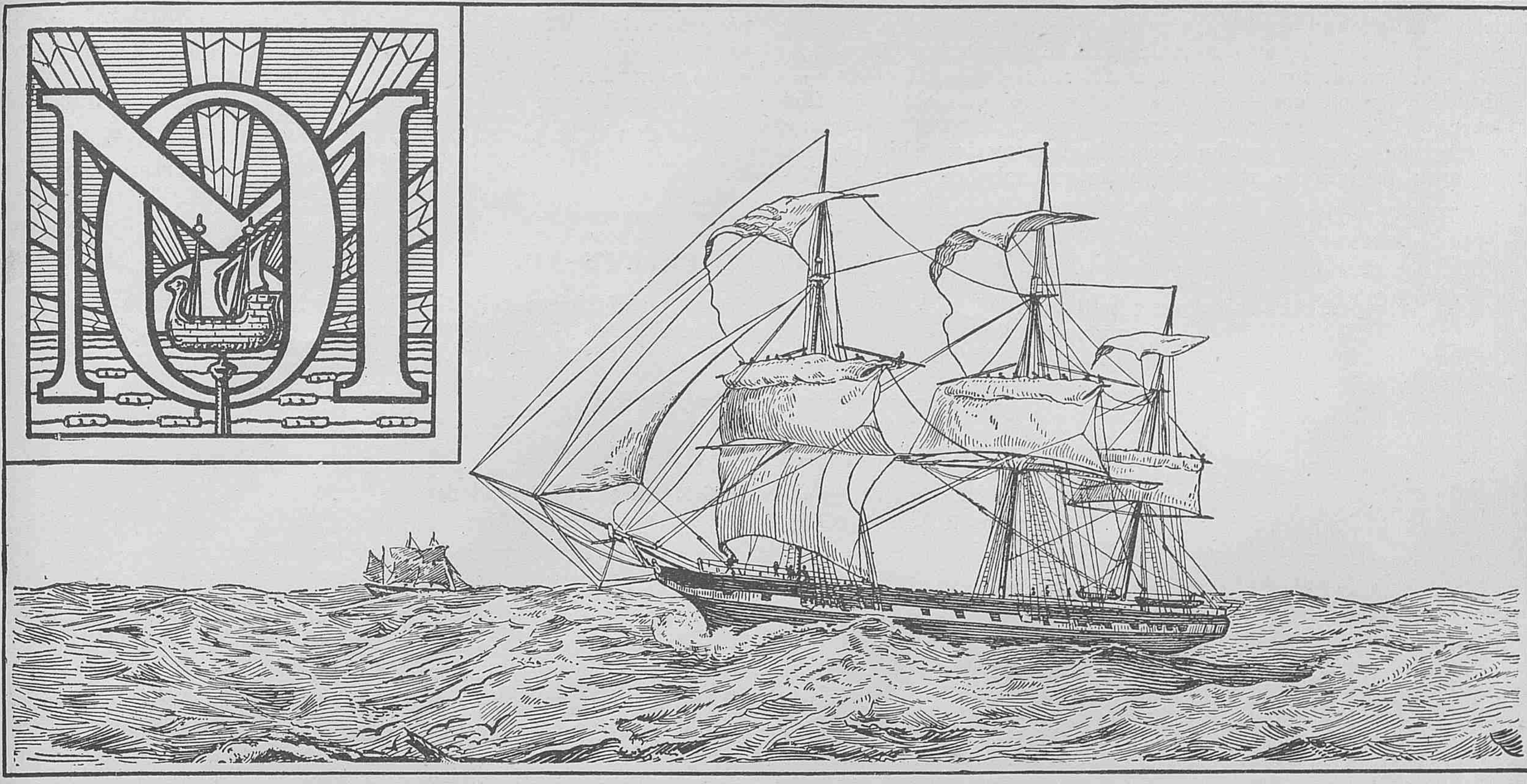
M.O. 262.



