE's work many years ago. You will see that the current sets most frequently to the westward near St. Paul Rocks, but occasionally it has set to the eastward. The greatest frequency of easterly set is in about latitude 4° N.

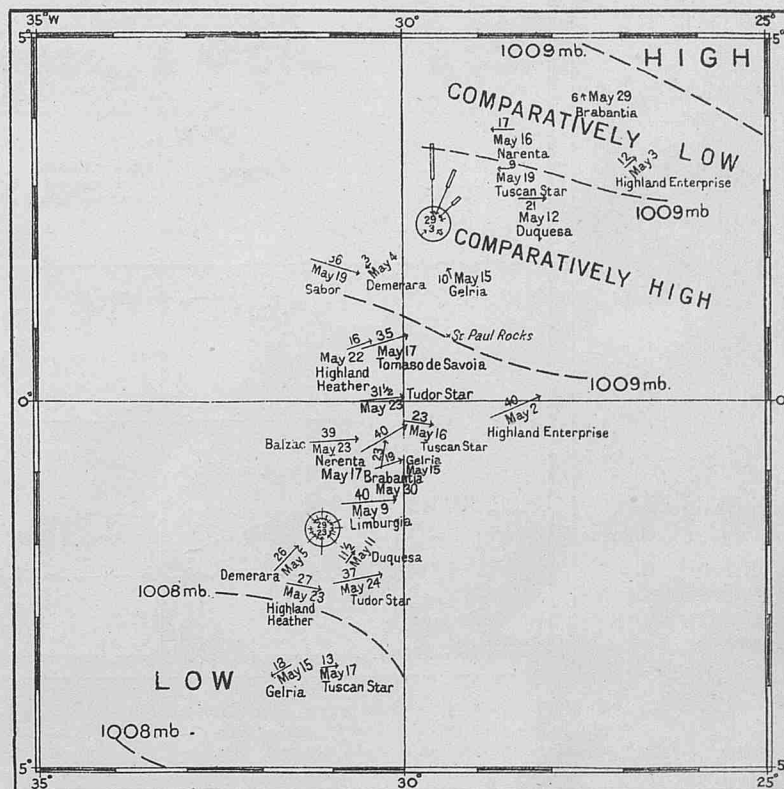
Figure 36. Normal pressure in May, in the region near St. Paul Rocks.



Based on figures given in the "Charts of Meteorological Data for Nine Ten-degree Square, Lat. 20° N. to 10° S., Long. 10° to 40° W."

This chart shows the normal distribution of barometer pressure in the Equatorial Atlantic in the month of May, also the limits of the N.E. and S.E. trades in that month; you will note that the Low approximately occupies the position of the Doldrums.

Figure 37. Current in May, 1921, in the region of St. Paul Rocks.



Explanation:—

Currents are shown by arrows, drawn from the mid-position of the ship's run, and proportional to the strength of the current. The velocity in miles per day is shown above the arrow, the date below, together with the name of the observing ship.

The wind roses refer to the track from the equator to 5° N., and from the equator to 5° S. 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 1-3, ———; moderate winds 4-7, ———; and gales 8-12, ——— (LIGHT MODERATE GALE)

The circle supplies a scale for estimating the frequency of winds in any direction. From the heads of the arrows to the circumference represents 5 per cent of the whole number of observed winds.

The upper figures in the centre of the wind rose are the total number of observations, the percentage of calms being given underneath.

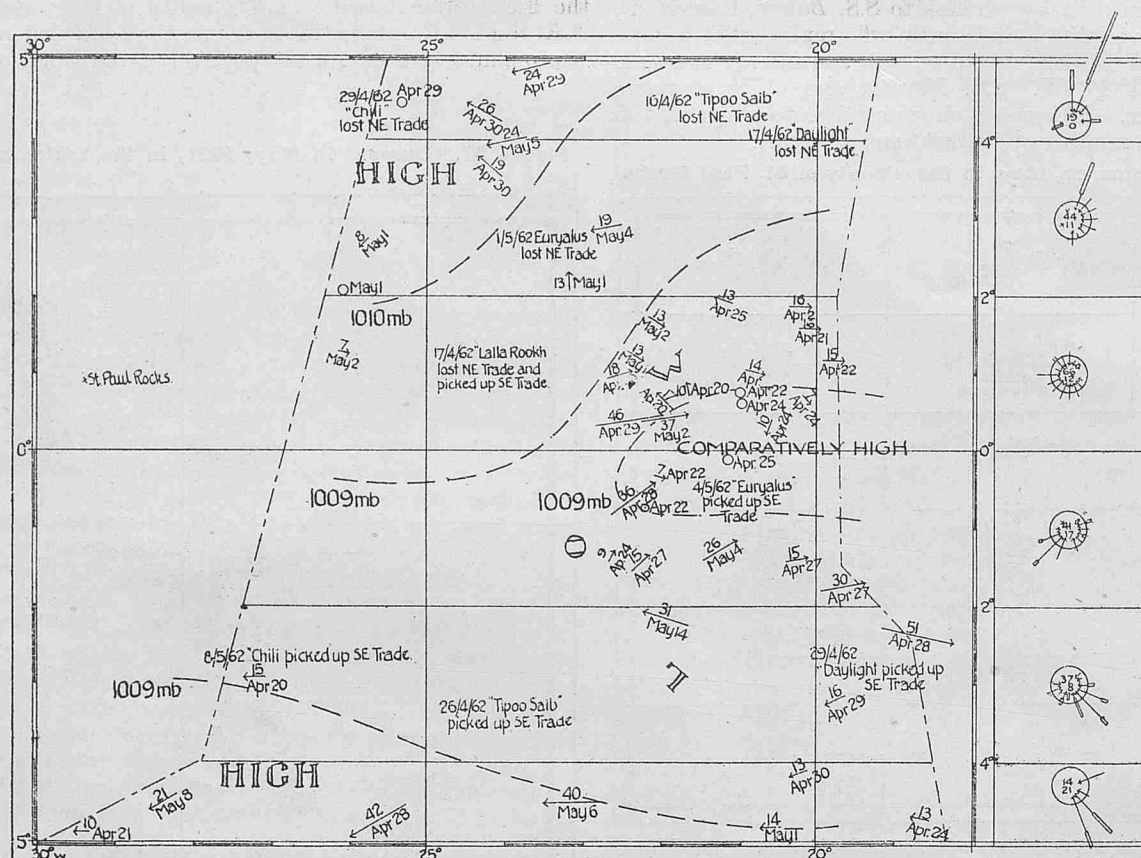
The isobars are not reliable for absolute pressure, but give a conception of the relative distribution along the track

On this chart all the observations of set and drift reported in May, 1921, are plotted with the day of the month and the name of the ship, also isobars. Compared with the observations compiled by Captain TOYNBEE, these sets and drifts are abnormal, for they all set to the eastward, where the current is most frequently—I might almost say nearly always—setting to the westward.

You will also note that the Low is some 5° south of its normal position in May. The N.E. trade extended to a mean latitude of 3° 10' N during the month and the Doldrums were approximately 4° further south than usual in May in the longitude of St. Paul Rocks.

We searched the logs and data books to see if there had been a similar case in previous years and found that in May, 1862, easterly sets had been logged near the Equator, also in 1859, when the Doldrums were south of their normal position.

Figure 38. Current in May, 1862, in the vicinity of St. Paul Rocks.



Currents are shown by arrows drawn from the mid-position of the ship's run, and proportional to the strength of the current. The velocity in miles per day is shown above the arrows, the date beneath.

The wind roses are made from observations between the parallels of latitude shown, and extend over areas contained between the diagonal lines marked thus —. —. 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, (LIGHT MODERATE GALE). The circle supplies a scale for estimating the frequency of winds in any direction. From the heads of the arrows to the circumference represents 5 per cent. of the whole number of observed winds

The upper figures in the centre of the wind rose are the total number of observations, the percentage of calms being given underneath.

The isobars cannot be considered as giving more than a rough representation of the relative pressure distribution during the period.

This chart shows the conditions in May, 1862, when H.M.S. *Euryalus*, ships *Lalla Rookh*, *Tippoo Sahib*, *Chili* and *Daylight*, all well-known ships of their day (the day of the sailing ship) reported easterly sets and the Doldrums were centred some 6° south of the normal position.

From these experiences we conclude that the N.E. trade sets the surface water to the westward north of the Doldrum belt and the S.E. trade sets the surface water to the westward south of the Doldrums. Usually in May the Doldrums are centred in about latitude 4° N. and here between the two westerly currents there is a current setting to the eastward which joins the Guinea current.

When the Doldrums are moved abnormally south this easterly current moves with them.

Now if we attempt to try and explain the cause of this without sub-surface observations we are almost sure in time, when observations from the depths are obtained in this region, to find that we have overlooked some explainable thing and, therefore, I think it best not to try to advance a theory. There is too much at stake in navigation, the facts, as we know them, are our best guide.

There are probably practical advantages to be obtained even with our present knowledge, and I suggest that selected ships making weather reports to "All ships," and giving their set and drift may contribute to safe navigation. There is no light on St. Paul Rocks and therefore it is wise to give it a wide berth at night and in heavy rain with reduced visibility. Ships receiving reports a day or so before passing St. Paul Rocks indicating the position of the Doldrums would have a better idea of where to expect the easterly current and the lines of demarkation bordering the westerly currents.

I doubt very much if many, if any, know the extraordinary variations of current, it is more fickle, I think, than we realise. Cable ships note by the pranks played by the cable when they are laying it, how current varies not only at and near the surface but in the depths.

If we could lay down the course of a ship with absolute exactitude

even for a good day's run we should probably find that current had varied so much that the course would represent a very complicated traverse.

How often when coasting where there is supposed to be little tidal current we find by cross bearings that the ship has not made her course; this may be attributed to many causes, leeway, heave of the sea, (theory has it that the particles in waves oscillate) but when the heads of the waves curve over and break the particles of water probably advance in a horizontal direction near the surface and so tend to force the ship with them, and then there is deviation of the compass. But I think that current is a very frequent cause, and when the weather becomes thick with rain, or there is fog, it may often happen that just as the navigator is deprived of the means of fixing his position by terrestrial bearings through the land being obscured, his ship may be being set into danger by a current which is associated by the very same causes as those contributing to fog. Along the west coast of South Africa the Benguela current sets northward and its velocity increases with the "South-Easter" in the summer months. Sets towards the land are most frequent in the winter when westerly winds occur. Along this coast there is a strip of cold water upwelling from the bottom. The steady pull of the "South-Easter" tends to draw up the water from depths owing to the rotation of the earth and this is said to cause a pressure gradient in the water which accentuates the northerly current. When the wind drops there is a tendency for the water at the surface to flow towards the coast and with air coming off warmer water out to seaward, charged with moisture, fog forms as its lower layers are chilled by the cold water near the coast.

I can remember having a 5 knot current in the Agulhas Stream and south of Sokotra in the Indian Ocean; but so far as I can remember the biggest set and drift that I have ever experienced throughout a day's run was 86 miles or 3½ knots setting to the eastward near the Equator, in the Indian Ocean, to the westward of the Maldiv Islands and until I came to the Meteorological Office I used to think that other than in

tidal waters there were not currents of more than five knots.

In 1921 when compiling a current chart for the S.W. Monsoon season in the region near Cape Guardafui and laying down recommended steamship routes for Colombo to Perim we found a set and drift of 7.6 knots equal to 183 miles a day, recorded by S.S. *Ramsay*, Captain F. C. MULLAN, on July 2nd, 1906. At first I would have rejected this as impossible but I found that Captain HARRIS of the Bibby Line, *Worcestershire*, who has been long known as a very careful current observer, had recorded by good stellar sight on the very next day, July 3rd, 1906, a current of 7.4 knots equal to 177 miles a day, 120 miles away, so that *Worcestershire* had passed through the same water as *Ramsay* and many ships have since reported sets of over five knots in this vicinity. A study of the currents in this region and the tracks recommended in the June, 1924, MARINE OBSERVER will repay navigators running home from the East.

We constantly find by comparing the set and drift logged that navigation is more accurate than is often supposed and that this method though not perfect is the best that is practicable generally at sea.

Wireless Telegraphy.

There is no doubt that wind is one of the greatest of the contributory causes of current and with wireless communication now general at sea the unravelling of the mysteries of ocean currents is no longer only possible for those who are able to collect and assemble a great volume of data long after the event from the logs of many ships, but the navigator himself at sea can do something in this direction with observations of other ships as well as his own immediately after they are taken. He can obtain direct information which will be most valuable in navigation.

In our recent researches in charting the currents along the North and South Atlantic tracks we have examined a great deal of data including sub-surface observations made by the *Challenger* and other research ships, and Mr. DURST, who up to January 2nd, 1927, assisted in this work, has put forward a tentative theory based upon assembled surface observations of current, wind, and sea temperature, and sub-surface observations of temperature and density. It is briefly this.

Generally the temperature of the ocean decreases with depth, it is very cold at the bottom. As the temperature becomes colder the density of the water increases.

If cold water rises from the depths to the surface where it is surrounded by warmer water the cold heavier water will be depressed lower than the warm light surrounding water thus producing a slope towards the cold water in the centre. This will produce a pressure gradient in the water which will tend to make a current flow counter-clockwise in North Latitude around the cold water. When deep cyclonic depressions pass over the ocean they have left the surface water colder in their wake than can be accounted for by a surface current coming from a place where the surface water is cold, or by the cooling of the surface waters by the cold winds in the rear of depressions, or by radiation, or cold rain. It seems that the vortex of a cyclone has the effect of drawing up cold water to the surface and that the currents which are induced by surface friction by the wind revolving counter-clockwise (in North Latitude) is increased by the pressure gradient in the water caused by the difference of density and slope towards the centre. The column of cold water would be raised quicker than it sinks back to its former level so that the passage of a cyclone should by this theory leave behind it possibly for a day or so two currents running parallel to the track of the cyclone, the one to the right of the track (in North Latitude) setting in the same way as the cyclone had travelled and the one to the left in the opposite direction. You will find an interesting article in the June and December, 1926, MARINE OBSERVERS upon this giving charts and diagrams with observations.

It is another incentive to the practice of Wireless and Weather as an aid to Navigation. All the 500 regular observing ships on our list which have mercurial barometers are asked to make a daily report by Wireless, of weather observations made at the same Greenwich Mean Time as those of the nearest coast and to give the last determination of set and drift of current with position "From" and "To" addressed to "All ships."

All ships may benefit and participate in the work by intercepting these reports and making weather charts from which, with the Current Charts we are now publishing in THE MARINE OBSERVER and their own study, they may be able to glean much useful information and to thereby improve navigation. Here is an example:—

The Cable Ship *Colonia*, Captain V. CAMPOS, on passage from London to New York, at observation time on the morning of August 25th, 1924, is in Latitude 40° 24' N., Longitude 45° 05' W., and according to the difference between her D.R. and observed positions she experienced a current setting N. 57° E. at the rate of $\frac{3}{4}$ knot with middle position in Latitude 40° 58' N., Longitude 43° 33' W. The charts of currents on the trans-North Atlantic tracks for this quarter in Volume III, No. 33 of THE MARINE OBSERVER indicate by arrow that in the region she has just passed through the resultant set and drift of a total of 54 observations was E.N.E. 5.2 miles per day, while the current rose shows that in the region she has passed through and will be steaming in next day, that though the current most frequently sets E.N.E. and N.E. up to 2 knots yet it may set in any direction and may be less than a quarter of a knot on 24 out of 100 occasions. Further west the current has set east over 49 miles per day very occasionally. Now this information is useful but it does not give us the fore-knowledge we wish. Wireless weather reports charted may help us towards this end.

Supposing that *Colonia* intercepted the reports of all the regular observing ships within a range of say 1,500 miles which had been able to ascertain the current they had experienced by reliable stellar sights at dawn and the D.R., also the coast station reports from the "Arlington" message, with these reports she could make WEATHER CHART XLVI, the set and drift found and reported by each ship being indicated on the chart by an arrow midway between the positions "From" and "To" with the initial letter of the ship's name and the velocity to the nearest quarter-knot abreast it.

This chart indicates a West Indian Hurricane centred S.E. of Charleston, a "V" depression, east of Newfoundland, while the permanent North Atlantic anticyclone reaches northward of Latitude 40° N., to the S.W. of *Colonia's* position, and there is an extensive wedge of high pressure extending northward to Nova Scotia. We can now see the wind circulation. Not only over the water we are to steam through during the next 24 hours, but over a great strip of the ocean the currents reported now form a comprehensive picture, and the sea surface temperature is also conveniently given.

We now see that the currents reported in the region of south-westerly winds in advance of the V, and within the average limits of the Gulf Stream set before the wind and to the right, while *Scholar* has had a W.S.W. set of $\frac{3}{4}$ knot just south of the Gulf Stream. *Culebra*, away to the eastward has had current setting N.W. where the wind is now W.S.W. and the currents reported to the westward are southerly and S.E. Unfortunately just where *Colonia* wants to know how the current is setting no report is available. As *Colonia* proceeds to the westward and passes the trough of the depression the wind will veer and so the water she will be passing through will be subject to a tendency of induced frictional movement to the eastward. Comparing the sea surface temperatures reported with the average given on the charts of mean sea surface temperature in Volume III, No. 32, MARINE OBSERVER, we see that it is 4° above normal in Latitude 41° N. Longitude 44° W., and 3° above normal in Latitude 41° N., and 56° W., while in Latitude 37° N., Longitude 48° W., as reported by *Scholar*, it is 78° and normal. By comparison then the water is colder to the S.E., and according to deductions which have been made recently in conjunction with the charts of currents on the routes to the West Indies, a slight S.W. set would be expected hereabouts while the Gulf Stream to the northward and right in *Colonia's* course being warmer may be expected to set to the eastward with more than usual strength.

CHART XLVII, FOR THE MORNING OF AUGUST 26TH, 1924, shows there are N.W'ly winds between the 40th and 50th meridians west in the latitudes of the trans-North Atlantic tracks. The hurricane is now centred S.E. of New York. *Colonia* has experienced a set of East 2 $\frac{3}{4}$ knots in the Gulf Stream and *Scholar* has had a current setting W. by S. 1 knot to the southward of the Gulf Stream and with the wind acting nearly against it. The sea surface temperatures now are such that *Colonia* will not expect a continuance of the strong Gulf Stream set to the eastward.

CHART XLVIII, FOR THE MORNING OF AUGUST 27TH, 1924, indicates that the hurricane is now centred North of Sydney, C.B., and *Colonia* is within its wind circulation with a strong S.S.W. breeze; she has experienced a slight current from N.N.E. but has now entered warmer water. These charts serve to show how useful reports of current may be if assembled suitably by the navigator, but until more experience has been gained of the method and more research work has been done in the Marine Division it must not be expected that predictions of current will be fulfilled, for, as stated previously, really very little

is known of the laws which govern Ocean Currents. The man on the spot, and that is the man on the bridge of a ship at sea, with the data which other ships can give him, together with the information now being supplied in THE MARINE OBSERVER, can do much to promote a true knowledge of Ocean Currents and prediction of their vagaries.

As this system is developed by Commanders of ships at sea, more may be learnt of the changes and variations of currents which may be

expected with changes of wind and other observable conditions; but even when we reach that happy state of affairs there can be no doubt that navigational precautions must not be relaxed; increased knowledge only tends to make us the more careful and that means the *four L's*, Lookout, Lead, Latitude and Longitude; in the two latter the Wireless Direction Finder is giving more and more assistance. (To be continued.)

SOME FURTHER REMARKS ON THE USE OF THE MARINE DIRECTION FINDER AS AN AID TO NAVIGATION.

BY COMMANDER J. A. SLEE, C.B.E., R.N. (RETIRED).

WHEN a marine direction finder has been installed and adjusted it is a very great aid to navigation, as it is capable of providing bearings of wireless transmitting stations, which are out of sight, with a high degree of accuracy.

There is no reason why a good quality modern direction finder, when worked by a skilled man, should fail to obtain bearings which are less than one degree in error, provided that certain known unfavourable conditions do not occur. As the existence of these conditions can easily be discovered, there is no reason to fear misleading results, but the existence of the conditions referred to above should always be regarded as a warning that bearings usually precise are, for the occasion, only approximate.

These unfavourable conditions are two in number—one electrical and the other topographical. Under certain electrical conditions of the atmosphere direction finder bearings are to some extent distorted or obscured, and the operation of taking bearings becomes difficult and uncertain instead of clear and sharp. There is no doubt whatever about it, the observer is unable to make up his mind as to the exact bearing, he cannot satisfy *himself* of the accuracy of his observations, there is no sensation of certainty or security about it. This unfavourable condition is fairly common near sunrise and sunset, very rare at other times, but no experienced observer has the least difficulty in deciding whether or no it is present—nor would he hesitate to report that his bearings are “Approximate.” The case is quite analogous to that of observing an altitude with a misty horizon, the observer knows that he is near to accuracy but he also knows quite well that he is not absolutely certain.

Severe interference or atmospherics produce a similar uncertainty in observation, which must also render bearings “Approximate”; but the compensating fact to be remembered in both cases is that the observer *knows* that bearings are uncertain, and he is under no delusion as to their accuracy. He does not obtain bearings which appear excellent but are, in fact, wrong, he obtains bearings with difficulty and knows at once that they are only approximate.

The topographical unfavourable condition tells the observer nothing, but it is betrayed as soon as the bearing is laid off on the chart. If the line of bearing is seen to cut the coast line at a very acute angle, or to pass over an intervening island or mass of high land, then the bearing must be regarded with suspicion. In this case the observer receives no warning. To him the bearings appear perfectly sharp and clear. The warning is only given to the navigator when the bearing is laid off on the chart.

All available information on this subject has been collected and circulated under the title of “Arcs of Good Bearings,” but so far it has only been possible to make any statement at all about less than a quarter of the existing coast stations, and complete information is available concerning only a few of these. It has only been possible to state that bearings do not suffer from land effect (as it is called) over certain arcs. Bad bearings are to be expected just outside the edges of the good arcs, but it is possible that other unknown good arcs may exist. Among all the reports that have been examined there is only one station from which consistent good bearings have been obtained in an arc which would not have been selected after an inspection of the chart, and only one station which has a bad arc that would not have been detected by the most casual glance at the chart.

The uses that can be made of a D.F. bearing are exactly the same

as those that can be made of a bearing obtained by any other means. Certain points become important when using bearings taken at long range, which can rightly be ignored when using ordinary visual bearings. This is only a case of small aberrations amounting up to something noticeable as the distance increases; it has nothing to do with the fact that bearings have been obtained by wireless.

The direction finder bearing as observed is a relative bearing—it is only a measurement of the angle between the keel line and the transmitting station. If this angle is added to (or subtracted from) the compass course at the moment when the bearing was observed, a compass bearing is obtained. If this is corrected for deviation it gives the magnetic bearing. Magnetic bearings are very convenient, and are perfectly satisfactory when laying off visual bearings, but for use with bearings taken at considerable distances (say 50 miles or more) they are less satisfactory for the following reason. In a good many parts of the world the variation changes fairly quickly so that there is an appreciable difference between the variation at two points say 50 miles apart. If two points A and B, about 50 to 70 miles apart, are selected on a chart of such a part of the world, it will be seen that the magnetic bearing of A from B is not the reciprocal of the magnetic bearing of B from A, on account of the difference in the variation at the two places. The result of this is that if magnetic bearings are used, the parallel rulers must be set to the observed magnetic bearing by means of the compass-card, engraved on the chart, nearest to the assumed position of the ship, and they must then be worked about until their edge lies over the position of the transmitting station.

All this bother can be avoided if the relative bearing as obtained by the direction finder is converted into a true bearing. Taking the case referred to above, the true rhumb line bearing of A from B will always be the reciprocal of the true rhumb line bearing of B from A, and the reciprocal of the observed true bearing can be laid off through the transmitting station without any bother, and without the risk of the parallels slipping while searching about for their correct position.