VOL. IV. No. 48. THE MARINE OBSERVER. DECEMBER, 1927.

TABLE OF PRINCIPAL CONTENTS.

VOLUME FOUR.

This number concludes Volume Four. Comparing it with the three previous Volumes it seems to come nearer to the fulfilment of the aims and objects set when The Marine Observer was launched than any of its predecessors.

Let us give credit where credit is due.

The greatest of the work which makes our Journal what it is, is that of the Corps of Voluntary Marine Observers at sea; to them we owe the facts without which compiled information would be impossible, and to those members of the Corps who have contributed to " The Marine Observer's Log " our special thanks are due.

The work of preparation done in the Marine Division is second only to the voluntary work at sea, and here the work of my assistants has been a great factor. They have kept up a steady output in extraction, compilation and drawing, and have maintained an exacting programme for printing the Journal month by month. We would express our most grateful thanks to all those outside the Marine Division who have contributed articles.

The appearance and quality of the book reflects the credit due to the Printers who have always maintained their part of the programme.

In this Number we publish an article summarizing the results shown on the charts published in Volumes I to IV of the currents in the North Atlantic, which will show to still greater advantage when, as we hope, the arrows and roses may be reproduced on single sheets. Mr. C. S. Durst, who so long assisted in summarizing information of ocean currents, left us for work in another Division of the Meteorological Office last January, and was relieved as senior professional assistant by Mr. E. W. Barlow, and he has continued where his predecessor left off, the result being this summary of facts—many of them known for the first time—of the seasonal fluctuations of mean velocity of current in the North Atlantic, and a short statement of the modern theory of Ocean Currents.

Marine Observers, regular recipients, and subscribers to this Journal are again reminded that the number of copies printed is

(529) Wt. 10–1 1100 & 200 11/27 . H. St. G. 4/1

strictly limited and for the purposes of preservation a special binding cover may be purchased from H.M. Stationery Office.

The arrangement for binding is as follows:—

The title page—loose—and the Index are published in this number. The cover, advertisement pages, list of voluntary observing ships, and Ice Chart, certain information which is not permament or may be repeated in future volumes, may be dispensed with. When these have been removed there will remain pages numbered in sequence throughout each number, also pages unnumbered containing lithographic charts which will follow the numbered pages as they were published in the monthly numbers.

These should be placed in the Volume cover and bound.

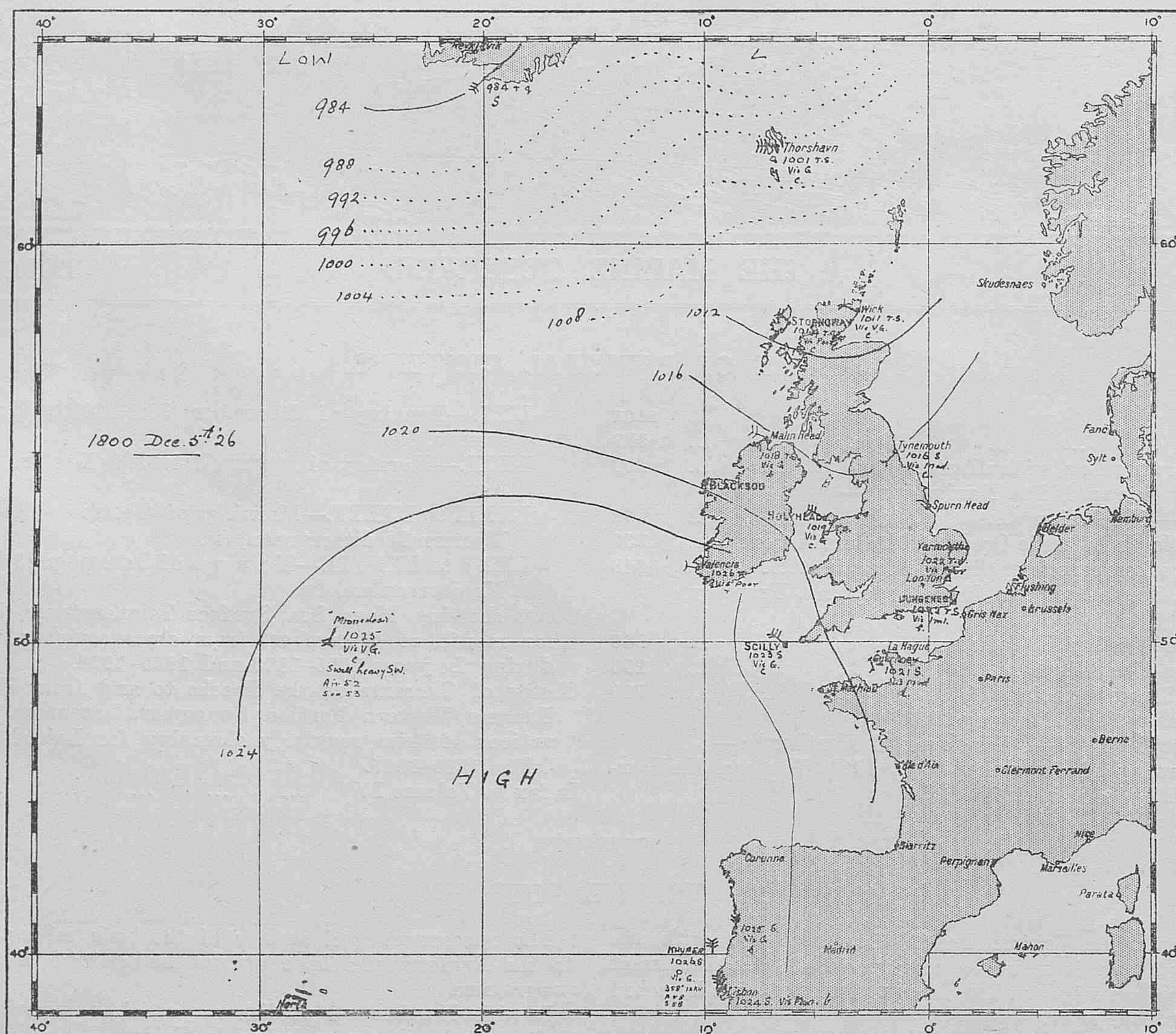
MARINE SUPERINTENDENT.

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.

WEATHER CHART MADE AT SEA.

Weather Chart made at sea on board S.S. "Khyber," Commander C. Hester, R.D., R.N.R., by Mr. C. B. Roche, Chief Officer.



REMARKS ON GULF STREAM.

THE following is an extract from the Meteorological Report of S.S. *Hororata*, Captain E. HOLLAND, New Zealand to London via Panama, and U.S.A. Observers, Mr. E. R. KEMP, Chief Officer, and Mr. L. F. MALCOURONNE, 4th Officer:—

"Left Colon at 3 a.m., 12th December, 1926, for Newport News, U.S.A., fine weather prevailed in the Caribbean Sea and Windward Passage. In the former the usual S.W. set was experienced, until a position in Latitude 17° 30′ N., Longitude 75° 20′ W. was reached; between this position and San Salvador no further appreciable currents were experienced. San Salvador was abeam bearing 87° distant 12½ miles at 4.16 p.m. on the 15th. The course was then set to pass off *Diamond Shoal Light Vessel.* Approaching the latter on the 17th excellent stellar observations were obtained at 5.10 p.m., which gave Latitude 34° 03′ N., Longitude 75° 13′ W. Up to this position no decided set to the N.E. had been experienced. At 9.40 p.m. *Diamond Shoal Light Vessel* was abeam bearing 262° distant 10 miles. From 5.10 p.m. the current had set 48°, 3 knots. The Gulf Stream in this vicinity appears from these observations not more than 50 miles across in a north and south direction, and is north of position indicated on chart. From *Diamond Shoal*

Light Vessel to Newport News no appreciable currents were experienced. Temperature of air fell very rapidly during 12 hours previous to arrival 48° to 22° F. Temperature of sea surface when clear of stream 40° to 45° F.