At still longer distances another small aberration may grow to important dimensions. This is the correction known as the “half convergency error” and is caused by the fact that bearings obtained by wireless are in fact great circle bearings and all ordinary navigation is carried out with the assistance of charts prepared on MERCATOR'S projection, on which a straight line is a rhumb line.

This half convergency correction is not in any way special to wireless bearings. Visual bearings are also great circle bearings, and if they could be obtained at long enough distances the half convergency correction would be just as necessary.

The half convergency correction is never very great in practice and it can be ignored for all distances up to 70 miles. It has been tabulated for all ordinary conditions by Mr. E. JACKSON, and Mr. R. KEEN has worked out and published in his book “Direction and Position Finding by Wireless” a very neat diagram from which this correction can be obtained by laying a straight edge across two columns and reading the correction from a central scale. The problem of deciding which way to apply this correction is easily settled if it is remembered that when a great circle is plotted on a Mercator's chart it bulges out to one side of the rhumb line, the bight being towards the nearest pole. That is to say, the great circle lies to the north of the rhumb line in the northern hemisphere and vice versa.

Under ordinary circumstances the direction of the ship's head by

compass must be observed on the bridge at the moment when the D.F. bearing is taken. There are some cases in which the positions of the D.F. pointer can be read off directly or by means of a system of mirrors on the steering compass card, or a gyro compass repeater, a very satisfactory arrangement being found in an instrument manufactured by Messrs. SPERRY, in which a scale on the D.F. instrument is driven by a gyro compass repeater motor. Where instruments of this nature are available true bearings can be observed by means of the direction finder without any calculation, but under common conditions the relative bearing has to be worked through compass and magnetic bearings to a true bearing before it is suitable for use. Most ships having direction finders are provided with a set of concentric discs which allow this process to be carried out with speed and accuracy. Some of these are quite elaborate instruments and can be used to solve any possible problem turning on the translation of bearings or courses from any one scale of bearings to any other.

There is another very useful application of the direction finder; that is, to keep watch on the relative bearing of crossing vessels. To get really good work out of a direction finder used in this way requires even more care and experience on the part of the observer than is necessary for straightforward bearings such as are commonly used for navigation. Ships do not transmit continuously, and if they did the resulting chaos would make all observations impossible. Again, an ordinary direction finder is so sensitive that bearings would be obtained of vessels so far off that their relative bearing is of no interest, as there can be no chance of collision with them for many hours. If for any reason any ship is thought to be near, it is very easy to call her up and snap her bearing as she replies, but it is almost impossible to make a guess at her distance as the power she is using is unknown, though this point can, of course, be cleared up by an exchange of signals. The whole matter of the useful employment of a direction finder for ascertaining the whereabouts of other ships in crowded waters requires a combination of skill, experience, and common sense.

This particular use of the direction finder is well worth practising in clear weather. The information that can be obtained in this way is of the greatest value in thick weather, and a little time and trouble spent under easy conditions when the results can be verified by eye

will give the skill and confidence which is necessary to make full use of this valuable power of determining bearings under the conditions when they are most wanted.

It is worth remarking that the sensitiveness of most direction finders can be considerably reduced at will, without in any way affecting the accuracy of the observation, and with practice some sort of idea can be formed of the distance. At any rate it is fairly simple to find an adjustment which will cut down the range at which bearings can be taken to not more than ten miles.

The typical direction finder is of such a nature that it cannot distinguish between a bearing and its reciprocal, but nearly all marine instruments have an additional fitting which allows this distinction to be made. This arrangement is generally called a "sense-finder," and it is of the greatest use when watching cross traffic in thick weather or when making a rendezvous with another ship. For ordinary navigation this fitting is perhaps a luxury; no landfall is likely to be so bad that there is any doubt as to whether a transmitting station on land is on the port bow or the starboard quarter, but when watching traffic or making rendezvous the power of sense-finding is almost essential.

During thick weather when watching the slowly changing bearing of a vessel it is almost essential to know whether she is in fact on the starboard bow and growing ahead, or on the port quarter and safely growing astern. The pure direction finder, without the sense finding attachment, cannot make this distinction.

For making rendezvous, and above all when going to the assistance of a ship in distress, sense finding arrangements are invaluable. Under conditions in which ships of to-day are likely to be overborn by weather, it is unlikely that any vessel in the neighbourhood will have had sights for some days, and the last day's drift of a ship about to be overborn to such an extent as to require assistance is likely to be sufficient to make any position she can give somewhat vague, to say the least of it. A ship with a modern direction finder can pick up the bearing of her distress messages and steer straight for her irrespective of any signalled position. A ship not equipped for sense finding might find herself steering directly away from the casualty.

26TH APRIL, 1927.

ATMOSPHERICS* AND TYPHOONS AT SEA.

BY THE REVEREND FATHER E. GHERZI, S.J., ZI-KA-WEI OBSERVATORY, SHANGHAI, CHINA.

IN the August, 1925 Number of THE MARINE OBSERVER we briefly gave a few results obtained in our Far Eastern regions during the typhoon season, relative to the atmospheric's intensity experienced on board a ship caught in the centre of the storm.

These few facts had shown a real decrease of these disturbances in the radio reception, such that we dared to propose it as new premonitory sign of an approaching typhoon.

The 1926 typhoon season has given us again the opportunity of testing this new fact and we give to-day the detail of the reports hoping that these lines will be of interest to navigators.

I will quote the radio operator's answers and give two barometric curves showing that the ship did really pass through the typhoon centre.

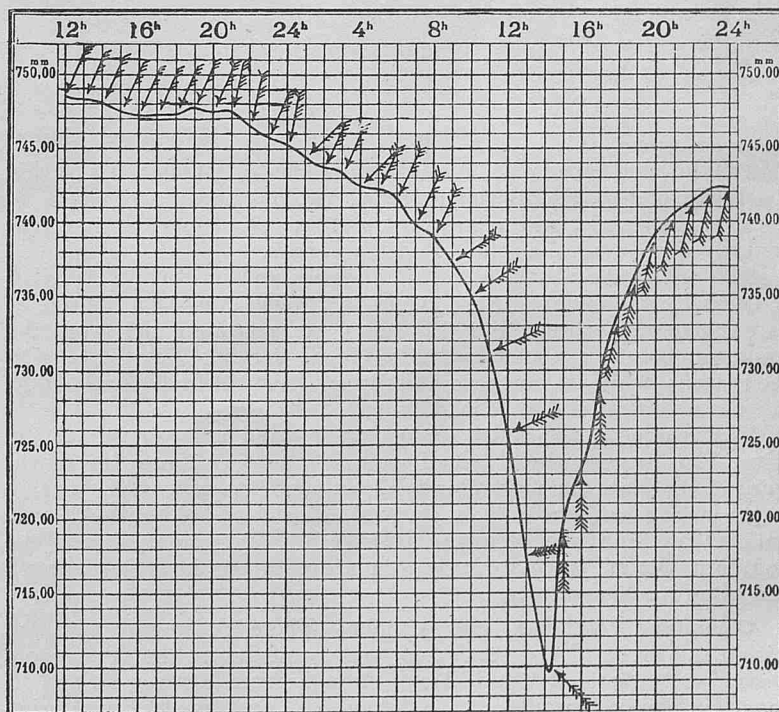
The first case is the typhoon experienced by the U.S.S. *Asheville* on her way from Hongkong to Shanghai on August the 15th, 1926.

She had news about the cyclone position and acted according to the direction received from a certain observatory which proved to be too much northerly, namely the typhoon was not moving N.N.W. but N.W.

So it happened that the gunboat having taken shelter in Namki Island Bay in Latitude $27^{\circ} 27' N.$, Longitude $121^{\circ} 04' E.$, the centre passed over her and having her four anchors dragging she was saved from a certain and imminent wreck by the sudden and violent shifting of the wind. Force 12 had been experienced during 8 full hours and the speed of the wind guessed about 145 miles in some gusts. Happily the radio aerial held.

The S.O.S. was received and radio communication kept on during several hours. The barometric record here given shows clearly how steep the gradient was.

* In the Article which first appeared by Father GHERZI, the word "Statics" was used and in this article, though he used that name, we have substituted "Atmospherics" as being a more familiar term to British Seamen.

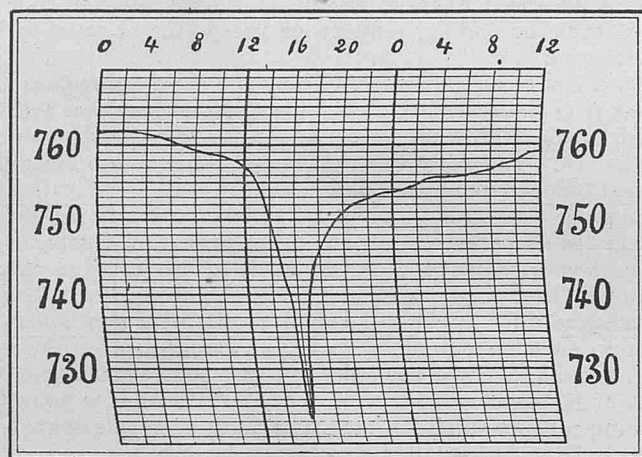


Typhoon of August 15th, 1926.

Curve obtained from the corrected mercurial barometer readings taken on board the American Gunboat "Asheville," at anchor at Nam-Ki (Latitude $27^{\circ} 27' N.$, Longitude $121^{\circ} 04' E.$).

Here are the exact words of the radio operator. "Atmospherics were very slight preceding the typhoon but during the typhoon or the entire day of the typhoon, the atmospheric was negligible" signed, A. E. CHAPMAN Lieut. U.S. Navy.

The second case concerns the LLOYD TRIESTINO Mail Boat *Fiume* on 17th September, 1926. This ship had not received our warning giving the position of the typhoon centre in Latitude 33° N., and Longitude 135° E. at noon, and as the barometer did not give warning, she kept steering the ordinary course on her passage to Shanghai. Nevertheless just after noon the barometer started falling rapidly, and at 4 p.m., the centre of the typhoon was passing over the steamer in Latitude $33^{\circ} 30'$ N., and Longitude $136^{\circ} 10'$ E. She got out safely but the damage was very heavy and several times the Captain thought that all was lost. The minimum pressure's corrected value was 714 mm. (28.11 ins.) Now the radio reception according to the radio officer, during the passage of the centre was quite good and atmospherics very slight.



Barometric trace during Typhoon, s.s. "Fiume," 17th September 1926. Pressure in millimetres, not corrected.

I will now quote three more reports concerning ships which did not enter the centre of the typhoon, but passed very close to it. On September 7th, 1925, *Empress of Canada* on her way to Shanghai from Hongkong had rather nasty weather because of a typhoon proceeding N.N.W., just ahead of her. Through the courtesy of Captain S. ROBINSON, Commander of the mail steamer, we received

from the Chief Radio Officer the following note. "With reference to enclosed enquiry regarding atmospherics, beg to advise that from between 4 p.m. and 5 p.m. Friday the 4th until 6 a.m. Saturday 5th, atmospherics were exceptionally troublesome, but from Saturday morning until our arrival at Woosung on Monday afternoon (the 7th) the atmospherics were comparatively clear and not at all troublesome" signed, R. L. STEVEN, Chief Operator.

On August 29th, 1925, the LLOYD TRIESTINO Motor Ship *Esquilino* nearing Shanghai almost ran into the centre of a typhoon. The answer received from the radio officer copied from the "Routine work book of reception" shows the atmospherics had become from very moderate to almost nil. The S.S. *President Jefferson* which had also felt something of the cyclone wirelessly to us the following:—"Some atmospheric clashes, but not steady."

These new cases seem again to show that the typhoon centre is not a cause of radio disturbances; but a more solid conclusion could be arrived at, if more of such cyclone experiences were at hand. We give these which we could collect, hoping that other people will join in this research which should be a question of real facts rather than of a theory founded on too scanty data.

Nevertheless the very common opinion that electrical phenomena are rather exceptional in the full core of a tropical cyclone would seem to be borne out by the above statement. The air so violently revolving in these typhoons is only equatorial (at least while moving in lower latitudes and in the summer months). Hence a fundamental difference between the extratropical storms which are composed of warm (equatorial) air and those formed of cold (polar) air; of course as we have already said in the first article (see THE MARINE OBSERVER, August, 1925), these typhoons once they come in contact with the continental high pressure systems either meeting them (even in lower latitude, for instance October in our seas) or when following them (after they have recurved N.E.) should then be similar to the extratropical depressions and become a cause of atmospherics in the radio reception. The latest case we have at hand is the report received from Captain A. V. R. LOVEGROVE, D.S.O., R.D., R.N.R., of the *Empress of Asia*, September 25th, 1926. The ship weathered out a rather violent typhoon when the centre had already recurved N.E. and was in Latitude 42° N. and Longitude 150° E. The radio operator reported that "The atmospherics greatly increased during the storm and decreased again soon afterwards." At this relatively high latitude and in the north-eastern track, the typhoon is not any longer a pure tropical storm.

Let us hope that more experiences will be collected as so little is yet known of the typhoon dynamics.

LOCAL WINDS, ATLANTIC OCEAN.

III.—East Coast of South America.

THE major portion of the East Coast of South America lies within the limits of two main wind systems, viz. the south-east trade of the South Atlantic, and, southward of this, the changeable irregular westerly winds known as the "Roaring Forties."

The S.E. trade though diverted at times and on certain stretches of coast by the summer warming of the South American continent, blows generally throughout the year, its southern limit on the American coast in about Latitude 17° S. varying very little with the season; while its northern limit varies from about Latitude 6° N. in August to Latitude 4° S. in February.

The region to the south of the trade wind area as far as the River Plate is generally a belt of variable winds; while to the southward of the Plate the prevailing westerly winds are met with. Owing to the steep mean gradients on the southern side of the South Atlantic anticyclone, and the frequent passage of depressions across the Southern Ocean, these westerly winds are of considerable strength and often reach gale force.

Colombia, Venezuela, and Guiana.—These coasts are situated within the limits of the north-east trade, and during the dry season, December to April, the trade blows strongly from between N. and E. to within five or ten miles of the Colombian Coast, moderating during the night to a light breeze or calm; occasionally a light land breeze is experienced, but these are not noticeable far from the coast. Westerly winds, called "Vendavales" prevail here at times for a few days between July and November.

Off the coast of Venezuela, the predominating direction of the wind is from between N.E. and East, the proportion of winds from this quarter during the dry season amounting to 68 per cent. During the night, the winds incline from the land, but winds directly off the land are rare. During the rainy season, April to October, the trade wind is light, and changeable winds from south and west often blow, with frequent thunder squalls.

On the Guiana coast, the year as regards winds, may be considered as divided into two periods; the comparatively cool period, November to May, when the N.E. trade blows home to the coast with some force; and the very hot period, lasting from June to November, when S.E. winds, variables, and calms prevail. Near the coast the wind generally decreases in force during the night, and land winds from S.W. to N.W. blow at intervals during all seasons.

North Coast of Brazil.—From the mouth of the Amazon to Cape St. Roque the prevailing winds vary from between N.E. and S.E. From November to March, the rainy season, the north-east trade blows from between N.E. and East along the coast as far south as Cape St. Roque. It then weakens, and about the beginning or middle of April, E.S.E.'ly winds reach the coast near Cape St. Roque, and gradually spread northwards to the mouth of the Amazon; and by May extend from the shore for a distance of 250 miles.

June and July are months of calms, squalls, and variable winds. From August to October the S.E. trade is felt at its full force, and

blows almost uninterruptedly.

Near the coast the wind generally decreases or dies out during the night, and at times a land breeze from between south and west sets in, lasting until 8 or 9 a.m., when the trade wind is again established.

During the wet season near Maranhão and Para, squalls from N.W. or S.W. are experienced, and are sometimes violent, with heavy rain, thunder, and lightning.

East Coast of Brazil.—From Cape St. Roque, southward, the south-east trade is experienced along the coast from March to August as far as Bahia; but during the remainder of the year, it only extends as far as Pernambuco. From this point southward to Rio de Janeiro, as the southern limit of the trade wind is approached, the winds become variable, with periodic or seasonal winds from N.E. and S.E. well marked, especially near the coast. From October to March when the north-western side of the South Atlantic anti-cyclone lies to the southward of this coast the prevalent wind direction is from N.E. with occasional winds from north and west, with rain and calms.

From April to June, the rainy season, the winds blow from S.E. to East, being light and variable, with occasional squalls and rain from S.W., and thunderstorms from N.W. "Abrolhos squalls," so called on account of being experienced principally in the vicinity of Abrolhos Rocks, occur between May and August from the S.E., and come up as small round white clouds; while near Rio de Janeiro, north-west squalls lasting five to six hours, and called "Terre Altos" are sometimes experienced.

From July to September S.E. winds predominate, which at times veer to S.W. and blow strongly.

Land breezes are felt along nearly the whole coast of Brazil, during the greater part of the year; but vary in regularity and force according to the place and season. The land breeze is stronger and more regular when the sea breeze is from N.E.

Between Rio de Janeiro and Monte Video, from October to April, winds from a north-easterly direction preponderate, extending for a distance of about 200 miles from the coast. These north-easterly winds acquire their full force and greatest frequency from December to February, but are always less strong within 30 to 40 miles of the coast, and their direction is also influenced by the trend of the coast.

Strong north-easterly winds are frequently followed by a period of calms and south-west winds; and squalls with rain may be expected during this season, especially in the neighbourhood of St. Catherina Island.

During the winter, April to September, winds are chiefly from south to south-west, alternating with north-easterly and south-easterly winds, while occasional gales from S.E. to S.W. are also experienced.

Rio de la Plata.—The entrance to the Rio de la Plata is noted for the frequency and rapidity of the changes of the weather.

During the summer months, September to March, the prevailing winds in the offing are from north-east, but as the river is approached, the wind veers to the east, and even south-east. During the winter, March to September, the winds are chiefly from west to south-west, but up the river they are more frequently from north of west than from south of west.

A feature of this region is the occurrence of strong winds or

squalls from the south-west, known as "Pamperos." The inhabitants understand by that name any wind, whether light or strong, from the south-west, from the fact of their blowing over the pampas before reaching the coast. By seamen a "Pampero" is generally understood to mean a storm, peculiar to this locality, marked by a heavy squall accompanied by thunder, lightning, and rain, with a sudden shift of wind. Usually the wind backs with a falling barometer from N.E. or N. and shifts to west or south-west, where it attains its greatest force, dying away usually at south or south-east.

Pamperos are most frequent between June and September, an average of 16 in a year occurring at Monte Video, and 12 at Buenos Aires. Their duration varies from a few hours to several days, and they are felt as far seaward as Longitude 48° W., between the parallels of Latitude 31° and 40° S.

They can usually be foretold by definite signs which give warning of their approach. Northerly winds, freshening and backing to N.W., accompanied by haze and slight rain, and at the same time lightning and an overcast sky in the S.W. are sure indications of a "Pampero." The barometer falls rapidly for several hours, and sometimes for a whole day, before the storm breaks.

Another characteristic wind of this region is the "Su-Estado," which blows with great force from the south-east, especially in winter, and raises a heavy sea; and also causes a strong current to the N.N.W. which is dangerous on account of the accompanying fog and rain which obscure the land. They are not nearly so frequent as "Pamperos" and are anticipated by a rise in the barometer, cloudy threatening weather, with lightning, and a red sky at sunrise.

Argentina—East Coast.—Between Rio de la Plata and Magellan Strait, westerly winds mainly prevail throughout the year, those from N.W. predominating during the southern winter. Winds from the north-west quarter (which are at times accompanied by much lightning and thunder) begin and increase gradually, associated with a falling barometer. When the barometer ceases to fall, the wind will back to the southward, and the weather clear.

From September to June the westerly winds are frequently interrupted by south-easterly gales, accompanied by thick weather, rain, and a heavy sea.

East Coast of Tierra del Fuego.—On this coast the weather is mostly dull and stormy, westerly gales often following each other at short intervals, owing to the passage of successive depressions to the southward.

Easterly winds occur at times during the winter months when disturbances pass to the northward, but are very rare during the summer.

The westerly gales are usually preceded by a moderate wind from north, with overcast sky and slight rain. As the barometer falls, the wind freshens, and backs to the westward, attaining its greatest force at N.W., with thick weather and heavy rain, snow or hail. It usually lasts from 12 to 15 hours from this direction, and when the barometer ceases to fall, backs rapidly to S.W., followed by strong squalls from that direction.

With a rising barometer, the gale gradually decreases, and the weather may become fine for a few days; or the above process may be immediately repeated, and the weather remain stormy for weeks at a stretch.

(To be continued.)

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

WEATHER SIGNALS.

II.—WIRELESS WEATHER SIGNALS.

WIRELESS WEATHER BULLETINS.

CANADA, NOVA SCOTIA, NEWFOUNDLAND AND
LABRADOR, ETC.

(Spark Issues.)

THE following stations transmit the weather forecasts issued by the Canadian Meteorological Service, the wavelength used being 600 metres (spark) in all cases. Where the times of transmission are omitted forecasts are sent on request without charge. Stations marked with an asterisk (*) are open during the season of navigation only.

Country.	W/T Station.	Call Sign.	Position (approx.).		Time, G.M.T.
			Lat. N.	Long. W.	
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	—
Canada	North Sydney	- VCO	46 13	60 15	—
	Sable Island	- VCT	43 56	60 02	—
	Grindstone Island	- VCN	47 23	61 54	—
	*Fame Point, Que.	- VCG	49 07	64 36	0145, 1345
	*Clarke City, Que.	- VCK	50 12	66 38	—
	*Father Point, Que.	- VCF	48 31	68 28	—
	Grosse Island, Que.	- VCD	47 02	70 40	—
	Quebec	- VCC	46 48	71 12	—
Canada (New Brunswick).	*Montreal	- VCA	45 34	73 38	—
	*Heath Point Lt. Vsl. (Anticosti I.)	- VCI	49 03	61 30	—
	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	1100, 1600, 2300

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

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 0330 and 1530 G.M.T. on wave lengths of 2,677 and 4,409 metres (A.C.W.) simultaneously.

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

First Part.

Part I of the 0330 and 1530 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.).	Indicator Letters.	Station.	Position (Approx.).
		Lat. Long.			Lat. Long.
*J	St. Johns, N.F. ...	47°34' N. 52°42' W.	CN	Cincinnati, 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°10' 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.
N	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°06' W.	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, Neb. ...	41°23' N. 96°01' W.
LB	Lynchburg, Va. ...	37°18' N. 79°01' W.	OK	Okla. City, Okla. ...	35°32' N. 97°28' W.
AV	Asheville, N.C. ...	35°32' N. 82°28' W.	DA	Dallas, Tex. ...	32°46' N. 96°31' W.
H	Hatteras, N.C. ...	35°14' N. 75°32' W.	EP	El Paso, Tex. ...	31°50' N. 106°30' W.
C	†Charleston, S.C. ...	32°43' N. 79°52' W.	SE	Seattle, Wash. ...	47°38' N. 122°25' W.
*B	Bermuda ...	32°17' N. 64°46' W.	RO	Roseburg, Ore. ...	43°11' N. 123°10' W.
CO	†Columbia, S.C. ...	34°02' N. 80°57' W.	SF	San Francisco, Calif. ...	37°50' N. 122°30' W.
JA	Jacksonville, Fla. ...	30°19' N. 81°51' W.			
K	†Key West, Fla. ...	24°33' N. 81°48' W.	DI	San Diego, Calif. ...	32°42' N. 117°15' W.
AT	Atlanta, Ga. ...	33°42' N. 84°26' W.	BS	Boise, Idaho ...	43°40' N. 116°00' W.
TA	Tampa, Fla. ...	27°35' N. 82°29' W.	LD	Lander, Wyo. ...	41°40' N. 108°40' W.
P	†Pensacola, Fla. ...	30°21' N. 87°19' W.	DV	Denver, Colo. ...	39°48' N. 105°05' W.
MG	Montgomery, Ala. ...	32°22' N. 86°23' W.	*ED	Edmonton, Alberta	53°32' N. 113°05' W.
VK	Vicksburg, Miss. ...	32°22' N. 90°02' W.	*SC	Swift Current, Sask.	50°30' N. 107°45' W.
NO	New Orleans, La. ...	29°57' N. 90°02' W.			
LR	Little Rock, Ark. ...	34°45' N. 92°20' W.	BK	Bismarck, N. Dak. ...	— —
GV	Galveston, Tex. ...	29°19' N. 94°48' W.	*HT	Horta, Azores ...	38°32' N. 28°38' W.
NV	Nashville, Tenn. ...	36°10' N. 86°47' W.			