From	To	From		To		Set.	Drift.
		Lat. N.	Long. W.	Lat. N.	Long. W.		
December, 1926.							
15, Noon	16, Noon	23° 14′	74° 32′	28° 08′	74° 50′	N. 17° E.	6
16, ,,	17, ,,	28° 08′	74° 50′	32° 57′	75° 04′	S. 69° E.	14
17, ,,	17, 5.10 p.m.	32° 57′	75° 04′	34° 03′	75° 13′	N. 10° E.	2
17, 5.10 p.m.	17, 9.40 p.m.	34° 03′	75° 13′	35° 07′	75° 07′	N 48° E.	13
17, 9.40 p.m.	17, Midnt.	35° 07′	75° 07′	35° 37′	75° 16′	N. 9° W.	4

Temperatures on the 17th :—

Time.	*Air.*	*Water.*
Noon	58° ...	68°
5.10 p.m.	54° ...	70°
8.00 p.m.	48° ...	72°
9.40 p.m.	47° ...	54°
Midnight	46° ...	49°

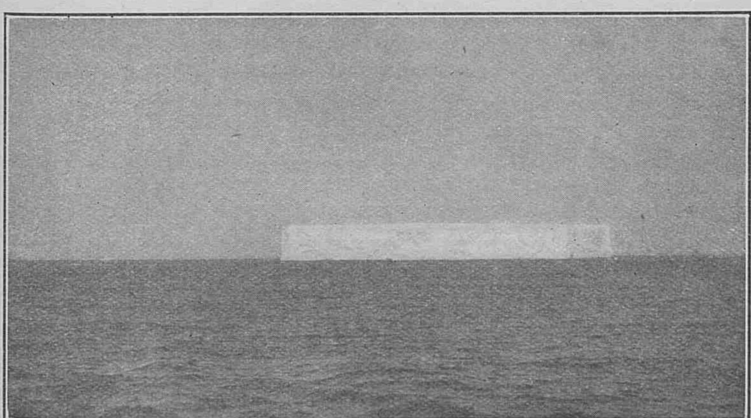
" From New York to London the usual track for the time of the year was followed, viz., South of *Nantucket Light Vessel* to a position in Latitude 42° N., Longitude 50° W. After one day's steaming from New York, the influence of the Gulf Stream should have been felt setting about E.N.E. at a rate of from 1 to 2 knots, instead of which a decided set to the S.W. was experienced of from 12 to 24 miles per day, until a position in Latitude 41° N., Longitude 58° W. was reached, currents were then variable. During this time northerly winds prevailed, air temperature varying from 40°-50° F., sea surface 54°-63° F."

TABULAR BERG.

South Atlantic.

THE following report and accompanying photograph have been received from S.S. *Enton*, Observer, Mr. W. E. BUCKINGHAM, 2nd Officer :—

" On December 26th, 1926, at 9 a.m., in Latitude 44° 06′ S., Longitude 59° 23′ W., passed five tabular icebergs, the largest berg being 280 feet high and ¼ of a mile long (height found by sextant angles). At distances of from 3 to 5 miles from main berg were four smaller bergs (about one-eighth as large as large berg), possibly calved from main berg by weathering. The large berg had many large transverse cracks and looked as if it would break up at any time. Several tons were falling from the large berg at short intervals and slabs of from 2 to 10 tons floated around the berg. The berg was in Latitude 44° 06′ S., Longitude 59° 23′ W., about 40 miles east of the 100-fathom line. At 1.20 p.m. passed one large tabular berg similar to the former berg and two small ones about 3 miles apart. Latitude (of berg) 42° 55′ S., Longitude 58° 53′ W. Bergs in the distance as ship had crossed the 100-fathom line (steering N., True). At 3.30 p.m. two small bergs seen in the distance (eastward) in Latitude (of berg) 42° 39′ S., Longitude 58° 40′ W. The photograph was taken at a distance of one mile from the large berg passed at 9 a.m.