* Cloud reports not included.

The stations are indicated by the key 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.

If upper air observations are not possible, these groups will be substituted by the words "foggy," "rain," or "snow," as the case may be.

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 hundredths, the initial 2 or 3 being omitted. (To convert to millibars, see Table XXXIX.)

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

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 XXXVI).

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

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

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:—

0330 G.M.T. bulletin contains Noon G.M.T. observations which were received too late for inclusion in the 1530 G.M.T. bulletin, and 0000 G.M.T. observations.

1530 G.M.T. bulletin contains 0000 G.M.T. observations received too late for inclusion in the 0330 G.M.T. bulletin, and Noon G.M.T. observations.

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 XXXIX.)

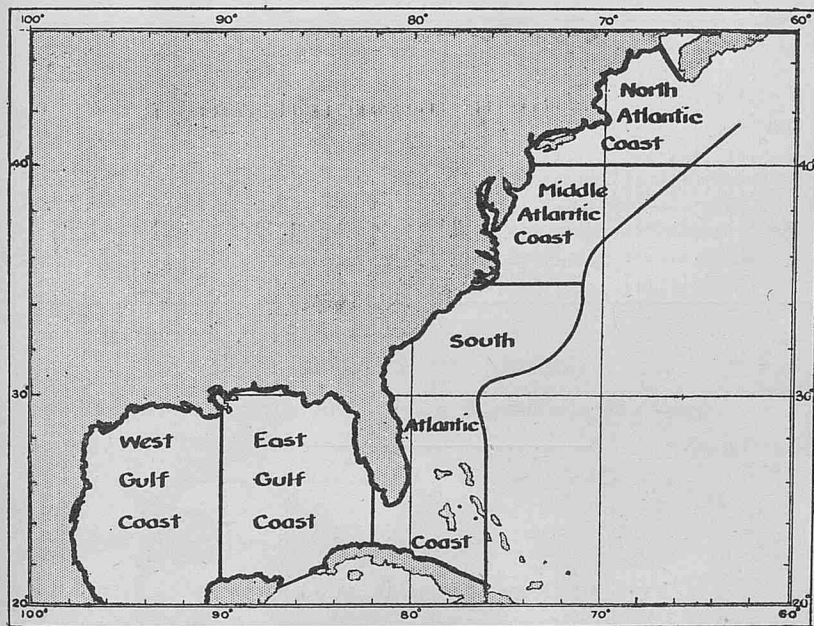
4th figure gives the wind direction (Table XXXV).

5th figure gives the wind force by Beaufort Scale.

Second Part.

Part II of the bulletin is in plain language, and consists of a synopsis 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 below.

CHARTLET OF U.S. MARINE FORECAST AREAS.



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

Weather Information 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
Chatham (Marion), Mass.	WCC	41° 43' N.	70° 46' W.	1400, 2200	(I.C.W.). 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 wave length of 1,600 metres, spark, and at 0020 and 1220 G.M.T., on a wave length 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 XXXV.—Wind Direction True.

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

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

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

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

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

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

Table XXXVIII.—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 XXXIX.

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.	Wave length. (Metres.)
Jupiter, Fla. - - -	NAQ	26° 57' N. 80° 05' W.	1630, 2300	2,271 (C.W.).
St. Augustine, Fla. - -	NAP	29° 53' N. 81° 17' W.	1630	2,342 (Spark).
Savannah, Ga. - - -	NEV	32° 05' N. 81° 06' W.	1600, 2300	2,271 (C.W.).
Charleston, S.C. - - -	NAO	32° 52' N. 79° 58' W.	1530, 2300	2,776 (C.W.).
Norfolk, Va. - - -	NAM	36° 50' N. 76° 18' W.	0100, 1545, 2100.	2,883 (C.W.).
Washington (Arlington) -	NAA	38° 52' N. 77° 05' W.	0330, 1530 1700.	2,677 and 4,409 (A.C.W.) simul- taneously.
Philadelphia - - -	NAI	39° 52' N. 75° 11' W.	1545, 2200	2,828 (C.W.).
New York - - -	NAH	40° 28' N. 74° 00' W.	1530, 2200	2,776 (C.W.).
Boston, Mass. - - -	NAD	42° 21' N. 70° 57' W.	1600, 2200	2,939 (C.W.).

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 0500 G.M.T.

Charleston W/T Station, NAO, for 24 hours.

Norfolk W/T Station, NAM, until 0500 G.M.T.

The areas to which the warnings refer are given in the text of the messages.

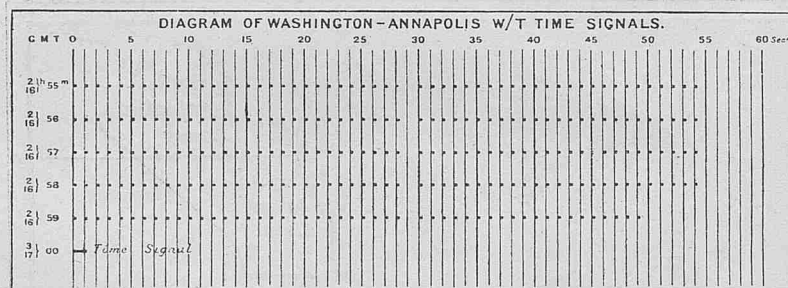
III.—WIRELESS TIME SIGNALS.

UNITED STATES OF AMERICA (ATLANTIC COAST).

All American Time Signals are sent according to the American Code, (See Diagram of Washington-Annapolis W/T Time Signals.)

Station.	Call Sign.	Wave length.	G.M.T. of Time Signal.	
Washington (Annapolis). Lat. 38° 59' 00" N. Long. 76° 27' 00" W.	NSS	17,150 C.W.	0255-0300 1655-1700	Signals sent daily. The "lag" of the Annapolis T.S. is 0.09 second. Error generally has been less than 0.1 second.
Washington (Arlington). Lat. 38° 52' 05" N. Long. 77° 04' 47" W.	NAA	2,677 and 4,409 (A.C.W.) simul- taneously.	0255-0300 1655-1700	Daily. Controlled by Naval Observatory, Washington. The "lag" of the Arlington T.S. is 0.09 second. Error generally less than 0.1 second. Should the time signals fail they will be sent out 1 hour later.
Charleston (S.C.) -	NAO	2,776 C.W.	1655-1700	
Norfolk (Va.) -	NAM	2,883 C.W.	do.	
New York -	NAH	2,776 C.W.	do.	

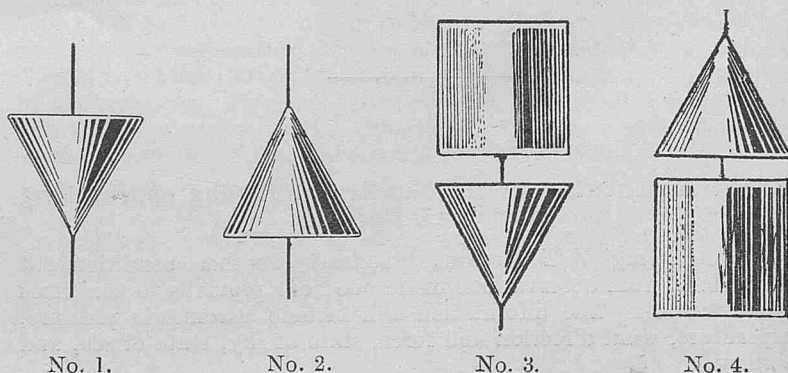
NOTE.—Sharp tuning to the individual wave lengths of the American Stations is required, in order to receive satisfactorily.



IV. VISUAL STORM WARNINGS.

Canada.

By Day.



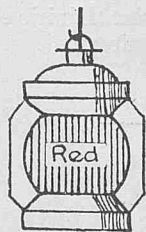
No. 1.

No. 2.

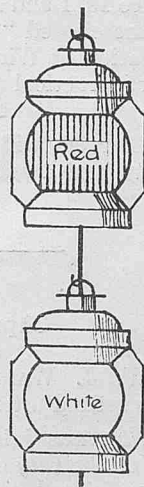
No. 3.

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.

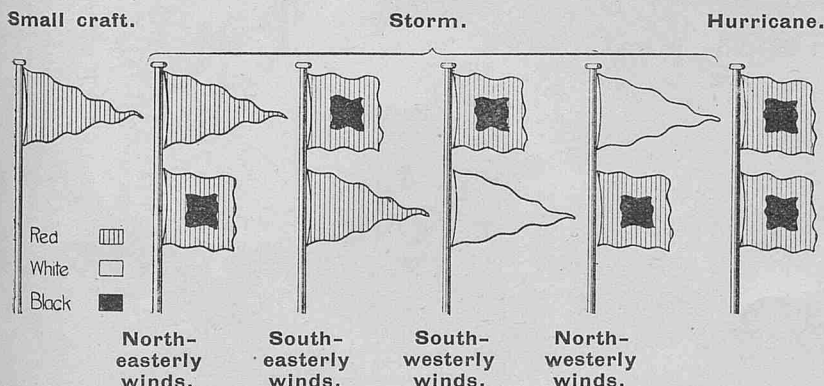
Signification ; Day or Night Signals.

- 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, or 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 and Northern Atlantic Coast.

Special Notices regarding Personnel.

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

Commodore William Marshall, C.B., D.S.O., R.D., R.N.R.

Captain WILLIAM MARSHALL, of the WHITE STAR LINE, a member of the Corps of Voluntary Marine Observers, has been promoted to Commodore, Royal Naval Reserve, 2nd Class, to date June 2nd, 1927.

Captain W. A. Splatt.

Captain W. A. SPLATT, Commander of the R.M.S. *Orita*, has retired after 34 years' service with the Pacific Steam Navigation Company.

Captain SPLATT served his apprenticeship in sailing ships owned by Messrs. THOMPSON, ANDERSON & Co., his first ship being the *Sierra Morena*, which he joined in 1882. On completing his time he remained in the same Company's service until 1891, when he transferred to steam, serving as a Junior Officer in the HALL and BEAVER Lines.

In 1893 he joined the PACIFIC STEAM NAVIGATION Company and obtained his first command in 1906; since when he has commanded many of the Company's vessels, including some of their finest mail ships.

Captain SPLATT has been a member of the Corps of Voluntary Marine Observers since 1921, and Marine Observers will join with the Marine Division in wishing him long life and happiness in his well-earned retirement.

Commander A. S. Mackay, R.D., R.N.R.

Captain A. S. MACKAY has been elected an Elder Brother of Trinity House. The Corps of Marine Observers and Marine Division heartily congratulate Captain MACKAY upon gaining a position which is honoured throughout the Sea Service.

Educated at Edinburgh High School he served his time in sail, and joined the service of the ROYAL MAIL STEAM PACKET COMPANY on August 14th, 1908.

He served in H.M. Fleet throughout The Great War, and from March 1920 to December 1921 was an Assistant Marine Superintendent of the R.M.S.P. Co.

In December 1921 he was appointed to the command of S.S. *Conway* and later transferred to S.S. *Culebra*.

Captain MACKAY has been a member of the Corps of Voluntary Marine Observers since 1905, and the ships commanded by him have contributed eight meteorological logs attaining the "Excellent" classification. He encountered, in October last year, the *Valerian-Eastway* Hurricane, of which *Culebra* contributed valuable information.

Commander J. W. Hague, R.N.R.

Captain JOHN WILLIAM HAGUE, Commodore of the UNION CASTLE Fleet, has retired after 42 years in the service of the UNION and UNION CASTLE STEAMSHIP COMPANIES.

During the 31 years that Captain HAGUE held command, he has had under his charge the majority of the vessels of the UNION CASTLE Fleet, his last ship being the highly successful Motor Vessel *Carnarvon Castle*.

Captain HAGUE has been a member of the Voluntary Corps of Marine Observers since 1892, and Marine Observers will join with the Marine Division in wishing him long life and happiness in his well earned retirement.

Captain G. Byers.

Captain GERALD BYERS, Commander of the S.S. *Kweiyang*, of the CHINA NAVIGATION COMPANY, has retired from active service afloat after 34 years at sea.

Captain BYERS served his apprenticeship in the Barque *Cairnsmore*, owned by Messrs. NICHOLSON AND MCGILL, which he joined in 1893. In 1901 he joined the CHINA NAVIGATION COMPANY as an officer and has commanded many ships of that Company's Fleet.

He has been a regular member of the Voluntary Corps of Marine Observers since 1911 and has kept no less than 25 Meteorological Logs, of which 22 are classed "Excellent." His keenness and recent work in the Application of Wireless and Weather as an Aid to Navigation has proved of practical value to shipping during typhoons in the China Sea.

Marine Observers will join with the Marine Division in wishing Captain BYERS health and happiness in his retirement.

Captain W. J. Walters.

Captain W. J. WALTERS, Commander of the ANCHOR Liner *Caledonia*, has retired after 28 years' service with the Company.

Captain WALTERS joined the Anchor Line in 1899, serving as fourth officer of the *City of Rome*. He obtained his first command in 1915, when appointed to the *Massilia* and has since commanded several of the Company's vessels.

A member of the Corps of Voluntary Marine Observers, Marine Observers will join with the Marine Division in wishing Captain WALTERS long life and happiness in his retirement.

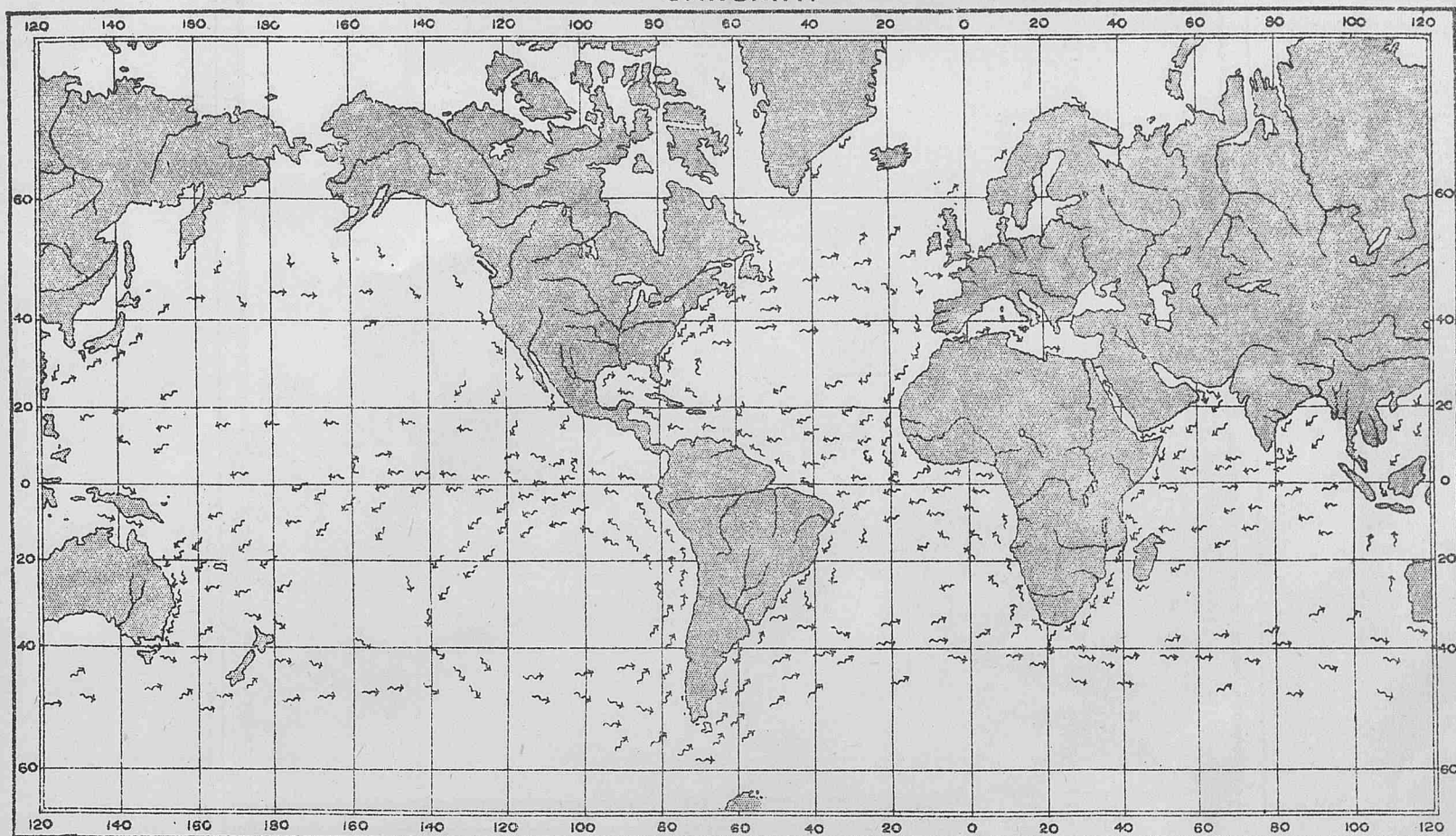
Ocean Currents.
JANUARY.

Chart XLIV—"WIRELESS AND WEATHER".

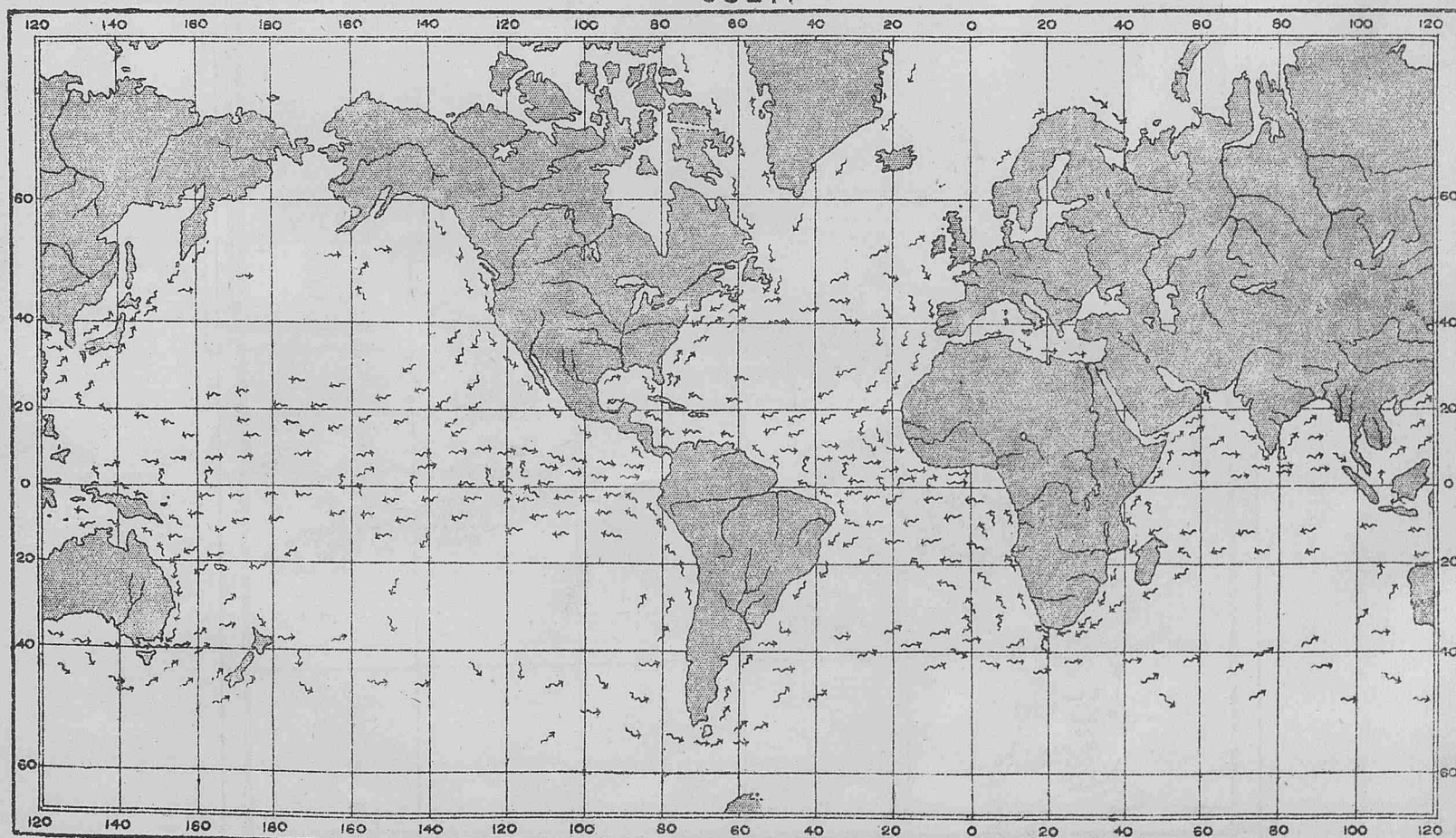
Ocean Currents.
JULY.

Chart XLV—"WIRELESS AND WEATHER".

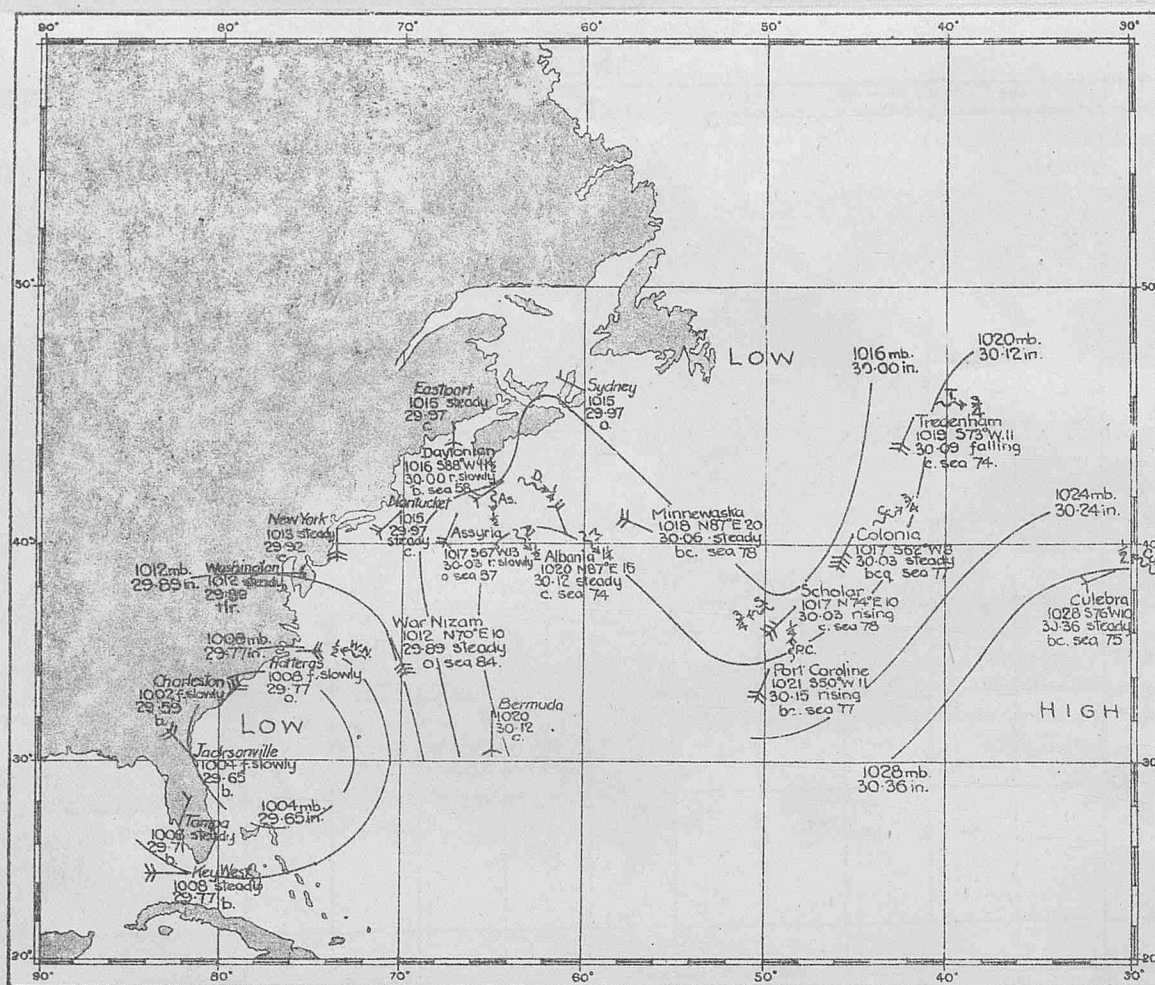
WEATHER CHART, MORNING OF AUGUST 25TH 1924.