" As this berg is 280 feet high the depth of it must be over 1,960* feet if the berg does not shelve. The chart gives 1/130 fathoms or no bottom at 780 feet. Evidently it must be much deeper at this place and the 100-fathom line too far east."

Temperature Observations.

" Distances are from the large berg in Latitude 44° 06′ S., Longitude 59° 23′ W. as this is the only berg we passed close to. Wind throughout day S.W., force 3. Swell S.W., 2, sea slight, S.W.

December, 26th.	Distance.	Injection.	Surface.
7 a.m. ...	20 miles from berg ...	50° F.	49° F.
8 a.m. ...	10 ,, ,, ,, ...	46° F.	49° F.
9 a.m. ...	1 mile ,, ,, ...	48° F.	47° F.
10 a.m. ...	10 miles ,, ,, ...	47° F.	47½° F.
10.30 a.m. ...	15 ,, ,, ,, ...	—	48° F.
11.20 a.m. ...	23 ,, ,, ,, ...	50° F.	50° F.
Noon	30 ,, ,, ,, ...	52° F.	51½° F.

" Excepting main berg, no berg was passed nearer than 5 miles.
" Both thermometers checked by the standard.
" Injection 15 to 20 feet below surface.
" Injection fell to 49° at 1.30 p.m. and rose again at 3 p.m. (surface not taken)."

* NOTE.—According to Professor H. G. BARNES, F.R.S., " Experimenting with Ice Bergs," THE MARINE OBSERVER, page 93, No. 41, Vol. IV, many bergs float with as much as one-third of their mass out of water.

PHOSPHORESCENT WHEELS.

Straits of Malacca.

THE following is an extract from the Meteorological Report of S.S. *Aeneas*, Captain W. K. WALLACE, Suez to Penang via Colombo, Observer, Mr. J. M. ANDERSON, 2nd Officer :—

" Colombo to Penang.—On December 3rd at 0.30 a.m. in Latitude 5° 48′ N., Longitude 98° 09′ E., steering 95°, steaming 13½ knots, wind calm, sea smooth. Barometer 29.64, cloudy clear weather.

" A remarkable phosphorescence of the sea was observed. Commencing with but a few isolated points and patches of sparkling and pulsating light, the display developed until the surface of the sea from horizon to horizon had the appearance of being lit up from below, by thousands of beams of light which independently flashed and were eclipsed with great regularity, at intervals of about one second. This phosphorescence increased in brilliancy until at 1.45 a.m. two distinct systems of light waves or phosphorescent wheels were observed; one to port and the other to starboard. These light waves were observed to be travelling clockwise over the surface of the sea, appearing to issue from a focus around which they rotated, increasing in brilliancy and velocity of rotation until 2.05 a.m. The bearing of the apparent focus to port was two points abaft the beam, that to starboard, four points abaft the beam, and in spite of the forward progress of the vessel, they maintained their bearings whilst the display lasted.

" The illuminated beams were about 12 feet wide where they touched the vessel, the dark intervals being about twice that width and were distinctly curved, the concave edge of each being in the direction of rotation round the focus.

" The phosphorescent points and patches previously described were noticed to increase in brilliancy as the illuminated beams swept over them and to decrease in intensity during the passage of the successive dark spaces; and this phenomenon was quite noticeable even when the light waves towards the end of the display became quite faint. The steamer's hull was not more illuminated by the light waves than by any ordinary form of phosphorescence, nor had the disturbance in the water caused by the vessel's progress, any effect, either in increasing or diminishing the brilliancy or regularity, of that part of the luminescence, in proximity of the vessel. At 2.15 a.m. the light waves were no longer visible, and at 2.30 a.m. the last traces of phosphorescence were observed."

SAND IN THE AIR.

In N.E. Trade Region, North Atlantic.