Chart XLVI —“Wireless and Weather.”

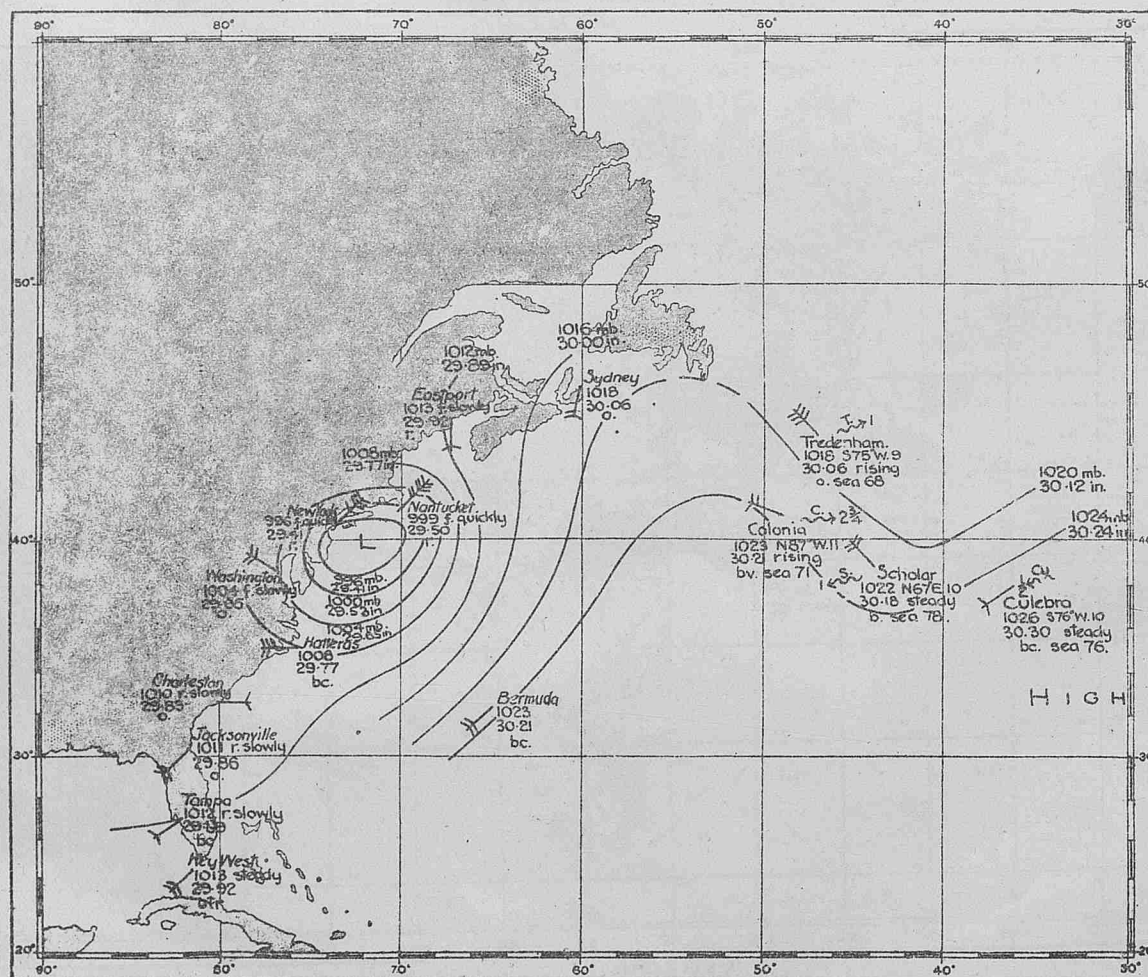
WEATHER CHART, MORNING OF AUGUST 26TH 1924.

Chart XLVII —“Wireless and Weather.”

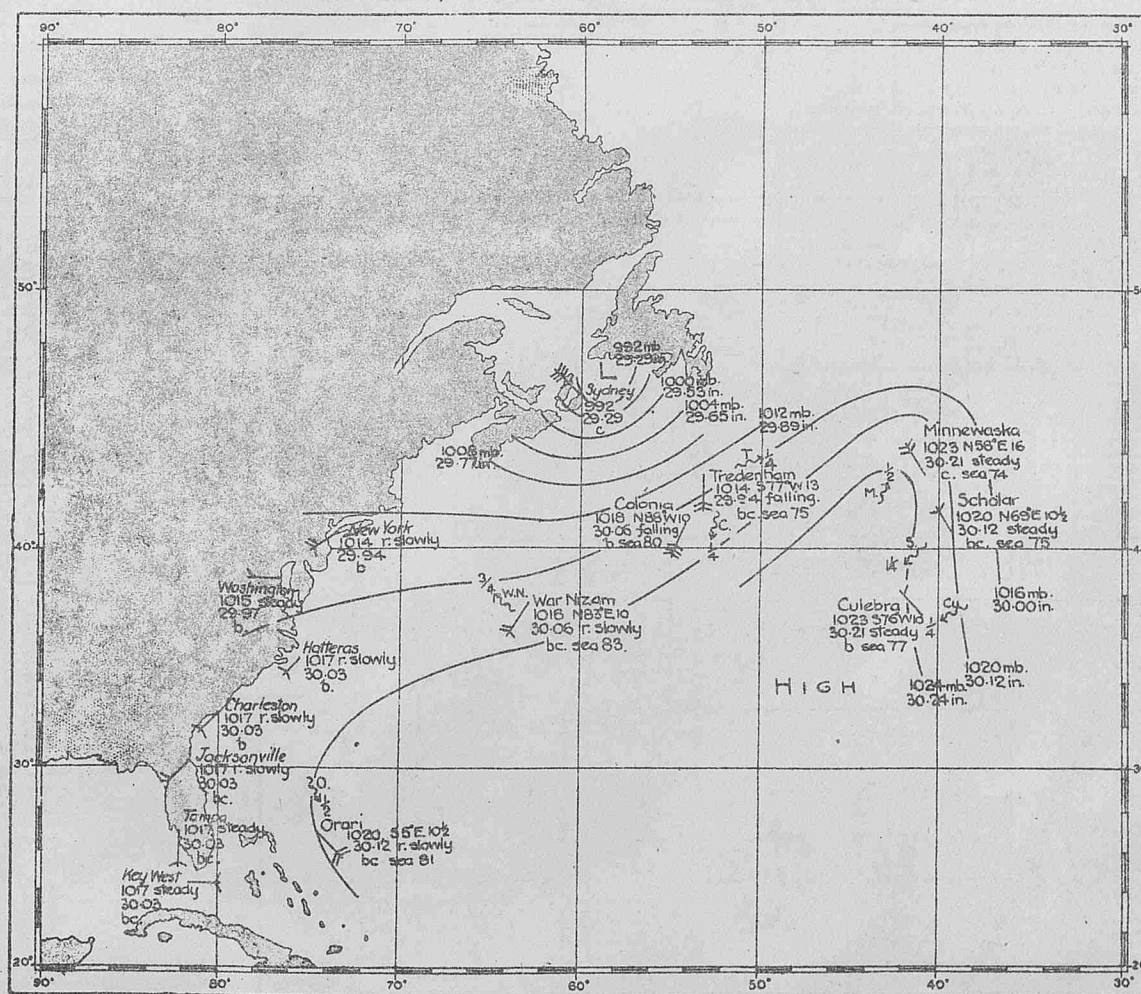
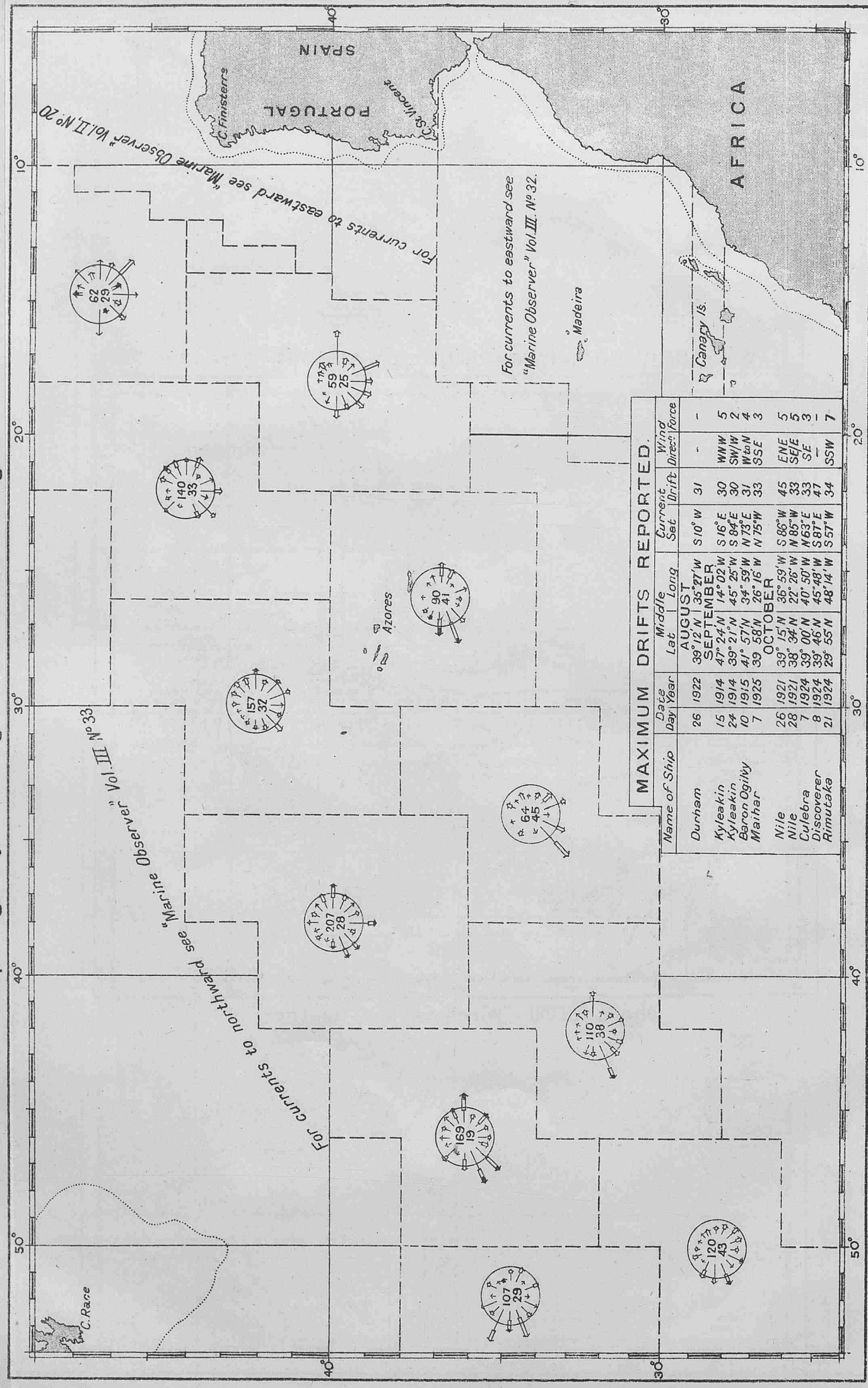
WEATHER CHART, MORNING OF AUGUST 27TH. 1924.

Chart XLVIII—"Wireless and Weather."

CURRENTS ON THE TRACKS TO AND FROM THE WEST INDIES AND PANAMA.
(EASTERN PORTION)

AUGUST, SEPTEMBER AND OCTOBER.
Observations of ships regularly observing for British Meteorological Office 1910-1925.



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

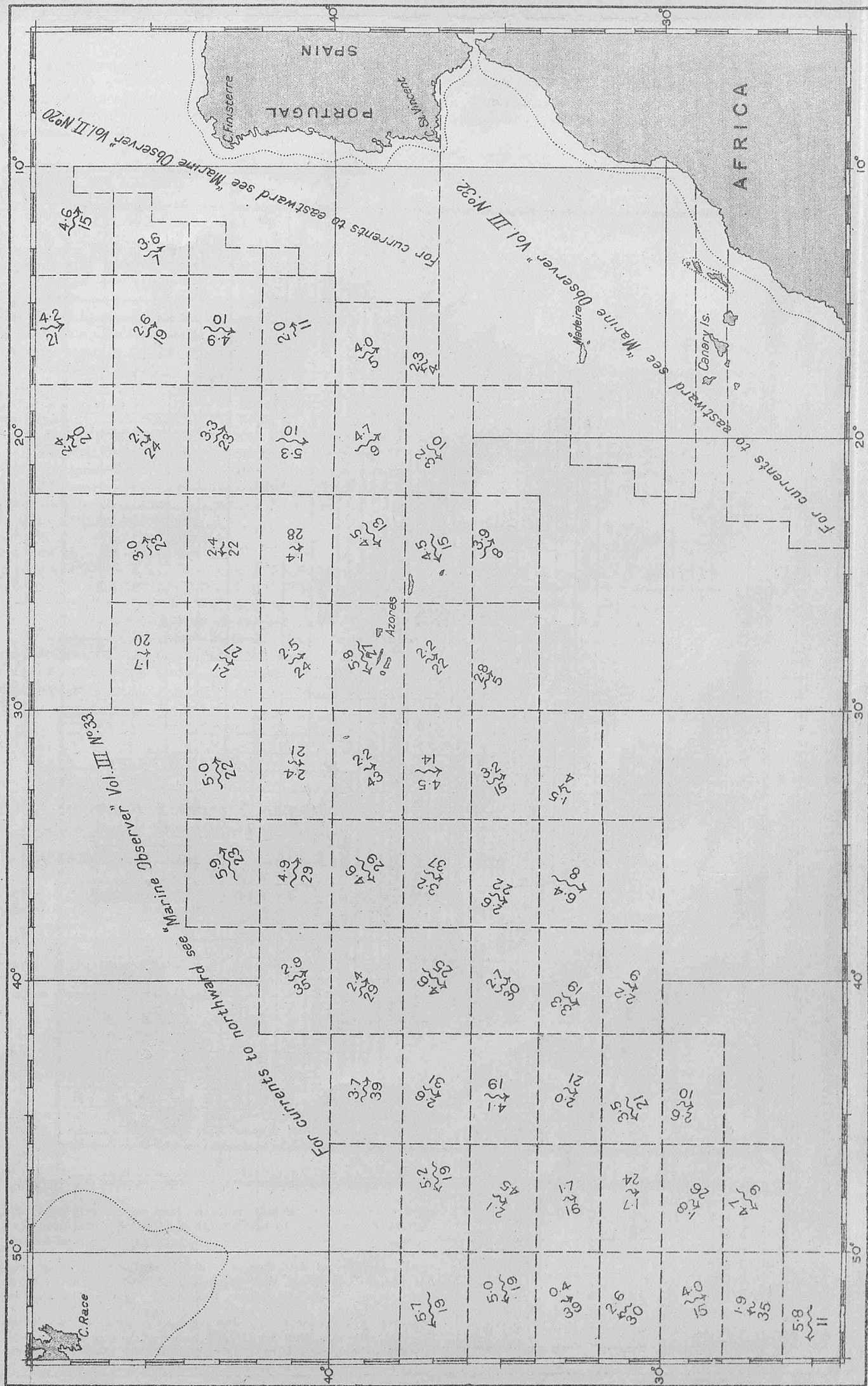
6-12 miles per day
13-24
25-48
49-72
73
and above

Distance from tail of arrow to circle represents 5% Scale 0 10 20 30 40 50%
The upper figure in centre of rose gives total number of observations, the lower figure the frequency of currents less than 6 miles per day.

CURRENTS ON THE TRACKS TO AND FROM THE WEST INDIES AND PANAMA. (EASTERN PORTION)

AUGUST, SEPTEMBER AND OCTOBER.

Observations of ships regularly observing for British Meteorological Office 1910-1925.

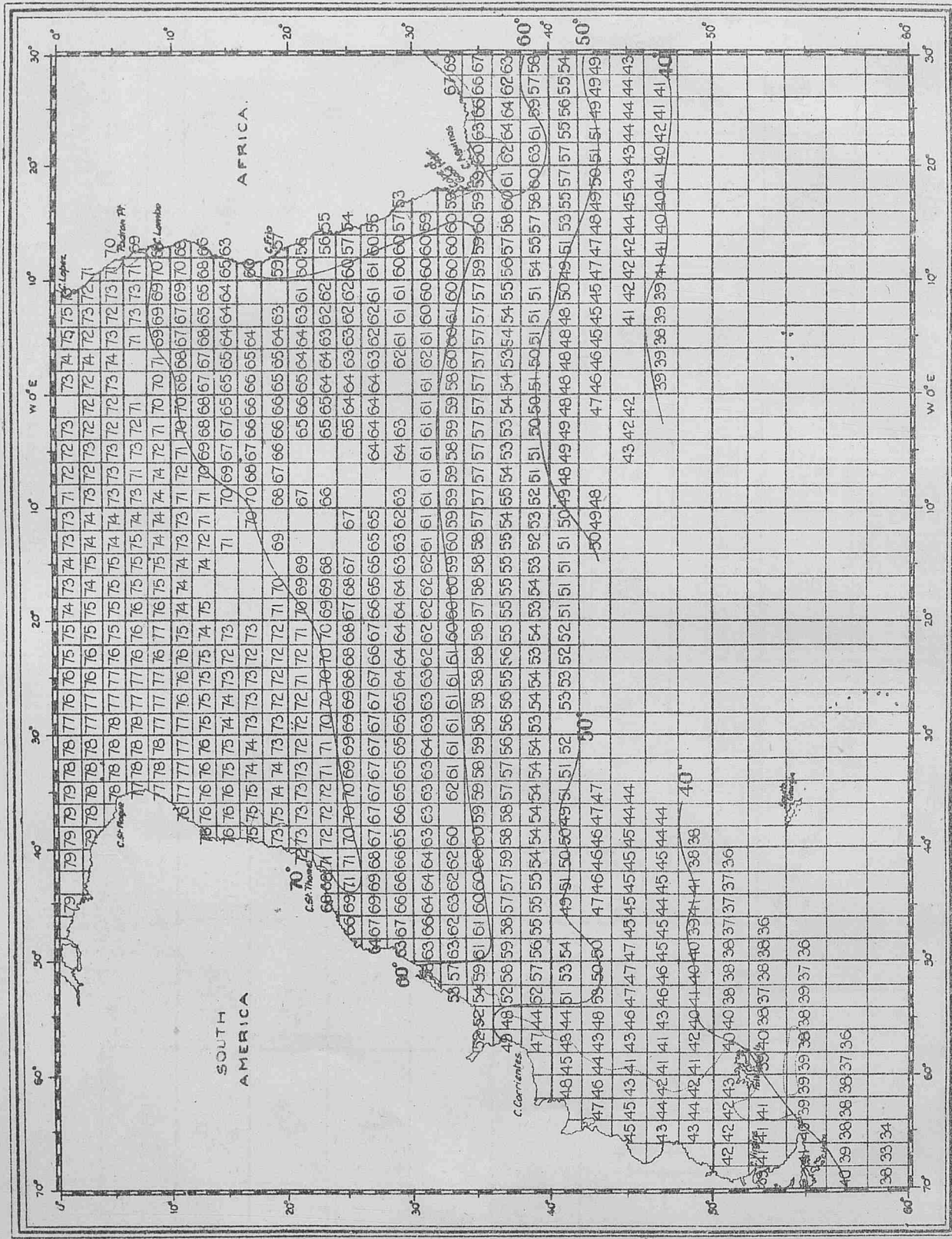


EXPLANATION OF CURRENT ARROWS.

The arrows flow with the current and represent the resultant of currents observed within the pecked lines. The centre of each arrow lies in the mean position of observation. The figures above the arrows give the velocity of current in miles per day; the figures below the arrows the number of observations.

SOUTH ATLANTIC.

MEAN SEA SURFACE TEMPERATURES FOR MONTH OF AUGUST,



Computed from observations of British ships during the years 1855 to 1899 except to the Southward and Eastward of Latitude 30° South and Longitude 10° East where the observations are for the years 1855 to 1878.

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*.

IMPORTANT.

Request to return Additional Remarks and supplementary documents with the Meteorological Log and Form 911.

As the interest of the Corps of Marine Observers increases, so more information is returned to the Marine Division, and there is a tendency to send in supplementary documents to the Meteorological Log and Ship's Meteorological Report Form 911.

The strength of the Marine Division is constant, that is to say, the number of assistants in the Marine Division to handle the data received remains the same whatever the amount.

To maintain or increase the output of published information it is necessary to regulate collection.

Marine Observers will greatly assist, and in so doing, help towards publication by making their Logs and Reports when returned as complete as possible.

Information or considered views in reply to the Marine Superintendent's circulars or notes of enquiry in this Journal may be conveniently written on the pages in the Log and Form 911 for "Additional Remarks."

In this space narratives of experiences in storms, accounts of unusual phenomena and abnormal currents experienced should be entered.

A selection of a few of the best weather charts made during the voyage can be appropriately attached to the fly-leaf of the Log. Sketches and photos should be similarly attached.

By forwarding all information which it is intended to return, along with the Log or Form 911, Marine Observers will make it possible to give better acknowledgment for work well done.

The remarks, weather charts, sketches and photos, now being received are greatly appreciated and it is hoped that these may increase, but if justice is to be done to them, it is necessary that they should be properly placed so that they may receive the greatest possible amount of attention.

ICE REPORTS.

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

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

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.

CONVERSION TABLE.

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		

ICE CHART. WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE

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

- (3) From 1st March 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.
- (G) Eastbound, steer from position 25 miles S. of Cape Race. 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.

ROUTE NOTICES.

For latest information re Tracks see pages 78-9, Vol. IV. No. 40, of this Journal.

SYMBOLS USED ON THE CHART.

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

PHENOMENAL DRIFTS 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°18' N. 42°06' W.	Piece 18 ft. by 5 ft., 2 ft. out of water.
" 14, 1912	S.S. Ulstermore ...	43°55' N. 39°18' 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°00' N. 56°43' W.	Berg.
" 21, 1915	S.S. Strathgarry ...	40°48' 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.

Reports of Ice sighted between June 1st and June 30th, 1927, 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.

LATEST ICE REPORT FROM CANADA.

The following cablegram dated 11th June, 1927, was received from the Superintendent, Canadian Signal Service, Quebec:—

"Point Amour, numerous bergs and growlers in sight and open ice inshore. Belle Isle, numerous bergs and growlers. Cape Race, some bergs in sight. Other points, no ice in sight."