THE following is an extract from the Meteorological Report of S.S. *Justin*, Commander O. J. P. LEE, R.D., R.N.R., Leixoes to Ceara, Observer, Mr. R. C. HOLMES:—

"Between 8 p.m., December 13th, 1926, and 8 a.m., December 14th (M.T.S.), whilst the ship was steaming on a S. 30° W. (true) course between Latitude 19° 20′ N., Longitude 24° 25′ W., and Latitude 17° 25′ N., Longitude 25° 39′ W., a considerable quantity of fine silver-grey sand was deposited on board.

"The weather at the time was fine with a light variable breeze S.E. to N.E. and a gradually falling barometer, and during the three days, December 13th to 15th, 1926, a reddish haze was very evident, especially just after dawn."

METEORITE.

South Atlantic.

THE following account has been received from S.S. *Andes*, Captain W. H. PARKER, C.B.E., R.D., R.N.R., Southampton to Rio de Janeiro, Observer, Mr. H. G. WHITTLE, 2nd Officer:—

"On the 16th December, 1926, at 0630 G.M.T., in Latitude 6° 51′ S., Longitude 34° 07′ W., about 85 miles N.N.E. of Pernambuco, a meteorite of exceptional brillancy was observed travelling from the direction of the constellation of *Orion* through the zenith towards the constellation of *Corvus*, where it broke into several smaller parts, which travelled individually for a short distance and disappeared.

"About 5 minutes after a muffled report was heard from the direction in which the meteorite was observed to break.

"The meteorite was so brilliant that it became as light as day.

"The weather conditions at the time of observation were as follows:—Fine, clear and cloudless. Smooth sea. Wind, east, force 2 to 3."

WATERSPOUT.

Arabian Sea.

THE following is an extract from the Meteorological Log of S.S. *Margha*, Commander R. A. MILNE, R.D., R.N.R., Colombo to Aden, Observer, Mr. R. M. WYATT, 3rd Officer:—

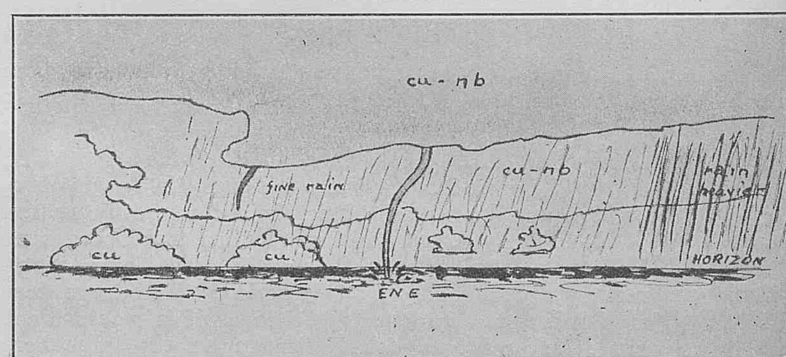
"December 27th, 1926, at 8.30 a.m. A.T.S., 3.30 G.M.T., in Latitude 7° 50′ N., Longitude 75° 09′ E., a waterspout was observed bearing N. by W. (True) at a distance of approximately 5 to 6 miles. A bank of Nimbus clouds occupied an arc of the sky from about N. by E. to W.N.W. The lower edge was exceptionally well defined and maintained an altitude of about 2,000 feet from end to end. From this bank the waterspout descended in a perpendicular shaft, until it reached an altitude about 500 feet above the sea, which directly below the spout was disturbed, whirling clouds of spray appeared to attain a height of 200 feet. The vertical shaft, seen through glasses, appeared to expand and contract as if in an endeavour to make a connection with the sea, but this it failed to do. In the meanwhile another finger appeared from the same bank of cloud, but a short distance to the westward. Before, however, it assumed any definite proportions it disappeared.