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 pages 15 and 17 of Vol. IV No. 37.

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.		Description.
	Latitude.	Longitude.	
BALTIC.			
6.6.27	60°57'N.	18°58'E.	Big iron tank.
MEDITERRANEAN.			
10.6.27	35°20'N.	17°47'E.	Derelict Maltese boat, dangerous to navigation.
NORTH ATLANTIC.			
1.6.27	50°10'N.	5°40'W.	Small vessel on fire.
1.6.27	47°46'N.	19°35'W.	Large light or whistle buoy, projecting about 15 feet.
4.6.27	41°23'N.	55°11'W.	Spar about 20 feet long, 3 feet diameter, covered with marine growth.
5.6.27	40°49'N.	65°04'W.	Spar about 18 inches diameter, projecting about 6 feet out of water, apparently attached to submerged wreckage.
6.6.27	47°50'N.	18°03'W.	Large red conical buoy with cage.
6.6.27	30°50'N.	74°06'W.	A cargo derrick about 70 feet long, with gear attached.
10.6.27	32°50'N.	55°04'W.	Large piece of wreckage showing 2 feet out of water with 4 feet stump of mast standing probably part of hull of schooner, covered with marine growth.
17.6.27	39°20'N.	34°00'W.	Derelict schooner, dangerous to navigation, probably the <i>Annabel Cameron</i> .
18.6.27	48°28'N.	19°54'W.	20 feet log, 4 feet diameter, dangerous to navigation.
21.6.27	47°35'N.	6°52'W.	Submerged wreckage.
23.6.27	51°54'N.	6°52'W.	Submerged wreck, masts projecting 6 feet out of water, dangerous to navigation.
26.6.27	47°34½'N.	6°01½'W.	Red coloured cylindrical buoy.
CARIBBEAN SEA.			
3.6.27	12°15'N.	78°26'W.	3 spars projecting out of water, apparently attached to a submerged wreck.
NORTH PACIFIC.			
2.6.27	40°26'N.	124°31'W.	Large upright spar, projecting 4 feet out of water.
3.6.27	43°47'N.	124°33'W.	Large log about 30 feet long, 4 feet diameter.
6.6.27	8°24'N.	79°33'W.	Partly submerged wreckage.

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

LONDON ...	Captain L. A. BROOKE SMITH, R.D., R.N.R., Marine Superintendent.	
	Commander J. Hennessy, R.D., R.N.R., Senior Nautical Assistant. Room 319, Adastral House, Kingsway, W.C.2. (Telephone No.: Holborn 3434 Extension 421). Nearest station Temple, District Railway.	
LIVERPOOL ...	Mr. W. T. GRIEVES, Visiting Officer for the Port of London.	
	Lieut. Commander M. CRESSWELL, R.N.R., Port Meteorological Officer, Dock Office. (Telephone No.: Bank 3959).	

Agents.

BELFAST ...	Captain J. MCINTYRE, Harbour Master, Harbour Office. (Telephone No.: Belfast 4090).
CARDIFF ...	Captain T. JOHNSTON, Technical College, Cathays Park.
GLYDE ...	Captain M. C. CORRANCE, Board of Trade Sur- veyor's Office, 73, Robertson Street, Glasgow.

Agents (contd.).

FREMANTLE, W. Australia.	Captain J. J. AIREY, Deputy Director of Naviga- tion, Dalgety's Buildings.
HONG KONG, China.	Lieut. Commander O. C. G. LEVESON-GOWER, R.N., Superintendent, Admiralty Chart and Chronometer Depot, H.M. Dockyard.
HULL ...	Captain Geo. B. STURDY, c/o Mr. W. HAKES, Commercial Road.
LEITH ...	Captains G. BLACK and C. G. BONNER, V.C., D.S.C., Leith Salvage and Towage Co., Ltd., 2, Commercial Street.
SOUTHAMPTON	Captain D. FORBES, Nautical Academy, 1, Albion Place.
SYDNEY, New South Wales.	Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R., Deputy Director of Navigation, Customs House.
TYNE ...	Captain J. J. MCEWAN, Marine School, South Shields.
VANCOUVER, British Columbia.	Mr. T. S. H. SHEARMAN, Room 40, Post Office Building.

LIST OF VOLUNTARY OBSERVING SHIPS

i

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 Ship's 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.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
<i>Aba</i> ...	Hughes, J. ...	S. J. Bristowe, O. E. Jones, C. Spark.	M.L.	Elder Dempster ...	Met. Log. 13.10.26 to 12.3.27...	17.3.27.
<i>Abinsi</i> ...	Millson, H. E. ...	E. W. Bascombe ...	No. A.	"	Form 911 29.12.26 to 23.2.27...	3.3.27.
<i>Achilles</i> ...	Wilson, C. A. ...	A. Gillard, A. M. Wright, F. B. Allen.	M.L.	A. "Holt" ...	Met. Log. 27.12.26 to 1.5.27 ...	10.6.27.
<i>Actor</i> ...	Haylett, E. ...	A. Frew, J. McKay, G. Morrice.	"	Harrison ...	" 9.1.27 to 7.4.27 ...	21.4.27.
<i>Adda</i> ...	Toft, J. T. ...	R. G. Roberts, O. V. Lucas ...	No. M.	Elder Dempster ...	Form 911 27.10.26 to 3.12.26...	7.12.26.
50 <i>Adriatic</i> ...	Hickson, V. W., Lieut. Commr. R.N.R.	"	W.T.	White Star ...	W.T. Reg. 2.5.27 to 21.5.27 ... Form 911 18.10.26 to 6.11.26...	23.5.27. 9.11.26.
<i>Aeneas</i> ...	Wallace, W. K. ...	J. M. Anderson ...	No. A.	A. Holt ...	" 27.3.27 to 4.4.27 ...	19.4.27.
<i>Agapenor</i> ...	Ramsay, J. ...	"	" A.	"	" 23.4.27 to 3.5.27 ...	8.6.27.
<i>Aidan</i> ...	Pym, J. ...	J. Whayman ...	" A.	Booth ...	" 10.3.27 to 22.3.27 ...	4.5.27.
<i>Alban</i> ...	Whayman, W. R. ...	S. E. Adams ...	" A.	"	" 9.3.27 to 26.4.27 ...	11.5.27.
<i>Albania</i> ...	Gronow, S. ...	L. Harper ...	" A.	Cunard ...	" 29.8.26 to 22.9.26 ...	24.9.26.
<i>Alipore</i> ...	Harrison, R., D.S.O., R.D., Captain, R.N.R.	"	" M.	P. and O. ...	" 2.3.27 to 5.5.27 ...	30.5.27.
<i>Almanzora</i> ...	Wakeman, E. C. ...	D. O. Llewellyn ...	" A.	R.M.S.P. ...	" 19.3.27 to 3.5.27 ...	4.5.27.
<i>Albertic</i> ...	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	J. Farrell ...	" A.	White Star ...	" 23.4.27 to 10.6.27 ...	14.6.27.
<i>Alondra</i> ...	Prendergast, J. J. ...	H. Peters ...	" A.	Yeoward ...	" 8.5.27 to 28.5.27 ...	2.6.27.
<i>Ampetco</i> ...	Vandenkerckhove, A. ...	L. Brachs ...	" A.	American Petroleum...	" 3.4.27 to 6.5.27 ...	9.6.27.
<i>Andalucia</i> ...	Thomas, R. J. ...	"	" M.	Blue Star ...	"	"
<i>Anchises</i> ...	Woodgett, R. J. ...	"	" A.	A. Holt ...	Form 911 27.3.27 to 15.4.27 ...	9.5.27.
<i>Andes</i> ...	Smith, W. E. ...	"	" M.	R.M.S.P. Co. ...	" 2.4.27 to 16.5.27 ...	18.5.27.
<i>Antiochus</i> ...	Dunlop, S. K. ...	R. W. Trethewey ...	" A.	A. Holt ...	" 8.4.27 to 26.4.27 ...	27.5.27.
<i>Aorangi</i> ...	Crawford, R. ...	G. H. Kime, E. Anderson, C. G. Eustace, D. Richards.	" M.L.	Canadian-Australasian	Met. Log. 15.12.26 to 26.5.27...	16.6.27.
30 <i>Aquitania</i> ...	Charles, Sir J. T. W., K.B.E., C.B., R.D., Commr. R.N.R.	F. P. Collins, J. Locke, D. MacLean.	W.T.	Cunard ...	W.T. Reg. 1.5.27 to 16.5.27 ... " 22.5.27 to 5.6.27 ...	19.5.27. 9.6.27.
62 <i>Arabic</i> ...	Harvey, H. ...	W. F. Jackman, J. M. Appleby, W. Jenkins.	"	White Star ...	" 2.5.27 to 21.5.27 ...	24.5.27.
<i>Arafura</i> ...	Gordon, A. S. ...	G. C. Smith, R. Lloyd Harry, C. G. Knight, B. W. Dun.	M.L.	Eastern and Australian	Met. Log. 29.10.26 to 26.1.27...	25.3.27.
<i>Arava</i> ...	Summers, W. G. ...	E. R. Hartley ...	No. A.	Shaw, Savill and Albion	"	"
<i>Archimedes</i> ...	Downs, E. B. ...	J. M. Crone ...	" M.	Lamport & Holt ...	Form 911 30.4.27 to 12.5.27 ...	1.6.27.
<i>Argyllshire</i> ...	Wallace, J. ...	S. A. Sapworth, G. McKee, W. E. Butcher, J. W. Kendall.	M.L.	Federal ...	" 22.4.27 to 12.5.27 ...	2.6.27.
<i>Ariguani</i> ...	Scudamore, J. H. H., D.S.C., R.D., Commr. R.N.R.	"	"	Elders & Fyfes ...	Met. Log. 14.8.26 to 12.12.26	18.12.26.
<i>Armada Castle</i> ...	Owen, S. H. ...	"	"	Union Castle ...	" 31.10.26 to 24.4.27...	9.5.27.
<i>Arracan</i> ...	Imlah, C. B. ...	R. McInnes, G. B. Christie, C. C. Weir.	"	P. Henderson ...	" 22.5.26 to 3.12.26 ...	4.4.27.
<i>Arundel</i> ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 17.6.27 ...	17.6.27.
<i>Arundel Castle</i> ...	George, J., O.B.E. ...	R. May ...	No. A.	Union Castle ...	Form 911 22.4.27 to 8.5.27 ...	11.5.27.
<i>Astronomer</i> ...	Richards, J. ...	A. Brown, J. Glen, — Thompson.	M.L.	Harrison ...	Met. Log. 15.8.26 to 25.12.26	1.1.27.
<i>Ascanius</i> ...	Agnew, J. ...	W. Hill ...	No. A.	A. Holt ...	Form 911 25.4.27 to 17.5.27 ...	9.6.27.
<i>Athenic</i> ...	Binks, J. W. ...	F. A. Brown ...	" A.	A. Holt ...	" 14.3.27 to 21.5.27 ...	9.6.27.
<i>Atreus</i> ...	Salter, G. H. ...	A. Hurakami ...	" A.	Nippon Yusen Kaisha	" 12.2.27 to 13.6.27 ...	17.6.27.
<i>Atsuta Maru</i> ...	Shibutami, S. ...	T. E. Steel ...	" M.	Harrison ...	" 7.4.27 to 9.5.27 ...	12.5.27.
<i>Auditor</i> ...	Owen, W. T. ...	E. R. B. Freeman...	" A.	Cunard ...	" 19.2.27 to 28.2.27 ...	3.3.27.
<i>Ausonia</i> ...	Stafford, W., D.S.C., R.D., Lt.-Commr. R.N.R.	"	"	"	"	"

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
<i>Avon</i> ...	Hannam, F. S. ...	E. S. Dunch ...	No. M.	R.M.S.P. ...	Form 911 10.11.26 to 20.1.27...	8.2.27.
<i>Balfour</i> ...	McQueen, D. S. ...	W. P. Philips ...	" A.	Canadian Pacific	" 10.1.27 to 14.2.27 ...	18.2.27.
<i>Balranald</i> ...	Townshend, W. P., Commr., R.N.R.	C. Hannan, F. Ward, — Cowell, — Davis, J. Law.	M.L.	P. & O. Branch	Met. Log. 25.12.26 to 1.5.27 ...	7.5.27.
51 <i>Baltic</i> ...	White, E. R., Commr., R.N.R.	J. W. Paine, D. K. Crawford, J. F. H. Coombes ...	W.T.	White Star ...	W.T. Reg. 16.5.27 to 3.6.27 ...	8.6.27.
<i>Bampton Castle</i> ...	Hutchings, A. H. ...	J. F. H. Coombes ...	No. A.	Union Castle	Form 911 15.5.27 to 4.6.27 ...	9.6.27.
<i>Banbury Castle</i> ...	Swiney, W. A. ...	C. G. Cuthbertson ...	" A.	"	" 20.4.27 to 24.5.27 ...	9.6.27.
<i>Banffshire</i> ...	Wynne, R. H. ...	W. F. Lockhead ...	" A.	Turnbull Martin	" 11.5.27 to 30.5.27 ...	9.6.27.
<i>Baradine</i> ...	Rollo, W. ...	"	M.L.	P. & O. Branch	"	"
<i>Baron Murray</i> ...	Edgar, J. E. ...	W. P. G. Arthur, H. Thompson	No. A.	Hogarth & Sons	Form 911 8.5.26 to 10.6.26 ...	21.9.26.
<i>Barpeta</i> ...	Strachan, J. ...	W. P. Page ...	" M.	British India	" 13.4.27 to 11.5.27 ...	30.5.27.
<i>Barrabool</i> ...	Rhodes, H. R. ...	F. S. Bowman ...	" M.	P. & O. Branch	" 19.4.27 to 27.5.27 ...	10.6.27.
<i>Baychimo</i> ...	Cornwall, S. A. ...	W. H. Deans ...	" A.	Hudson's Bay Co.	" 20.4.27 to 13.5.27 ...	9.6.27.
<i>Baymaud</i> ...	Foellmer, G. ...	"	" M.	"	"	"
59 <i>Belgenland</i> ...	Howell, F. ...	F. Good, F. Clitty ...	W.T.	Red Star ...	W.T. Reg. 15.5.27 to 2.6.27 ...	7.6.27.
<i>Beltana</i> ...	Allin, C. H. C. ...	F. Ardern ...	No. M.	P. & O. Branch	Form 911 15.5.27 to 2.6.27 ...	9.6.27.
<i>Bendalder</i> ...	Cole, J. H., D.S.C. ...	"	" A.	Ben Line ...	" 6.4.27 to 21.4.27 ...	9.5.27.
<i>Bendigo</i> ...	Nicholl, R. N. C. ...	J. Young ...	" M.	P. & O. Branch	" 5.4.27 to 14.5.27 ...	16.5.27.
<i>Benefactor</i> ...	O'Connor, T. ...	A. Watson ...	" M.	Harrison ...	" 4.2.27 to 18.3.27 ...	24.3.27.
31 <i>Berengaria</i> ...	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. 10.4.27 to 5.5.27 ...	8.6.27.
<i>Berrima</i> ...	Short, C. E. ...	T. Ferguson ...	No. M.	P. & O. Branch	Form 911 8.5.27 to 22.5.27 ...	25.5.27.
<i>Berwyn</i> ...	McCombie, G. ...	D. Dunn ...	" A.	Canadian Pacific	" 29.5.27 to 13.6.27 ...	16.6.27.
<i>Bintang</i> ...	Morzer Bruyns, M. F. ...	M. C. Altins ...	" M.	Nederland	" 4.8.26 to 5.12.26 ...	7.12.26.
<i>Bogota</i> ...	Barkley, E. ...	"	" A.	R.M.S.P. Co.	" 23.1.27 to 19.3.27 ...	24.3.27.
<i>Bolingbroke</i> ...	Murray, M. F. ...	J. B. Hewson, F. G. Webster, N. Scallan, R. Davidson.	M.L.	Canadian Pacific	" 26.2.27 to 25.3.27 ...	29.3.27.
<i>Borda</i> ...	Holland, R. ...	"	No. M.	P. & O. Branch	Form 911 15.2.27 to 2.3.27 ...	22.3.27.
<i>Bothwell</i> ...	Rothwell, A. J. ...	— Biggs ...	" A.	Canadian Pacific	Met. Log. 16.9.26 to 23.3.27 ...	25.5.27.
<i>Brandon</i> ...	Sargent, A. H., R.D., Lt.-Commr., R.N.R.	T. Beck ...	" A.	"	" 1.1.27 to 23.1.27 ...	1.2.27.
<i>Brecon</i> ...	Rothwell, A. ...	E. H. Coleman ...	" A.	"	" 6.3.27 to 14.4.27 ...	20.4.27.
<i>Brenda</i> ...	Lamont, A. ...	T. Mather ...	" A.	"	" 25.7.26 to 25.8.26 ...	27.8.26.
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	C.C.	Scottish Fishery Board	" 5.5.27 to 6.6.27 ...	14.6.27.
<i>British Advocate</i> ...	Taylor, R. J. ...	E. Williams ...	No. M.	Southern Railway	" 2.5.27 to 31.5.27 ...	2.6.27.
<i>British Engineer</i> ...	Joures, F. W. ...	W. Evans ...	" M.	British Tankers	Telegraphic Report 1.6.27 ...	1.6.27.
<i>British Enterprise</i> ...	Putt, R. O. ...	"	" M.	"	Form 911 15.2.27 to 1.4.27 ...	8.4.27.
<i>British Soldier</i> ...	Putt, R. O. ...	H. J. Crangle ...	" A.	"	" 11.2.27 to 26.2.27 ...	25.5.27.
<i>Bronte</i> ...	Crappier, J. S. ...	W. Jones ...	" A.	Lampert & Holt	Form 911 17.11.26 to 10.12.26 ...	3.1.27.
<i>Burma</i> ...	Reid, R. B. ...	J. Henderson ...	" A.	Henderson ...	" 1.5.27 to 20.5.27 ...	14.6.27.
<i>Cambria C.S.</i> ...	Sherwood, C. A., D.S.C.	A. J. English, B. C. Farrow, C. F. St. John.	No.	Eastern Tel. Co.	" 24.7.26 to 10.10.26...	29.10.26.
<i>Cambria</i> ...	Telfer, J. E., O.B.E.	V. S. Phillips ...	C.C.	L.M. & S. Rly.	Met. Log. 9.9.26 to 25.1.27 ...	23.2.27.
<i>Cameronia</i> ...	Gemmell, W. ...	"	No. A.	Anchor ...	Telegraphic Report 13.6.27 ...	13.6.27.
<i>Camito</i> ...	Forrester, W. T., O.B.E.	W. T. Broome, P. C. Congdon, F. Dudgeon.	M.L.	Elders & Fyffes	Form 911 27.3.27 to 14.4.27 ...	27.4.27.
<i>Canadian Importer</i> ...	McCulloch ...	C. R. Randle ...	No. A.	Canadian Govt. Mercantile Marine.	Met. Log. 20.11.26 to 21.3.27 ...	26.3.27.
<i>Canadian Inventor</i> ...	Boulton, F. W. ...	O. Dalcorn ...	" A.	"	Form 911 18.11.26 to 4.1.27 ...	10.1.27.
<i>Canadian Miller</i> ...	McConechy, W. T. ...	C. E. Moore, H. Ruegg ...	" A.	"	" 13.2.27 to 2.6.27 ...	9.6.27.
<i>Canadian Scottish</i> ...	Wallace, C. ...	"	" A.	"	" 14.3.26 to 23.6.26 ...	15.7.26.
<i>Canadian Skirmisher</i> ...	Millar, W. H. ...	"	" A.	"	" 6.3.27 to 18.4.27 ...	30.5.27.
<i>Canadian Winner</i> ...	Hocking, N. P. ...	"	" M.	"	" 19.11.26 to 5.1.27 ...	11.1.27.
35 <i>Carnania</i> ...	Brown, F. G. R.D., Capt., R.N.R.	W. M. Stewart, P. L. Williams, D. E. Sibson.	W.T.	Cunard ...	W.T. Reg. 24.1.27 to 3.5.27 ...	23.5.27.
<i>Carnarvon Castle</i> ...	Hague, J. W., Commr., R.N.R.	S. Colbourne, H. A. Causton, G. Gorrington, H. Iddes.	M.L.	Union Castle	W.T. Reg. 16.5.27 to 2.6.27 ...	8.6.27.
34 <i>Caronia</i> ...	Hossack, W. H., R.D., Capt., R.N.R.	M. Boston, H. G. Hayward...	W.T.	Cunard ...	Form 911 9.5.27 to 1.6.27 ...	8.6.27.
<i>Casanare</i> ...	Steidemann, H. ...	"	No. A.	Elders & Fyffes	" 9.5.27 to 2.6.27 ...	9.6.27.
<i>Cavina</i> ...	Riseley, A. D. ...	W. J. Dodd ...	" A.	"	" 24.2.27 to 25.3.27 ...	31.3.27.
52 <i>Cedric</i> ...	Smith, R. G. ...	S. S. Fieldwood, D. Chamberlain, E. Lloyd.	W.T.	White Star ...	" 10.5.27 to 12.6.27 ...	15.6.27.
53 <i>Celtic</i> ...	Berry, G. ...	F. Pratt, A. Thompson, J. Peters.	"	"	W.T. Reg. 25.4.27 to 12.6.27 ...	15.6.27.
<i>Centaure</i> ...	Rose, A. F. ...	L. Johnstone ...	No. M.	A. Holt & Co.	Form 911 24.4.27 to 12.6.27 ...	14.6.27.
<i>Ceramic</i> ...	Roberts, J., C.B.E., D.S.O., R.D., Capt., R.N.R.	H. J. Yates ...	" A.	White Star ...	W.T. Reg. 8.5.27 to 29.5.27 ...	2.6.27.
<i>Change</i> ...	Gambrill, F. C. ...	J. Thomas, D. D. Tyer, J. A. Allan.	M.L.	Yuill & Co....	Form 911 8.5.27 to 2.6.27 ...	2.6.27.
<i>Changuinola</i> ...	Thorburn, R. A. ...	"	No.	Elders & Fyffes	" 22.12.26 to 2.2.27 ...	14.3.27.
<i>China</i> ...	Furlong, G. H. S., R.D., Capt., R.N.R.	M. K. Stone ...	No. M.	P. & O. ...	" 14.4.27 to 20.5.27 ...	21.5.27.
<i>Chindwara</i> ...	Brooks, E. G. ...	J. J. Smith ...	" M.	British India	Met. Log. 18.12.26 to 8.4.27 ...	7.6.27.
<i>Chindwin</i> ...	Esslemont, C. ...	W. D. Tulloch ...	" A.	Henderson ...	" 8.10.26 to 27.10.26...	15.11.26.
<i>City of Baroda</i> ...	McMillan, J. ...	A. Beaton, E. H. Routledge, H. C. Snow.	M.L.	Ellerman ...	Form 911 20.11.26 to 28.11.26 ...	29.12.26.
<i>City of Benares</i> ...	Anderson, W. W. ...	C. G. Inglis ...	No. A.	"	" 22.1.27 to 8.4.27 ...	13.4.27.
<i>City of Brisbane</i> ...	Seaborne, F. O., D.S.C.	R. M. Redhead ...	" A.	"	Met. Log. 22.7.26 to 2.1.27 ...	4.3.27.
<i>City of Canterbury</i> ...	Bremner, D. M. ...	W. F. Munro ...	" A.	"	Form 911 9.5.27 to 2.6.27 ...	9.6.27.
<i>City of Carlisle</i> ...	Mordue, J. A. ...	"	" A.	"	" 11.3.27 to 8.5.27 ...	11.5.27.
<i>City of Chester</i> ...	Letton, F. W. ...	H. Asher, W. Speakman, H. A. Hazell.	M.L.	"	" 3.4.27 to 25.4.27 ...	16.5.27.
<i>City of Edinburgh</i> ...	Wyper, J. ...	N. G. Fraser ...	No. M.	"	" 1.5.27 to 22.5.27 ...	9.6.27.
<i>City of Hong Kong</i> ...	Walton, H. L., O.B.E., R.D., Comr., R.N.R.	"	" A.	"	Met. Log. 21.9.26 to 5.2.27 ...	23.2.27.
<i>City of London</i> ...	Parker, F. W., R.D., Commr., R.N.R.	J. McHattie ...	" A.	"	Form 911 17.2.27 to 9.4.27 ...	13.4.27.
<i>City of Rangoon</i> ...	Jones, F. ...	A. Gibb ...	M.L.	"	" 29.4.27 to 22.5.27 ...	1.6.27.
<i>City of Venice</i> ...	Lee, A. ...	"	No. A.	"	" 26.2.27 to 8.5.27 ...	28.5.27.
<i>City of Yokohama</i> ...	McDonald, W. D. ...	W. N. M. Faichney ...	" A.	"	Met. Log. 4.9.26 to 4.12.26 ...	15.12.26.
<i>Clan Alpine</i> ...	Lennox, W. J. ...	G. Short ...	" A.	Clan ...	Form 911 2.3.27 to 17.3.27 ...	4.5.27.
<i>Clan Lamont</i> ...	Urquhart, P., D.S.C.	P. de Gruchy ...	" A.	"	" 17.2.27 to 17.3.27 ...	4.5.27.
					" 27.1.27 to 21.3.27 ...	6.4.27.
					" 22.2.27 to 6.6.27 ...	14.6.27.

LIST OF VOLUNTARY OBSERVING SHIPS

iii

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
<i>Glan Lindsay</i> ...	Worthington, J. H.	E. P. Smith ...	No. A.	Clan ...	Form 911 23.3.27 to 5.4.27 ...	23.5.27.
<i>Glan Macbeth</i> ...	Young, A. H., R.D., Lieut. - Commr. R.N.R.	J. M. Lorimer ...	" A.	" ...	" 8.4.27 to 5.5.27 ...	21.5.27.
<i>Glan Macfadyen</i> ...	Stenson, F. J., R.D., Capt. R.N.R.	H. M. Wavell ...	" A.	" ...	" 25.3.27 to 23.4.27 ...	27.4.27.
<i>Glan Macgillivray</i> ...	West, W. F. ...	J. H. Johnson ...	" A.	" ...	" 26.1.27 to 12.3.27 ...	22.3.27.
<i>Glan Macindoe</i> ...	Low, A. ...	J. K. Thomas ...	" A.	" ...	" 11.2.27 to 30.3.27 ...	4.4.27.
<i>Glan Mackellar</i> ...	Smith, W. P. ...	W. F. Isaac, G. E. G. Davey, J. W. Innes.	" A.	" ...	" 15.5.27 to 10.6.27 ...	14.6.27.
<i>Glan Mackinnon</i> ...	McComish, A. B. ...	W. F. Isaac, G. E. G. Davey, J. W. Innes.	M.L.	" ...	Met. Log. 21.12.26 to 5.5.27 ...	13.5.27.
<i>Glan Macphee</i> ...	Gourlay, J. B. ...	D. S. Rae, A. F. Martin, W. A. Shewan.	"	" ...	" 14.5.26 to 2.5.27 ...	9.6.27.
<i>Glan Macnaughton</i> ...	Simpson, A. W. ...	F. Cossar ...	No. A.	" ...	Form 911 21.2.27 to 14.3.27 ...	23.3.27.
<i>Glan Macnagart</i> ...	Mee, F. T. ...	S. A. Carter, R. J. Richardson	" A.	" ...	" 9.4.27 to 16.5.27 ...	21.5.27.
<i>Glan Macwhirter</i> ...	Waterhouse, J. ...	R. W. Roberts ...	M.L.	" ...	" 26.11.26 to 12.12.26	17.12.26.
<i>Glan Macwilliam</i> ...	Williamson, A. ...	T. B. Cranwill ...	No. A.	" ...	" 28.8.26 to 9.10.26 ...	30.10.26.
<i>Glan Malcolm</i> ...	Neill, G. A. ...	J. T. Bell, H. V. Wightman, A. R. McDonald.	M.L.	" ...	Met. Log. 23.9.26 to 3.3.27 ...	30.3.27.
<i>Glan Morrison</i> ...	Porterfield, W. M. ...	L. C. Higgins ...	No. A.	" ...	Form 911 19.4.27 to 16.5.27 ...	14.6.27.
<i>Glan Murdoch</i> ...	Miller, W. ...	H. F. M. Preston ...	" A.	" ...	" 17.3.27 to 24.5.27 ...	9.6.27.
<i>Glan Ranald</i> ...	Laird, C. ...	J. B. Templeman ...	" A.	" ...	" 23.2.27 to 21.3.27 ...	21.4.27.
<i>Glan Ross</i> ...	Openshaw, L. G. ...	H. T. Booth ...	" A.	" ...	" 7.3.27 to 22.5.27 ...	14.6.27.
<i>Glan Sinclair</i> ...	George, L. S. ...	N. Macleod ...	" A.	" ...	" 13.3.27 to 3.5.27 ...	14.6.27.
<i>Glan Urquhart</i> ...	Baker, E. W. ...	E. A. Hewson ...	" A.	" ...	" 8.2.27 to 8.5.27 ...	12.5.27.
<i>Colonia, C.S.</i> ...	Carlton, G. F., O.B.E., Commr. R.N.R.	W. E. Allen, W. F. Anderson, F. B. Bolingbroke.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 4.12.26 to 25.2.27 ...	8.3.27.
<i>Colonian</i> ...	Gittins, R. P. ...	... ..	No. A.	Leyland ...	Form 911 15.4.27 to 8.6.27 ...	10.6.27.
<i>Comorin</i> ...	Borland, J. Mc. I., C.B., D.S.O., R.D., Capt. R.N.R.	B. Pollitt ...	" M.	P. & O. ...	" 26.2.27 to 2.6.27 ...	8.6.27.
<i>Concordia</i> ...	Telfer, J. H. ...	T. Philip, J. McIntosh, S. R. McNie.	M.L.	Anchor Donaldson ...	Met. Log. 3.9.26 to 14.1.27 ...	24.1.27.
<i>Corinthic</i> ...	Hart, F. ...	E. Burt, J. Wartire, M. Ben- nett.	"	White Star ...	" 3.12.26 to 19.3.27 ...	11.4.27.
<i>Cornwall</i> ...	Haines, F. P. ...	H. S. White ...	No. A.	Federal ...	Form 911 26.1.27 to 28.2.27 ...	12.4.27.
<i>Craftsman</i> ...	Gibbings, W. ...	J. Williams ...	" A.	Harrison ...	" 23.12.26 to 10.3.27 ...	14.3.27.
<i>Crawford Castle</i> ...	Morgan, A. O., R.D., Commr. R.N.R.	J. A. Wilson ...	" A.	Union Castle ...	" 7.4.27 to 4.5.27 ...	9.6.27.
<i>Culebra</i> ...	Mackay, A. S., R.D., Commr. R.N.R.	P. Cooper, F. B. Collinson, J. W. Smith.	M.L.	R.M.S.P. Co. ...	Met. Log. 27.12.26 to 23.3.27...	12.4.27.
<i>Cumberland</i> ...	Deith, G. T. ...	J. D. Marks ...	No. A.	Federal ...	Form 911 7.8.26 to 8.1.27 ...	9.2.27.
<i>Cuthbert</i> ...	Barlow, F. P. ...	... ..	" A.	Booth ...	" 26.3.27 to 21.4.27 ...	16.5.27.
<i>Cyclops</i> ...	Cosker, W. ...	J. R. C. Evans ...	" A.	A. Holt ...	" 12.3.27 to 1.4.27 ...	19.4.27.
<i>Dardanus</i> ...	Williams, D. T. ...	C. F. Morgan ...	" M.	" ...	" 29.3.27 to 19.4.27 ...	16.5.27.
<i>Darian</i> ...	Masters, W. ...	A. S. Holland ...	" A.	Leyland ...	" 7.5.27 to 20.5.27 ...	23.5.27.
<i>Darro</i> ...	Matthews, G. P. ...	W. Halder-Campe ...	" M.	R.M.S.P. Co. ...	" 22.4.27 to 13.5.27 ...	16.5.27.
<i>Demerara</i> ...	Willan, F. C. L. ...	J. R. Baty ...	" M.	" ...	" 8.3.27 to 28.4.27 ...	4.5.27.
<i>Demosthenes</i> ...	Orriss, F. A. ...	J. Cruickshank ...	" M.	Aberdeen ...	" 5.2.27 to 17.3.27 ...	23.3.27.
<i>Deseado</i> ...	Shillito, B., R.D., Commr. R.N.R.	L. D. Jennings ...	" M.	R.M.S.P. Co. ...	" 26.2.27 to 18.3.27 ...	29.3.27.
<i>Desna</i> ...	Green, J. ...	A. F. Walker ...	" M.	" ...	" 3.12.26 to 19.1.27 ...	31.1.27.
<i>Deucalion</i> ...	Findlay, J. ...	R. Wilson ...	" A.	A. Holt ...	" 3.3.27 to 9.4.27 ...	12.4.27.
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	" C.C.	Southern Railway ...	Telegraphic Report 16.6.27 ...	16.6.27.
<i>Dimboola</i> ...	Roy, C. M. ...	S. J. Griffith ...	No. A.	Melbourne S.S. Co. ...	Form 911 18.3.27 to 12.4.27 ...	16.5.27.
<i>Discoverer</i> ...	Ling, J. T. ...	C. C. Heaton ...	" M.	Harrison ...	" 16.10.26 to 20.3.27...	23.3.27.
<i>Discovery, R.R.S.</i> ...	Stenhouse, J. R., D.S.O., D.S.C., O.B.E., R.D., Commr. R.N.R.	T. W. Goodchild ...	M.L.	Discovery Expedition	Met. Log. 8.5.26 to 11.7.26 ...	30.9.26.
<i>Domala, M.V.</i> ...	Kitson, A. G. ...	J. G. Wallace ...	No. M.	British India ...	Form 911 28.3.27 to 4.6.27 ...	15.6.27.
<i>Domitia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr. R.N.R.	S. A. Garnham, C. Bullock, L. J. Hegarty, R. Johnson.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 11.9.26 to 4.2.27 ...	25.2.27.
<i>Doric</i> ...	Bolton, S., D.S.C., R.D., R.N.R.	J. A. Heenan ...	No. A.	White Star ...	Form 911 15.5.27 to 4.6.27 ...	9.6.27.
<i>Doric Star</i> ...	Thomas, R. T. ...	L. McDermott ...	" A.	Blue Star ...	" 22.11.26 to 20.12.26	10.1.27.
<i>Dorington Court</i> ...	Clarke, E. J. ...	E. W. Blomberg ...	" A.	Haldin & Co. ...	" 11.2.27 to 1.5.27 ...	9.5.27.
<i>Dromore Castle</i> ...	Vincent, E. S., R.D., Commr. R.N.R.	D. H. McDougall ...	" A.	Union Castle ...	" 10.12.26 to 3.4.27 ...	13.4.27.
<i>Dryden</i> ...	Major, T. W. ...	... ..	" M.	Lampport & Holt ...	" 27.2.27 to 18.3.27 ...	4.5.27.
<i>Duendes</i> ...	Pape, E. R. ...	W. Billington ...	" M.	P.S.N. Co. ...	" 18.5.27 to 9.6.27 ...	10.6.27.
<i>Dunaff Head</i> ...	Butt, H. L., R.D., Commr. R.N.R.	S. Duff ...	" A.	Ulster S.S. Co. ...	" 3.2.27 to 15.5.27 ...	23.5.27.
<i>Dundrum Castle</i> ...	Weller, H. E. ...	... ..	" A.	Union Castle ...	" 27.1.27 to 24.2.27 ...	14.3.27.
<i>Dunrobin</i> ...	Ramsay, J. D. ...	C. H. Kendall ...	" A.	Glen & Co. ...	" 11.4.27 to 19.5.27 ...	17.6.27.
<i>Duquesa</i> ...	Ellis, F., D.S.C. ...	E. W. Denman ...	" M.	Furness Withy ...	" 1.4.27 to 18.5.27 ...	25.5.27.
<i>Durenda</i> ...	Beeching, P. H. ...	... ..	" A.	British India ...	" ... ..	...
<i>Edinburgh Castle</i> ...	Knight, A. ...	... ..	No. A.	Union Castle ...	" 6.5.27 to 22.5.27 ...	24.5.27.
<i>Egyptian Prince</i> ...	Ord, T. ...	... ..	"	Prince ...	" 13.1.27 to 7.3.27 ...	31.3.27.
<i>Elmina</i> ...	Williams, T. E. ...	E. Anders, G. G. S. Short, E. S. James.	M.L.	Elder Dempster ...	Met. Log. 3.11.26 to 21.3.27 ...	26.3.27.
<i>El Paraguayo</i> ...	Smith, F. C. ...	G. Fletcher ...	No. M.	Houlder Bros. ...	Form 911 12.3.27 to 4.5.27 ...	11.5.27.
<i>Elpenor</i> ...	Gordon, A. L. ...	M. Robertson, C. Kavanagh	M.L.	A. Holt ...	Met. Log. 11.10.26 to 7.2.27 ...	10.2.27.
<i>Elysia</i> ...	Duncan, A. R. ...	A. Laidlaw, H. C. Fry, J. A. Leitch.	"	Anchor ...	" 4.2.27 to 10.4.27 ...	22.4.27.
<i>Empress of Asia</i> ...	Lovegrove, A. V. R., D.S.O., R.D., Capt. R.N.R.	R. H. Foley, L. Johnston, L. C. Hogg, W. T. Miller.	"	Canadian Pacific ...	" 16.9.26 to 23.1.27 ...	2.3.27.
<i>Empress of Canada</i> ...	Robinson, S., C.B.E., R.D., Commr. R.N.R.	... ..	"	" ...	" 1.10.26 to 12.2.27 ...	22.3.27.
<i>Empress of France</i> ...	Griffiths, E. ...	E. Roberts, W. Ewens, W. Pickersgill.	"	" ...	" 29.1.27 to 15.4.27 ...	1.5.27.
<i>Empress of Russia</i> ...	Hosken, A. J. ...	F. A. R. Dobbin ...	"	" ...	" 25.12.26 to 8.5.27 ...	13.6.27.
<i>Empress of Scotland</i> ...	Latta, R. G. ...	P. Powys Smith, T. Sargent, E. Aikman.	"	" ...	" 14.11.26 to 22.4.27...	3.5.27.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
<i>Endeavour</i> ...	Commr. S. A. Geary-Hill, D.S.O., R.N.	C. S. E. Lansdown ...	M.L.	His Majesty's Ship ...	Form 911 14.11.26 to 13.3.27...	28.3.27.
<i>Essequibo</i> ...	Kite, E. ...	H. E. Hughes ...	No. M.	R.M.S.P. Co. ...	" 24.2.27 to 22.4.27 ...	26.4.27.
<i>Eumaeus</i> ...	Read, J. W. ...	J. L. Millar ...	" A.	A. Holt ...	" 6.3.27 to 6.5.27 ...	14.6.27.
<i>Euripides</i> ...	Collins, P. J., O.B.E.	H. S. Cox, K. D. Fisher, P. Congdon.	M.L.	Aberdeen ...	Met. Log. 1.1.27 to 8.5.27 ...	14.5.27.
<i>Euryades</i> ...	Stewart, J. R. ...	... ..	No. A.	A. Holt ...	Form 911 22.2.27 to 3.4.27 ...	6.4.27.
<i>Explorer</i> ...	Allan, J. ...	A. Stout ...	" A.	Scottish Fishery Board	" 2.5.27 to 28.5.27 ...	10.6.27.
<i>Ferndale</i> ...	Daniel, F. ...	E. F. Pember ...	" M.	Commonwealth Govt. ...	" 21.4.27 to 29.4.27 ...	9.5.27.
<i>Flandria</i> ...	Maars, L. ...	T. Doornbosch ...	" M.	Holland Lloyd ...	" 15.4.27 to 2.6.27 ...	9.6.27.
<i>Francisco</i> ...	Scales, H. ...	J. C. Nettleship ...	" A.	Ellerman Wilson ...	" 22.1.27 to 4.3.27 ...	17.3.27.
<i>Freya</i> ...	Angus W. ...	W. Pirrie ...	" A.	Scottish Fishery Board	" 1.5.27 to 31.5.27 ...	9.6.27.
<i>Gaika</i> ...	Whitfield, G. J. ...	R. E. H. Partington ...	" A.	Union Castle ...	" 26.1.27 to 21.4.27 ...	4.5.27.
<i>Galtymore</i> ...	Southerland, E. ...	R. B. Gurner ...	" M.	Furness Withy ...	" 12.3.27 to 23.3.27 ...	29.3.27.
<i>Garret</i> ...	Visser, C. W. ...	C. J. Vandenboom ...	" M.	Rotterdam Lloyd ...	" 1.4.27 to 14.4.27 ...	4.5.27.
<i>Garth Castle</i> ...	Jackson, C. R. ...	W. S. J. Aldous ...	" A.	Union Castle ...	" 8.4.27 to 30.4.27 ...	23.5.27.
<i>Getria</i> ...	Veldkamp, G. J. ...	T. van der Mast ...	" M.	Holland Lloyd ...	" 22.4.27 to 13.5.27 ...	16.5.27.
<i>Geranium</i> ...	Bennett, H. T., D.S.O., Commr. R.A.N.	... ..	M.L.	His Majesty's Australian Ship	... ..	...
<i>Glamorganshire</i> ...	Spriddell, F. G. ...	... ..	No. M.	R.M.S.P. Co. ...	... ..	...
<i>Glenamoy, M.V.</i> ...	Homan, C. E. ...	R. H. Bishop ...	" A.	Glen Line ...	Form 911 28.2.27 to 9.5.27 ...	12.5.27.
<i>Glengarry</i> ...	Angier, J. ...	C. S. Brewer ...	" A.	" ...	" 21.4.27 to 15.5.27 ...	18.5.27.
<i>Glentuce</i> ...	Kennett, W. H. ...	J. Rankine ...	" A.	" ...	" 21.3.27 to 11.5.27 ...	14.6.27.
<i>Glenshane</i> ...	Beer, E. ...	D. C. Evans ...	" A.	" ...	" 4.2.27 to 21.4.27 ...	4.5.27.
<i>Gloucestershire</i> ...	Robin, E. ...	H. J. Jarrett ...	" A.	Bibby ...	" 12.3.27 to 20.5.27 ...	23.5.27.
<i>Gorgon...</i> ...	Hughes, J. W. ...	A. E. Bowlt, E. W. Powell, J. M. T. Edward.	M.L.	A. Holt & Co. ...	" 29.10.26 to 7.4.27 ...	9.5.27.
<i>Halesius</i> ...	... ..	... ..	No. A.	R. P. Houston ...	... ..	...
<i>Haliartius</i> ...	Marsh, L. V. ...	... ..	" A.	" ...	Form 911 24.2.27 to 20.3.27 ...	4.5.27.
<i>Harmonides</i> ...	Hughes, W. F. ...	S. S. Davidson ...	" A.	" ...	" 10.4.27 to 2.5.27 ...	16.5.27.
<i>Hatarana</i> ...	Graham, H. A. ...	... ..	M.L.	British India ...	... ..	...
<i>Hatimura</i> ...	Lane, S. R., R.D., Capt. R.N.R.	... ..	No. M.	" ...	... ..	...
<i>Hauraki, M.V.</i> ...	Frew, J. D. ...	B. F. Fisher ...	M.L.	Union S.S. Co., N.Z....	Met. Log. 11.8.26 to 6.3.27 ...	9.6.27.
<i>Henry Holmes, C.S.</i> ...	Bicker Caarten, A. ...	K. G. M. Pearce ...	No. M.	W. I. & Panama Telegraph Co.	Form 911 25.4.27 to 14.5.27 ...	15.6.27.
<i>Herald</i> ...	Silk, H. V., Lieut.-Commr., R.N.	D. G. V. Williams ...	M.L.	His Majesty's Ship ...	Met. Log. 4.9.26 to 30.11.26 ...	27.1.27.
<i>Herefordshire</i> ...	Mann, R. P. ...	H. R. Mackay ...	No. A.	Bibby ...	Form 911 21.8.26 to 29.1.27 ...	7.2.27.
<i>Herminius</i> ...	Roberts, T. V. ...	G. P. McCraith ...	" A.	Shaw, Savill & Albion	" 25.9.26 to 11.10.26...	22.11.26.
<i>Herschel</i> ...	Watson, W. W. ...	J. F. Maurey ...	" A.	Lampart & Holt ...	" 21.3.27 to 4.4.27 ...	25.4.27.
<i>Hertford</i> ...	Urquhart, D. ...	A. Robertson ...	" A.	Federal ...	" 1.2.27 to 21.2.27 ...	4.4.27.
<i>Hibernia</i> ...	Tanner, E. B., O.B.E.	R. Woodall ...	C.C.	L.M. & S. Rly. ...	Telegraphic Report, 16.6.27 ...	16.6.27.
<i>Highland Heather</i> ...	Powell, G. A. ...	J. H. Fitton, J. Hardy ...	No. A.	Nelson ...	Form 911 13.12.25 to 24.6.26	14.7.26.
" <i>Laddie...</i> ...	Alford, C. ...	E. F. Smart ...	" A.	" ...	" 23.11.26 to 14.1.27	24.1.27.
" <i>Piper</i> ...	Collings, D. ...	S. E. Jackson, R. G. Owen, G. E. Leech.	M.L.	" ...	Met. Log. 11.10.26 to 12.5.27...	8.6.27.
" <i>Pride</i> ...	Robinson, R. H. ...	... ..	No. A.	" ...	Form 911 8.4.27 to 6.6.27 ...	10.6.27.
" <i>Prince...</i> ...	Brown, J. B. ...	S. A. Wheaton ...	" A.	Prince ...	" 28.4.27 to 9.5.27 ...	20.5.27.
" <i>Rover</i> ...	Ashby Graves, F. ...	C. C. Legg ...	" A.	Nelson ...	" 1.2.27 to 24.3.27 ...	4.4.27.
<i>Hildebrand</i> ...	Maddrell, J. ...	... ..	" A.	Booth ...	" 16.3.27 to 28.4.27 ...	4.5.27.
<i>Hobson's Bay</i> ...	Kydd, O. J. ...	R. Pearce, G. Clinch, H. Benson, H. Hendy.	M.L.	Commonwealth Govt.	Met. Log. 18.1.27 to 8.5.27 ...	18.5.27.
<i>Holbein</i> ...	Gough, W. A. ...	H. L. Rudd ...	No. A.	Lampart & Holt ...	Form 911 9.1.27 to 18.3.27 ...	23.3.27.
<i>54 Homeric</i> ...	Holme, A. ...	A. S. Dyer, H. G. Morgan, S. B. Morfee.	W.T.	White Star... ..	W.T. Reg. 12.5.27 to 27.5.27 ...	31.5.27.
<i>Hororata</i> ...	Holland, E. ...	B. Evans, F. Malcounonne	No. A.	New Zealand S.S. Co.	Form 911 22.1.27 to 17.5.27 ...	21.5.27.
<i>Hubert...</i> ...	Evans, L. ...	S. G. Edwards ...	" A.	Booth ...	" 12.1.27 to 10.3.27 ...	4.4.27.
<i>Huntingdon</i> ...	Ashworth, W. ...	A. Carlyon ...	" A.	Federal ...	" 18.4.27 to 2.5.27 ...	23.5.27.
<i>Huntsman</i> ...	Dunn, E. ...	... ..	No.	Harrison ...	... ..	...
<i>Hurumui</i> ...	Burton Davies, J. ...	J. Oxnard, L. C. Hill, L. Cann, K. Goldsworthy.	M.L.	New Zealand S.S. Co.	Met. Log. 10.10.26 to 18.11.26	26.11.26.
<i>Ingoma</i> ...	Barrow, R. K. ...	D. G. Russell ...	No. M.	Harrison ...	Form 911 14.4.27 to 27.5.27 ...	8.6.27.
<i>Inkum</i> ...	Meetham, J. T. ...	... ..	" A.	J. H. Welsford ...	... ..	...
<i>Iris, C.S.</i> ...	Hughes, H. R. ...	W. Oliver, D. Bruce, D. MacDonald, T. Vickers.	M.L.	Pacific Cable Board ...	Met. Log. 23.1.26 to 25.4.26 ...	5.10.26.
<i>Iroquois</i> ...	Jackson, A. L., Commr., R.N.	H. L. Jenkins ...	"	His Majesty's Ship ...	" 24.8.26 to 3.12.26 ...	15.2.27.
<i>Ixion</i> ...	Reed, G. C. ...	C. W. R. Murphy ...	No. A.	A. Holt ...	Form 911 10.1.27 to 10.3.27 ...	19.4.27.
<i>Javanese Prince</i> ...	Naylor, E. ...	W. Venn ...	" A.	Prince ...	" 30.3.27 to 26.4.27 ...	23.5.27.
<i>Jervis Bay</i> ...	Chaplin, W. R. ...	R. W. Laycock ...	" M.	Commonwealth Govt.	" 30.3.27 to 18.4.27 ...	9.5.27.
<i>John Pender, C.S.</i> ...	Smythe, T. W. ...	H. W. Milne ...	" A.	Eastern Tel. Co. ...	" 8.9.26 to 25.9.26 ...	25.10.26.
<i>Justin</i> ...	Lee, O. J. P., R.D., Commr., R.N.R.	... ..	" A.	Booth ...	" 25.4.27 to 8.5.27 ...	10.6.27.
<i>Kaisar-i-Hind</i> ...	Manley, G. ...	A. H. Cole ...	" M.	P. & O. ...	" 30.4.27 to 19.5.27 ...	8.6.27.
<i>Kalyan</i> ...	Cotching, A. ...	... ..	" M.	P. & O. ...	... ..	...
<i>Kamo Maru</i> ...	Shiratori, S. ...	... ..	" A.	Nippon Yusen Kaisha	Form 911 15.1.27 to 15.2.27 ...	6.4.27.
<i>Kangaroo</i> ...	Norris, H. C. ...	V. J. Denton, V. L. Gilbert, H. Brackenridge.	M.L.	State Service Australia	Met. Log. 21.11.26 to 30.4.27...	13.6.27.
<i>Karapara</i> ...	Miller, A. C. ...	J. W. Knight ...	No. M.	British India ...	Form 911 24.11.26 to 7.1.27 ...	24.1.27.
<i>Kashmir</i> ...	Stringer, R. H., O.B.E., R.D., Commr., R.N.R.	J. H. Anderson ...	" M.	P. & O. ...	" 8.4.27 to 27.4.27 ...	30.5.27.
<i>Kenilworth Castle</i> ...	Chave, Sir B., K.B.E.	... ..	M.L.	Union Castle ...	Met. Log. 8.8.26 to 30.1.27 ...	5.4.27.
<i>Kent</i> ...	Downton, M. M. ...	F. M. Knight ...	No. A.	New Zealand S.S. Co.	Form 911 28.7.26 to 31.8.26 ...	8.9.26.
<i>Khiva</i> ...	Cooper, C. P., O.B.E., R.D., Capt., R.N.R.	G. W. Wood, F. Hewison, E. Allen.	M.L.	P. & O. ...	Met. Log. 12.3.27 to 19.4.27 ...	8.6.27.
<i>Khyber...</i> ...	Hester, C. W., R.D., Commr., R.N.R.	C. B. Roche, E. J. Parry, H. D. Case, G. S. B. Collard.	"	P. & O. ...	" 1.1.27 to 19.5.27 ...	23.5.27.
<i>Kia Ora</i> ...	McIntosh, A. ...	E. A. Hickling, J. Laurensen	"	Shaw Savill & Albion	" 21.6.26 to 15.12.26...	30.12.26.
<i>Knight Companion</i> ...	Cox, B. T. ...	... ..	No. M.	A. Holt ...	Form 911 3.3.27 to 15.3.27 ...	23.3.27.
<i>Koolinda, M. V.</i> ...	Norris, H. ...	J. S. Airey ...	" M.	State Service, Australia	" 9.4.27 to 1.5.27 ...	8.6.27.
<i>Kono</i> ...	Dossor, W. A. ...	H. Redfern, A. Snowdon, A. Hebblewhite.	M.L.	Ellerman Wilson ...	Met. Log. 12.6.26 to 26.11.26	27.11.26.
<i>Kyogle</i> ...	Coalstad, C. ...	E. W. Hughes, C. B. Odman	No. A.	Commonwealth Light-house Service.	Form 911 26.11.26 to 19.12.26	7.2.27.
<i>37 Lacontia</i> ...	Britten, E. T. ...	T. Parry, J. Ashcroft, J. W. Caunce.	W.T.	Cunard	W.T. Reg. 24.4.27 to 14.5.27 ... Form 911. 24.4.27 to 14.5.27 ...	18.5.27. 18.5.27.

LIST OF VOLUNTARY OBSERVING SHIPS

v

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received
<i>Lady Denison</i> ... <i>Pen-der, C.S.</i> ...	West, G. W. ... Pattison, G. H. ...	F. Lawrence ...	No. A.	Eastern Tel. Co. ...	Form 911 9.5.26 to 7.7.26 ...	7.8.26.
<i>Laguna</i> ...	Kirkwood, J. H. ...	E. A. Owen ...	" A.	Pacific S.N. Co. ...	" 9.3.27 to 27.3.27 ...	19.4.27.
<i>Lahore</i> ...	Dawson, E. N. ...	W. G. Stevenson ...	" M.	P. & O. ...	Met. Log. 27.11.26 to 31.12.26 ...	5.1.27.
<i>Lalande</i> ...	Hamill, H. ...	A. E. Warburton ...	" A.	Lampport & Holt ...	Form 911 21.11.26 to 12.3.27... ..	29.3.27.
<i>Lancashire</i> ...	de Legh, P. ...	F. Holdsworth ...	" A.	Bibby ...	" 1.1.27 to 13.3.27 ...	16.3.27.
<i>36 Lancastriu</i> ...	Oram, B. B., R.D., Capt., R.N.R.	R. P. Campbell, L. R. Sharp, F. G. Russell	" W.T.	Cunard ...	W.T. Reg. 8.5.27 to 2.6.27 ...	7.6.27.
<i>Laomedon</i> ...	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	H. A. Standfield ...	No. A.	A. Holt ...	Form 911 7.5.27 to 2.6.27 ...	9.6.27.
<i>La Paz, M.V.</i> ...	Benson, C. W. ...	D. Beamer ...	" M.	Pacific S.N. Co. ...	" 23.4.27 to 9.5.27 ...	28.5.27.
<i>Laplace</i> ...	Shaw, W. ...	A. L. Murray, R. D. Cottam	" A.	Lampport & Holt ...	" 18.11.26 to 31.3.27... ..	13.4.27.
<i>55 Lapland</i> ...	Knight, R. A. Morehouse, W. M. ...	E. Cornellie, J. C. Flett ...	W.T.	Red Star ...	W.T. Reg. 13.4.27 to 30.4.27 ...	4.5.27.
<i>Lautaro, M.V.</i> ...	Dunn, R. E. ...	" ...	No.	Pacific S.N. Co. ...	Form 911 12.4.27 to 1.5.27 ...	4.5.27.
<i>Leicestershire</i> ...	Lyon, H. ...	J. Cullen, P. Hawkins, J. K. Gemmell, H. S. Vickers.	M.L.	Bibby ...	Met. Log. 13.2.27 to 15.4.27 ...	27.4.27.
<i>Leighton, M.V.</i> ...	Lindesay, J. M. ...	J. T. A. Thomson ...	No. A.	Lampport & Holt ...	Form 911 21.2.27 to 12.3.27 ...	4.4.27.
<i>Leitrim</i> ...	Robertson, A. ...	" ...	" A.	Dowie, J., & Co. ...	" 22.2.27 to 9.4.27 ...	19.4.27.
<i>Llandaff Castle</i> ...	Morton Betts, W. ...	" ...	No.	Union Castle ...	" ...	" ...
<i>Llandovery Castle</i> ...	Owens, G. ...	" ...	M.L.	" ...	" ...	" ...
<i>Loch Katrine</i> ...	Buret, T. J. C. ...	R. J. Finch ...	No. M.	R.M.S.P. Co. ...	Form 911 5.2.27 to 2.5.27 ...	12.5.27.
<i>London Commerce</i> ...	Young, H. J., D.S.C.	" ...	" A.	Furness Withy ...	" 14.4.27 to 17.5.27 ...	23.5.27.
<i>London Importer</i> ...	Fowler, W. H. ...	J. S. Williams, W. Stanley ...	M.L.	" ...	Met. Log. 23.1.27 to 15.4.27 ...	1.5.27.
<i>Lord Antrim</i> ...	Jarvis, F. E. ...	L. G. Kirwan ...	No. A.	Ulster S.S. Co. ...	Form 911 27.4.27 to 10.5.27 ...	23.5.27.
<i>Loriga, M.V.</i> ...	Clapham, E. C. ...	R. W. Gill ...	" A.	Pacific S.N. Co. ...	" 28.1.27 to 12.4.27 ...	19.4.27.
<i>Losada, M.V.</i> ...	Ross, J. ...	E. Baxter ...	" M.	" ...	" 23.2.27 to 16.5.27 ...	24.5.27.
<i>Macedonia</i> ...	Potter, H. W., R.D., Commr., R.N.R.	E. Lee ...	" M.	P. & O. ...	" 21.5.27 to 31.5.27 ...	14.6.27.
<i>Macharda</i> ...	Tyers, W. O. ...	W. Cowie ...	" M.	Brocklebank ...	" 3.5.27 to 13.5.27 ...	23.5.27.
<i>Mahana</i> ...	Kershaw, W. A. R.	F. M. Smith, H. C. Smith, J. C. K. Rogers.	" A.	Shaw, Savill & Albion	Met. Log. 15.4.26 to 10.8.26 ...	30.8.26.
<i>Maharani</i> ...	Hinton, J. C. ...	H. A. Hartley, M. Haslett ...	" M.	Asiatic S.N. Co. ...	Form 911 21.12.26 to 11.5.27 ...	8.6.27.
<i>Maihar</i> ...	Elliott, G. F. Rowe, J. P. ...	C. Shaw, C. Cadwallader, S. S. Slade.	M.L.	Brocklebank ...	Met. Log. 24.7.26 to 1.5.27 ...	10.5.27.
<i>Maimyo</i> ...	Smith, G. C. ...	H. M. Drummond... ..	No. A.	" ...	Form 911 21.3.27 to 2.5.27 ...	9.6.27.
<i>Maiwara</i> ...	Brown, T. M. ...	" ...	M.L.	Burns Philp ...	" ...	" ...
<i>58 Majestic</i> ...	Metcalfe, G. R. ...	W. W. Pearson, L. Thompson	W.T.	White Star ...	W.T. Reg. 5.5.27 to 19.5.27 ...	23.5.27.
<i>Makambo</i> ...	Brown, T. M. ...	F. C. Vogelmann, W. O. L. Wilding, J. B. Norris, R. W. Holmes.	M.L.	Burns Philp ...	Met. Log. 26.5.27 to 9.6.27 ...	13.6.27.
<i>Makura</i> ...	Davey, A. H. ...	O. C. Bray, W. J. Weber, L. P. Bourke.	"	Canadian-Australasian	" 16.10.26 to 3.3.27 ...	17.5.27.
<i>Malabar</i> ...	Mawson, J. ...	" ...	"	" ...	" 9.9.26 to 20.1.27 ...	7.2.27.
<i>Malakuta</i> ...	Hillman, E. J. ...	R. Morris ...	" M.	Burns, Philp & Co. ...	" 6.7.26 to 15.12.26 ...	23.3.27.
<i>Malancha</i> ...	Adamson, F. L. ...	N. Grayson ...	No. M.	Brocklebank ...	Form 911 15.4.27 to 19.5.27 ...	24.5.27.
<i>Malda</i> ...	Sharpe, G. ...	R. Humble ...	" M.	" ...	" 5.2.27 to 24.2.27 ...	4.5.27.
<i>Maloja</i> ...	Gray, T. N. ...	W. S. Donald, A. A. Parker... ..	" M.	British India ...	" 20.1.27 to 24.2.27 ...	5.3.27.
<i>Mamari</i> ...	Warner, S. C. ...	" ...	" M.	P. & O. ...	" ...	" ...
<i>Manchester Brigade</i> ...	Falconer, H. ...	P. Campbell ...	" A.	Shaw, Savill & Albion	Form 911 30.4.27 to 16.5.27 ...	9.6.27.
<i>Manchester Corporation</i> ...	Stott, C. H. ...	" ...	" A.	Manchester Liners ...	" 23.4.27 to 23.5.27 ...	26.5.27.
<i>Manchester Hero</i> ...	Makin, T. ...	H. Swindells ...	" A.	" ...	" 2.4.27 to 16.5.27 ...	9.6.27.
<i>Manchester Merchant</i> ...	Riley, J. E. ...	J. H. Emmitt, H. Anderton, B. M. Brown.	M.L.	" ...	Met. Log. 31.7.26 to 10.2.27 ...	9.3.27.
<i>Manchester Regiment</i> ...	Struss, F. D. ...	E. W. Jeffries ...	No. A.	" ...	Form 911 26.6.26 to 11.8.26 ...	20.8.26.
<i>Manchester Shipper</i> ...	Foale, J. R. ...	J. Shaw ...	" A.	" ...	" 17.4.27 to 14.5.27 ...	26.5.27.
<i>Manipur</i> ...	Dormer, A. E. ...	H. Swindells ...	M.L.	" ...	Met. Log. 24.7.26 to 16.11.26... ..	29.11.26.
<i>Mantua</i> ...	Cochran, G. N. ...	R. Penston, K. Leadbetter ...	No. M.	Brocklebank ...	Form 911 6.1.27 to 4.2.27 ...	8.3.27.
<i>Marella</i> ...	Randell, G. G. ...	" ...	" M.	P. & O. ...	" 23.4.27 to 12.5.27 ...	8.6.27.
<i>Marengo</i> ...	Mortimer, S. ...	" ...	" M.L.	Burns Philp ...	Met. Log. 3.10.25 to 7.11.26 ...	5.4.27.
<i>Margha</i> ...	Williams, J. C., R.D., Commr., R.N.R.	F. Barnard, H. Bryon, J. Ford	"	Ellerman Wilson ...	" 14.1.27 to 21.2.27 ...	16.3.27.
<i>Marsina</i> ...	Milne, R. A., R.D., Commr., R.N.R.	P. Wright, H. E. Evans, R. M. Wyatt, R. A. Clarke.	"	British India ...	" 27.2.27 to 7.5.27 ...	18.5.27.
<i>Masirah</i> ...	Rothery, S. ...	H. C. Tarrington ...	No. A.	Burns, Philp & Co. ...	Form 911 15.9.26 to 6.10.26 ...	15.11.26.
<i>Matakana</i> ...	Mallett, R. ...	A. E. Evans ...	" M.	Brocklebank ...	" 12.9.26 to 13.10.26... ..	16.11.26.
<i>Matarara</i> ...	Thurston, H. P. ...	J. Hart, J. Dickson, G. E. Lindsay.	M.L.	Shaw, Savill & Albion	Met. Log. 1.2.27 to 13.3.27 ...	18.3.27.
<i>Matheran</i> ...	Voy, W. ...	V. V. Edmonds ...	No. A.	Burns Philp & Co. ...	Form 911 26.12.26 to 20.1.27... ..	28.2.27.
<i>Matiana</i> ...	Kershaw, W. A. R.	T. T. Oliver, J. J. Nicoll, J. C. K. Rogers.	M.L.	Shaw, Savill & Albion	Met. Log. 6.11.26 to 20.2.27 ...	9.3.27.
<i>Matungani</i> ...	Ison, W. A. ...	L. Jeans, H. Simpson, J. Richardson.	"	Brocklebank ...	" 2.2.27 to 29.4.27 ...	30.5.27.
<i>32 Mauretania</i> ...	Green, F. V. ...	R. M. Morrison ...	No. M.	British India ...	Form 911 18.4.27 to 24.5.27 ...	25.5.27.
<i>Media</i> ...	Davey, A. H. ...	C. G. Eustace ...	" M.	Union S.S. Co. of N.Z. ...	" 4.6.26 to 9.7.26 ...	23.8.26.
<i>Medic</i> ...	Diggle, E. G., R.D., Capt., R.N.R.	E. R. Taylor, J. A. Quarrie, G. Duguid.	W.T.	Cunard ...	W.T. Reg. 15.5.27 to 30.5.27 ...	1.6.27.
<i>Megantic</i> ...	Mallett, R. ...	S. C. Cramb ...	No. A.	T. & J. Brocklebank... ..	Form 911 2.5.26 to 28.6.26 ...	7.7.26.
<i>22 Melita</i> ...	Jones, W. H. ...	W. Nicoll ...	" A.	White Star ...	" 10.3.27 to 18.4.27 ...	21.4.27.
<i>Memnon</i> ...	Trant, E. L., R.D., Commr., R.N.R.	" ...	" A.	" ...	" 7.5.27 to 28.5.27 ...	2.6.27.
<i>21 Metagama</i> ...	Hall, A. H. ...	J. Shearer, N. J. P. Roberts	W.T.	Canadian Pacific ...	W.T. Reg. 15.5.27 to 2.6.27 ...	8.6.27.
<i>Middlesex</i> ...	Melling, C. F. ...	L. S. Evans ...	No. A.	A. Holt ...	Form 911 5.11.26 to 19.12.26... ..	6.1.27.
<i>Minderoo</i> ...	Freer, A. Capt., R.N.R.	R. Walker, H. J. Ferguson... ..	W.T.	Canadian Pacific ...	W.T. Reg. 1.5.27 to 20.5.27 ...	24.5.27.
<i>Minna</i> ...	Macrae, A. B. ...	A. V. Pearce ...	No. M.	Federal ...	Form 911 2.3.27 to 23.3.27 ...	27.4.27.
<i>23 Minnedosa</i> ...	Richardson, E. ...	B. J. Bennie, W. J. McPhedran, J. H. Oxtan.	" A.	West Australia Nav. Co. ...	Met. Log. 2.5.26 to 4.10.26 ...	1.12.26.
<i>Minnesota</i> ...	Mackenzie, G. G. ...	J. H. Hennessey ...	" A.	Scottish Fishery Board ...	Form 911 26.3.27 to 16.4.27 ...	19.4.27.
<i>Minnetonka</i> ...	Griffiths, J. N. ...	J. P. Dobson, E. V. Glennie	W.T.	Canadian Pacific ...	W.T. Reg. 30.4.27 to 20.5.27 ...	24.5.27.
<i>Mirror, C.S.</i> ...	Pollard, W. F., D.S.O., Capt., R.N.R.	" ...	No. M.	H.M. Transport ...	Form 911 30.4.27 to 20.5.27 ...	24.5.27.
<i>Minnewaska</i> ...	Gates, T. F., C.B.E. Claret, F. H., C.B.E., Commr., R.N.R.	A. Campbell ... F. Mummery ...	" M. " M.	Atlantic Transport ...	" 2.5.27 to 22.5.27 ...	30.5.27.
<i>Mirrored, C.S.</i> ...	Gibson, L. ...	A. G. Watts ...	" M.	Eastern Tel. Co. ...	" 8.5.27 to 28.5.27 ...	2.6.27.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
Mississippi ...	Wylie, J. T. J. ...	...	No. A.	Atlantic Transport ...	Form 911 10.3.27 to 18.4.27 ...	21.4.27.
Moldavia ...	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	G. H. Durrant ...	" M.	P. & O. ...	" 26.3.27 to 4.5.27 ...	13.6.27.
Mongolian Prince	Edwards, W. ...	V. E. Palmer ...	" A.	Prince ...	W.T. Reg. 21.3.27 to 4.4.27 ...	4.5.27.
24 Montcalm	Hamilton, G. ...	H. McFadyen ...	W.T.	Canadian Pacific ...	" 24.4.27 to 12.5.27 ...	17.5.27.
25 Montclare	Lewis, J. P. ...	...	"	"	" 22.5.27 to 9.6.27 ...	15.6.27.
Montferland	Webster, G. S., R.D., Lt.-Commr., R.N.R.	E. Shergold, A. Mansey, R. W. Jackson.	"	"	" 8.5.27 to 27.5.27 ...	1.6.27.
27 Montnairn	Van Noppen, C. D. ...	W. Sooten ...	No. M.	Holland Lloyd ...	Form 911 16.10.26 to 4.11.26...	9.11.26.
...	Turnbull, J., A.d.C., C.B.E., R.D., Capt., R.N.R.	L. Hammersley, N. A. Goater J. Roche.	W.T.	Canadian Pacific ...	W.T. Reg. 5.8.26 to 6.11.26 ...	17.11.26.
Montoro	...	...	No. A.	Burns Philp & Co. ...	...	...
26 Montrose	Landy, E. ...	A. Watt, F. Hutchings ...	W.T.	Canadian Pacific ...	W.T. Reg. 14.5.27 to 2.6.27 ...	11.6.27.
20 Montroyal	Sibbons, H. ...	R. Antrobus ...	"	"	" 21.5.27 to 7.6.27 ...	11.6.27.
Moresby	Edgell, J. A., O.B.E., Capt., R.N.	W. H. Martin ...	M.L.	His Majesty's Australian Ship.	Met. Log. 31.8.26 to 14.12.26	24.1.27.
Morvada	Mills, T. L., O.B.E., R.D., Commr., R.N.R.	D. S. Johnston ...	No. M.	British India ...	Form 911 13.3.27 to 6.6.27 ...	10.6.27.
Mulbera	Steadman, W. R. ...	E. H. Spriggs ...	" M.	"	" 22.4.27 to 4.5.27 ...	23.5.27.
Nagara	Foster, E. ...	J. Watson ...	" M.	R.M.S.P. Co. ...	" 15.1.27 to 24.5.27 ...	1.6.27.
Nagoya	Davis, H. C., D.S.C., R.D., Commr., R.N.R.	L. Porter... ...	" M.	P. & O. ...	" 28.1.27 to 3.5.27 ...	12.5.27.
Naldera	Coldwell, G. J. ...	W. F. Laughland ...	" M.	"	...	...
Nardana	Moth, F. L. ...	J. N. McMillan ...	" M.	British India ...	Form 911 27.3.27 to 15.4.27 ...	27.4.27.
Nellore...	Hignett, A. H., R.D., Lt. - Commr., R.N.R.	S. H. Baldwin ...	" M.	P. & O. ...	" 18.1.27 to 20.3.27 ...	26.4.27.
Nerbudda	Williams, B. N. ...	J. W. B. Archibald, T. Barnard.	" M.	British India ...	" 19.3.27 to 8.4.27 ...	16.5.27.
Nestor	Houghton, G. K. ...	O. C. Williams, G. R. Cheetham, N. Anderson.	M.L.	A. Holt ...	Met. Log. 17.1.27 to 19.5.27 ...	26.5.27.
Newby Hall	Butler, J. ...	E. M. Robertson, A. W. Wise, R. Y. Smith.	"	Ellerman ...	" 26.11.26 to 6.3.27 ...	28.3.27.
Newfoundland	Furieux, S. ...	R. F. Handley, E. Sainty, S. Moore.	"	Furness Withy ...	" 11.12.26 to 6.5.27 ...	18.5.27.
Niagara	Westgarth, W. A., D.S.C.	...	"	"	"	"
Ningchow	Showman, A. C. ...	A. P. Cousin, D. McKenzie, T. Haulton, J. M. Hood.	"	Canadian-Australian...	" 22.9.26 to 30.1.27 ...	5.4.27.
Norfolk	Christie, W. ...	...	No. A.	A. Holt ...	Form 911 13.10.26 to 30.12.26	10.1.27.
Norna	Mead, G. F. ...	J. W. Pring ...	" A.	Federal ...	" 27.2.27 to 29.3.27 ...	9.5.27.
Norseman, C.S.	Wright, J. W. ...	...	" A.	Scottish Fishery Board	" 5.5.27 to 28.5.27 ...	1.6.27.
Northwestern Miller	Barter, H. O., R.D., Commr., R.N.R.	R. W. Greenfield ...	" M.	Western Tel. Co. ...	" 3.5.27 to 13.5.27 ...	17.6.27.
Nova Scotia	Nuttall, E. L. ...	...	" A.	Furness Withy ...	" 20.11.26 to 23.12.26	29.12.26.
Novshera	Furieux, S. ...	W. P. Paterson ...	" A.	"	" 5.5.27 to 29.5.27 ...	1.6.27.
Nubian	Rowe, S. N. ...	W. D. L. Reeves ...	" M.	British India ...	" 12.3.27 to 1.6.27 ...	10.6.27.
Oaklands Grange...	Watmough, T. M. ...	...	" A.	Leyland ...	" 28.2.27 to 14.3.27 ...	22.3.27.
57 Olympic	St. Clair, C., D.S.C.	E. J. Longheed ...	" A.	Houlder Bros. ...	...	...
...	Marshall, W., C.B., D.S.O., A.d.C., R.D., Commadore, R.N.R.	A. Fisher, H. J. C. Day, A. E. Weller.	W.T.	White Star ...	W.T. Reg. 17.3.27 to 11.4.27 ...	7.5.27.
Opawa...	...	...	"	"	" 28.4.27 to 12.5.27 ...	14.5.27.
Orama...	Robinson, F. W. ...	T. Fox Russell, C. K. Blake, H. Tanner.	M.L.	New Zealand S.S. Co. Orient ...	Form 911 19.5.27 to 2.6.27 ...	8.6.27.
Oranian	Shelford, W. S., Lieut. - Commr., R.N.R.	...	"	"	Form 911 28.4.27 to 3.6.27 ...	9.6.27.
Orbita ...	Hoskins, W. ...	W. R. Atkinson. ...	No. A.	Leyland ...	Met. Log. 6.3.27 to 7.6.27 ...	14.6.27.
Orcoma	Dominy, R. H., C.B.E., Commr., R.N.R.	T. Naylor, G. Gerety, T. Mitchell.	M.L.	R.M.S.P. Co. Pacific S.N. Co. ...	Form 911 28.3.27 to 1.6.27 ...	9.6.27.
Orduna...	Daniel, T. ...	E. Hicks ...	No. M.	R.M.S.P. Co. ...	Met. Log. 18.11.26 to 4.2.27 ...	22.2.27.
Orestes	Flynn, G. A. ...	F. T. Berry ...	" A.	R.M.S.P. Co. ...	Form 911 13.1.27 to 22.3.27 ...	28.3.27.
Orita ...	Splatt, W. A. ...	D. W. Hutchinson, J. L. Jones, A. G. Litherhead, J. W. Milne.	M.L.	A. Holt Pacific S.N. Co. ...	" 1.5.27 to 9.5.27 ...	18.5.27.
Ormonde	Wyatt, A. G. N., Lieut. Commr., R.N.	A. M. Hughes ...	"	His Majesty's Ship ...	Met. Log. 22.12.26 to 30.5.27...	10.6.26.
Ormonde	James, L.V., D.S.C.	...	No. M.	Orient ...	" 7.9.26 to 17.11.26 ...	1.12.26.
Oronsay	Owens, A. L., R.D., Lt.-Commr., R.N.R.	J. C. K. Dowding, R. K. Rogerson, R. Galpin, R. S. Hawker.	M.L.	"	Form 911 18.4.27 to 27.4.27 ...	4.5.27.
Oroya ...	Duncan, E. E. ...	...	No. M.	Pacific S.N. Co. ...	Met. Log. 6.2.27 to 11.5.27 ...	16.5.27.
Orsova ...	Cameron, E. P., R.D., Commr., R.N.R.	L. E. Fordham, L. J. Vesty, W. Elliott, J. F. Castle-Bartley.	M.L.	Orient ...	Form 911 9.2.27 to 19.4.27 ...	4.5.27.
Ortega ...	Barkley, E. ...	G. M. Rice ...	No. M.	Pacific S.N. Co. ...	Met. Log. 12.12.26 to 16.3.27...	26.3.27.
Orvieto...	Thorne, G. G., R.D., Commr., R.N.R.	I. E. G. Goldsworthy, G. L. Carter, J. L. Skilling, T. L. Shurrock.	M.L.	Orient ...	Form 911 29.9.26 to 15.11.26...	24.11.26.
Osterley	Hayes, I. J. ...	S. Burnnand ...	No. A.	"	Met. Log. 25.12.26 to 31.3.27...	4.4.27.
Otaki ...	McNish, R. ...	C. R. Brown ...	" A.	"	Form 911 1.11.26 to 3.2.27 ...	8.2.27.
Olira ...	Wood, C. ...	D. N. MacGregor ...	" M.	New Zealand S.S. Co. Shaw, Savill & Albion	" 24.12.26 to 7.2.27 ...	10.2.27.
Otranto	Staunton, H. G., C.B.E., R.D.	...	" M.	Orient ...	" 15.12.26 to 29.1.27...	2.2.27.
Oxfordshire	Crumplin, W. E. ...	C. F. Hicks ...	" A.	Bibby Bros. ...	" 20.1.27 to 1.4.27 ...	19.4.27.
Pacific Shipper, M.V.	Newman, G. W. A.	G. Davis ...	" A.	Furness Withy ...	" 27.3.27 to 3.6.27 ...	9.6.27.
Pacuare	Sapsworth, S. ...	V. R. Watkins ...	" A.	Elders & Fyffes	" 22.2.27 to 25.3.27 ...	29.3.27.
Pakeha	W. P. Clifton Mogg	E. T. Baker, R. E. Nicholson, A. J. Tillot.	M.L.	Shaw, Savill & Albion	Met. Log. 4.4.27 to 7.5.27 ...	12.5.27.
Pareora	Evans, J. O. ...	N. F. Fitch ...	No. A.	Hain S.S. Co. ...	Form 911 21.12.26 to 29.4.27...	7.5.27.
Paris ...	Cook, C. L. ...	Mr. Biles... ...	C.C.	Southern Rly. ...	Form 911 27.3.27 to 3.5.27 ...	24.5.27.
Patia	Makepeace, S. ...	J. Kinsley ...	No. A.	Elders & Fyffes	Telegraphic Report. 15.10.26 ...	15.10.26.
Patrician	Pugh, R. H. ...	H. W. Stanley ...	" M.	Harrison ...	Form 911 27.12.26 to 28.1.27...	14.2.27.
Patrol, C.S.	Welsh, T. K. ...	J. S. Browne ...	No.	Eastern Extension (A. & C.) Telegraph Co.	Met. Log. 11.6.26 to 28.9.26 ...	23.11.26.
Peisander	Slater, H. N. ...	...	No.	A. Holt ...	Met. Log. 18.10.26 to 15.11.26	9.2.27.

vii

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
Peshawur ...	Wilding, H. G. ...	J. C. Mellonie, J. K. Crone, R. G. Wood.	M.L.	P. & O. ...	Met. Log. 30.10.26 to 6.3.27 ...	18.3.27.
Piako ...	Kettlewell, C. R. ...	E. W. Smith, M. Rose, H. N. Lawson.	"	New Zealand S.S. Co.	" 7.12.26 to 20.5.27 ...	26.5.27.
Polycarp ...	Welch, T. G. ...	J. G. West ...	No. A.	Booth	Form 911 10.3.27 to 28.3.27 ...	16.5.27.
Port Adelaide ...	Hayter, S. W. ...	R. W. Linklater, E. N. Rogers, L. Porter.	M.L.	Commonwealth & Dominion.	Met. Log. 14.8.26 to 18.12.26 ...	29.12.26.
Port Albany ...	Robinson, C. A. ...	E. A. Leavett, W. Eastoe, J. Thom.	"	" " "	" 24.12.26 to 10.5.27 ...	23.5.27.
" Auckland ...	Durham, R. S. ...	G. L. Hazlewood, C. F. Post, J. H. Sloan, H. E. Braine.	No. A.	" " "	" 18.9.26 to 22.1.27 ...	7.2.27.
" Bowen ...	Gilling, W. ...	W. R. Johnston ...	" A.	" " "	Form 911 8.2.27 to 20.3.27 ...	28.3.27.
" Caroline ...	Williams, R. ...	" " " " " " " "	M.L.	" " "	Met. Log. 31.5.26 to 2.12.26 ...	8.1.27.
" Darwin ...	Sawbridge, I. R. ...	E. T. N. Lawrey ...	"	" " "	Form 911 23.10.26 to 4.12.26 ...	13.12.26.
" Denison ...	Ferris, J. ...	P. J. Howe ...	No. A.	" " "	" 27.2.27 to 8.4.27 ...	25.5.27.
" Dunedin ...	Lea, W. H. ...	E. G. Jones, R. Needham, H. M. Post, E. Wheeler.	M.L.	" " "	Met. Log. 4.12.26 to 2.3.27 ...	5.4.27.
" Fremantle ...	Kearney, F. J. ...	" " " " " " " "	No.	" " "	" " " " " " " "	" " " " " " " "
" Hacking ...	Higgs, H. E. ...	F. W. Elgar, J. A. Fairbairn, E. Luker.	M.L.	" " "	Met. Log. 1.1.27 to 14.6.27 ...	16.6.27.
" Hobart ...	Craven, R. ...	C. Hersee, L. Copeland, G. G. Langford, C. L. Webb.	"	" " "	" 4.2.27 to 30.5.27 ...	10.6.27.
" Hunter ...	Cottell, S. C. ...	A. Cooper, R. Forrest, J. T. Weldie.	"	" " "	" 7.1.27 to 13.5.27 ...	7.6.27.
" Melbourne ...	Brown, A. H. ...	D. G. H. Bradley, E. M. Fenton, L. H. B. Bloye.	"	" " "	" 26.10.26 to 3.3.27 ...	23.3.27.
" Napier ...	Jones, C. N. ...	" " " " " " " "	No. A.	" " "	Form 911 25.2.27 to 12.4.27 ...	21.4.27.
" Nicholson ...	Jack, J. ...	J. L. Lewis, G. L. H. Dean, P. A. Munday, C. Jolly.	M.L.	" " "	Met. Log. 10.9.26 to 3.1.27 ...	19.1.27.
" Pirie ...	Kippins, T. ...	" " " " " " " "	"	" " "	" 6.11.26 to 8.3.27 ...	24.3.27.
" Sydney ...	Higgs, W. G. ...	H. G. Boys Smith ...	"	" " "	" 25.9.26 to 19.2.27 ...	28.2.27.
" Victor ...	Swan, L. H. ...	L. M. R. Bayly, J. B. Watson, A. Brown.	"	" " "	" 8.12.26 to 8.6.27 ...	13.6.27.
" Wellington ...	Farmer, F. ...	P. H. Pedrick ...	No. A.	" " "	Form 911 14.10.26 to 2.2.27 ...	11.2.27.
President Jackson	Griffith, J. ...	" " " " " " " "	" A.	Pacific Mail S.S. Co...	" 1.2.27 to 8.4.27 ...	16.5.27.
President Jefferson	Nichols, F. R. ...	C. H. Moen, B. Christensen...	" A.	Admiral Oriental Line	" 3.4.27 to 22.5.27 ...	10.6.27.
President Wilson	Nelson, H. ...	A. M. Quinlan ...	"	Dollar ...	" 5.9.26 to 2.11.26 ...	22.11.26.
Protea, H.M.S.A.S.	Woodhouse, A. F. B., Lt.-Commr., R.N.	" " " " " " " "	M.L.	South African Naval Service.	" 1.2.27 to 28.2.27 ...	20.3.27.
Protesilaus	Nelson, T. B. ...	" " " " " " " "	"	A. Holt ...	" " " " " " " "	" " " " " " " "
Pyrrhus	Elford, W. J. ...	R. E. Wilks ...	No. A.	" " "	Form 911 15.5.27 to 24.5.27 ...	1.6.27.
Ranpara	King, A. M., D.S.C.	G. Randall ...	" M.	P. & O. ...	" 15.4.27 to 8.6.27 ...	10.6.27.
Regina	Smith, R. G. ...	F. W. Laws, R. H. Shaw, C. Cochrane.	No.	White Star-Dominion	W.T. Reg. 6.3.27 to 27.3.27 ...	30.3.27.
Reindeer	Langdon, C. ...	" " " " " " " "	C.C.	G.W. Railway	Form 911 3.4.27 to 19.4.27 ...	21.4.27.
Remuera	Cameron, J. J. ...	P. McCullum, P. Shakespeare	No. A.	New Zealand S.S. Co.	Form 911 13.3.26 to 19.4.26 ...	27.7.26.
Reventazon	Jack, D. A. ...	B. R. Wickham Tarr ...	"	Elders & Fyffes	" 9.4.27 to 14.5.27 ...	21.5.27.
Rhodesian Transport.	Bullock, F. W. H. ...	H. B. Parkins ...	" A.	Houlder Bros.	" 6.4.27 to 22.5.27 ...	10.6.27.
Rimutaka	Henning, F. A. ...	H. A. Fryer, D. E. Hughes, G. O. Saul, H. Vernon.	M.L.	New Zealand S.S. Co.	Met. Log. 23.12.26 to 21.4.27	28.4.27.
Risaldar	Park, G. ...	C. E. Pratt, C. P. Harrison, D. A. P. Rigby.	No.	Asiatic S.N. Co.	" 23.9.26 to 16.3.27 ...	20.4.27.
Rotorua	Hunter, J. B. ...	E. Lawrence, R. G. Rees, H. Cockerill.	M.L.	N.Z.S. Co.	" 18.11.26 to 4.3.27 ...	10.3.27.
Royal Fusilier	Dawson, J. ...	J. Fraser ...	No. A.	London & Edinburgh S.S. Co.	Form 911 17.3.27 to 18.4.27 ...	19.4.27.
Royal Transport...	Dove, J. ...	R. W. Wass ...	" A.	Houlder Bros.	" 18.8.26 to 7.4.27 ...	27.4.27.
Ruapehu	McKellar, A. W., R.D., Capt., R.N.R.	H. M. Selmer, W. J. Glassborow, T. M. Devitt.	M.L.	New Zealand S.S. Co.	Met. Log. 4.2.27 to 9.6.27 ...	15.6.27.
St. Albans	Smith, G. L. ...	J. M. Heddle, F. O. Colvin, R. S. Millington, J. Kavanagh.	"	Eastern and Australian	" 31.12.26 to 29.3.27...	23.5.27.
St. Helier	Mulhall, W. ...	C. Bell ...	C.C.	G.W. Railway	Telegraphic Report 16.6.27 ...	16.6.27.
St. Julien	Langdon, C. H. ...	C. Joy ...	"	" " "	" 23.4.27 ...	23.4.27.
St. Andrew	Bearpark, E. W. ...	J. G. Feint ...	No. A.	Rankin Gilmour	Form	

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 17.6.27.	Date Received.
<i>Telamon</i> ...	Clark, D. ...	F. Wardrobe ...	No. A.	A. Holt ...	Form 911 19.2.27 to 7.3.27 ...	29.3.27.
<i>Teucer</i> ...	Hodgson, R. N. ...	D. T. Thorne ...	" A.	" ...	" 8.4.27 to 21.5.27 ...	30.5.27.
<i>Themistocles</i> ...	Jernyn, W. M. ...	H. C. Howe ...	" M.	Aberdeen ...	" 13.2.27 to 4.3.27 ...	29.3.27.
<i>Theseus</i> ...	Jones, E. ...	W. A. Fyffe ...	" A.	A. Holt ...	" 22.4.27 to 6.5.27 ...	9.6.27.
<i>Titan</i> ...	Wilkinson, T. G. ...	D. MacTavish, G. W. Best, C. G. Bailey.	M.L.	" ...	Met. Log. 27.8.26 to 12.2.27 ...	23.2.27.
<i>Tongariro</i> ...	Williams, J. M. ...	E. A. Quick ...	No. M.	New Zealand S.S. Co. Anchor ...	Form 911 12.3.27 to 26.4.27 ...	10.6.27.
<i>Transylvania</i> ...	Bone, D. W. ...	P. Middleton ...	" A.	" ...	" 13.5.27 to 3.6.27 ...	10.6.27.
<i>Traveller</i> ...	Worthington, B. ...	E. L. Stockley ...	" M.	T. & J. Harrison ...	" 2.2.27 to 12.4.27 ...	19.4.27.
<i>Trematon</i> ...	Evans, B. ...	R. Gregory, C. Warren, J. Toms.	M.L.	Hain S.S. Co. ...	Met. Log. 10.10.26 to 7.3.27 ...	25.4.27.
<i>Turakina</i> ...	Hamilton, E. S. ...	A. N. Marshall, G. S. Shepherd	No. M.	New Zealand S.S. Co. Anchor ...	Form 911 27.9.26 to 5.1.27 ...	28.1.27.
<i>Tuscania</i> ...	Smart, R. W. ...	J. Hamilton ...	" A.	" ...	" 23.4.27 to 22.5.27 ...	27.5.27.
<i>Tyndareus</i> ...	Scott, J. R. ...	A. G. Phillips, F. Howe, A. R. McDavid.	M.L.	A. Holt ...	Met. Log. 1.7.26 to 22.11.26 ...	10.1.27.
<i>Ulimaroa</i> ...	Wylie, W. J. ...	A. N. Robertson ...	No. M.	Huddart Parker, Ltd. ...	Form 911 1.4.27 to 25.4.27 ...	10.6.27.
<i>Ulysses</i> ...	McHutchon, W. ...	E. C. Radford ...	" A.	A. Holt ...	" 13.12.26 to 30.1.27 ...	3.2.27.
<i>Urvolosi</i> ...	Barnes, E. W. ...	R. L. B. Ryde ...	" A.	Bullard King ...	" 10.3.27 to 6.4.27 ...	4.5.27.
<i>Valacia</i> ...	Inch, F. ...	G. Meggitt ...	" M.	Cunard ...	" 12.1.27 to 10.4.27 ...	13.4.27.
<i>Vardulia</i> ...	Fear, E. T. C. ...	L. D. W. Rand ...	" A.	" ...	" 30.1.27 to 13.3.27 ...	4.4.27.
<i>Verbania</i> ...	Pooley, T. S. M. ...	A. F. Watts ...	" A.	" ...	" 8.2.27 to 26.3.27 ...	19.4.27.
<i>Vigilant</i> ...	Simpson, E. S. S. ...	J. Hunter ...	" A.	Scottish Fishery Board ...	" 1.5.27 to 31.5.27 ...	9.6.27.
<i>Waitapu</i> ...	Harris, E. ...	J. W. McCaskill ...	" M.	Canadian-Australasian Union S.S. Co. of N.Z. ...	Met. Log. 5.3.27 to 4.4.27 ...	20.4.27.
<i>Wairuna</i> ...	Whyborn, H. S. ...	R. Howie, G. H. George, A. W. Rabbitts.	M.L.	" ...	Met. Log. 19.6.26 to 25.9.26 ...	20.12.26.
<i>Wangaratta</i> ...	Scutt, W. ...	T. W. Wordingham, S. R. Millard, K. M. Morrison, A. G. Brooks.	"	British India ...	" 18.9.26 to 1.2.27 ...	7.2.27.
<i>Warfield</i> ...	Steel, R. ...	C. M. Quick ...	No. A.	" ...	Form 911 27.4.27 to 9.5.27 ...	16.5.27.
<i>War Nizam</i> ...	Moncrieff, T. ...	J. Row ...	" A.	British Tankers ...	" 27.4.27 to 16.5.27 ...	27.5.27.
<i>Welshman</i> ...	Rollerson, W. ...	J. Mendus ...	" M.	White Star-Dominion ...	" 22.10.26 to 14.11.26 ...	26.11.26.
<i>William Scoresby</i> ...	Mercer, G. M., D.S.C., Lt.-Commr., R.N.R.	A. Irving, M. C. Lester	M.L.	Falkland Islands Government. Union Castle ...	Met. Log. 5.7.26 to 23.12.26 ...	4.4.27.
<i>Windsor Castle</i> ...	Strong, H., R.D., Commr., R.N.R.	F. Wilbraham, C. L. Lovegrove, S. E. Aldam, L. A. J. Keeble.	"	" ...	" 1.10.26 to 29.5.27 ...	13.6.27.
<i>Winifredian</i> ...	Harrocks, W. ...	A. Crone ...	No. M.	Leyland ...	Form 911 27.3.27 to 30.4.27 ...	11.5.27.
<i>Wonganella</i> ...	Suffern, H. ...	G. F. Phillips ...	"	W. Crossby & Sons ...	" 4.3.27 to 27.3.27 ...	4.5.27.
<i>Woodarra</i> ...	Reilly, J. V. ...	L. D. Graham, H. Goater, B. W. Smith.	M.L.	British India ...	Met. Log. 23.10.27 to 18.4.27 ...	1.5.27.
<i>Yorkshire</i> ...	Millson, G. E. ...	W. M. C. Higginson ...	No. A.	Bibby ...	Form 911 15.1.27 to 26.3.27 ...	4.4.27.
<i>Conway H.M.S.</i>	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets...	Cadets' M.L.	" ...	Cadets' Met. Log. 23.1.27 to 2.4.27 ...	4.4.27.
<i>Pangbourne Nautical College</i>	Tracy, A. F. G., Commr., R.N.	" " ...	"	" ...	Cadets' Met. Log. 16.1.27 to 26.3.27 ...	30.3.27.
<i>Worcester, H.M.S.</i>	Sayer, M. B., O.B.E., R.D., Capt., R.N.R.	" " ...	"	" ...	Cadets' Met. Log. 21.1.27 to 13.4.27 ...	19.4.27.
<i>Abaco</i> ...	" ...	The Keepers ...	Lighthouse Register.	" ...	Lighthouse Register 1.7.26 to 20.10.26 ...	20.4.27.
<i>Cay Lobos</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26 ...	20.4.27.
<i>Double Headed Shot</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26 ...	20.4.27.
<i>Inagua</i> ...	" ...	" ...	"	" ...	Lighthouse Register 15.7.26 to 23.1.27 ...	20.4.27.
<i>Sombrero</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26 ...	1.2.27.
<i>Walling Island</i> ...	" ...	" ...	"	" ...	Lighthouse Register 17.1.26 to 20.7.26 ...	10.11.26.
<i>Cape Pembroke (Falkland Is.)</i>	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26 ...	24.2.27.

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 31.5.27.	Date Received.
<i>Casanare</i> ...	Steidelman, H. ...	R. O. Jones ...	Elders & Fyffes ...	Water Samples ...	12.5.27.
<i>Larro</i> ...	Matthews, G. P. ...	W. Halder-Campe ...	R.M.S.P. Co. ...	" ...	20.5.27.
<i>Deseado</i> ...	Shillitoe, B. ...	F. F. Wheeler ...	" ...	" ...	13.1.27.
<i>Hildebrand</i> ...	Maddrell, J. ...	A. Allan ...	Booth ...	" ...	6.5.27.
<i>Reventazon</i> ...	Jack, D. A. ...	L. C. Bach ...	Elders & Fyffes ...	" ...	20.5.27.

August, M.O., 1927.