"The main shaft now shortened, broadening considerably as it did so, while the head moved slowly in a N.E. direction. The lower end remained immediately above the sea disturbance thereby causing the shaft to bend. As the head moved further to the N.E., the length of the spout increased and its breadth decreased, until finally at 8.37 a.m. (A.T.S.) it broke at the bend, the lower part disappearing and the sea disturbance subsiding. The upper portion was withdrawn into the cloud."

South Indian Ocean.

THE following is an extract from the Meteorological Report of S.S. *Glenshane*, Captain E. BEER, Colombo to Port Sudan, Observer, Mr. R. A. DALE, 3rd Officer:—

"December 12th, 9.25 a.m. (A.T.S.), 4.49 (G.M.T.), Latitude 9° 09′ N., Longitude 68° 05′ E. Wind N.N.E., force 3-4. Barometer 29.98 inches. Temperature, air 82°, water 82°. Observed waterspout bearing N.E. by E. ½ E. and moving slowly in a Southerly direction, the estimated distance being 5 miles. Clouds $\frac{Cu/Cu\text{-}Nb}{N}1$ At 9.30 a.m. observed a second waterspout to the northward of the first, and thinner, which did not reach right down to the water as the first one did and lasted only about 5 minutes. The original waterspout lasted until 9.40 when it slowly became shorter and shorter until it finally disappeared. It was then bearing due East. Light rain was falling from the clouds in the vicinity of the waterspout."



WIRELESS AND WEATHER, AN AID TO NAVIGATION.

CHAPTER XI.

CONCLUSION.

IN preparing charts of the percentage frequency of observations of gales in all oceans for the Board of Trade Committee upon Weather Zones and Seasons for the Load Line, we were struck with the high percentage of gales occurring in the western parts of the North Atlantic and North Pacific Oceans as compared with the gale frequency in the eastern parts of these Oceans. In both these Oceans to the west there are cold currents coming from the Arctic regions and warm currents coming from the Tropics.

Thus, taking a great average of observations, the association of bad weather with steep sea isothermal gradients is shown. The Gulf Stream has long been known by seamen as a "weather breeder." MAURY wrote of it: "The most furious gales of wind sweep along with it; and the fogs of Newfoundland, which so much endanger navigation in spring and summer, doubtless owe their existence to the presence, in that cold sea, of immense volumes of warm water brought by the Gulf Stream."

In a report upon an "Investigation of the Meteorology of the North Atlantic," published in 1869, Captain TOYNBEE wrote: "The effect of the temperature of the surface water on the wind and weather seems to be a phenomenon of universal occurrence."

It was under Captain TOYNBEE that daily synoptic charts of the North Atlantic were first drawn, and daily synoptic charts drawn for areas over the sea have since proved that in middle and high latitude, where the changes of the surface temperature from place to place are more sudden, depressions more often occur or develop.

Different degrees of heat imparted by the surface to the air above it and the rotation of the earth contribute to pressure gradient, and in preceding Chapters we have seen that pressure gradient is proportional to wind.

There are, however, exceptions to this rule, for, if air cooled by mountain tops is moved by change of pressure distribution in the vicinity, it moves down the mountain slope by gravitation and attains a velocity, as wind, out of all proportion to the pressure gradient.

In his "Physical Geography of the Sea and its Meteorology," MAURY wrote:—

"When we travel out upon the ocean, and get beyond the influence of the land upon the winds, we find ourselves in a field particularly favourable for studying the general laws of atmospheric circulation. Here, beyond the reach of the great equatorial and polar currents of the sea, there are no unduly heated surfaces, no mountain ranges, or other obstructions to the circulation of the atmosphere—nothing to disturb it in its normal courses.

"The sea, therefore, is the field for observing the operations of the general laws which govern the movements of the great aerial ocean.

"*Observations on the land will enable us to discover the exceptions, but from the sea we shall get the rule.*

"Each valley, every mountain range and local district, may be said to have its own peculiar system of calms, winds, rains and droughts. But not so the surface of the broad ocean; over it the agents which are at work are of a more uniform character."

The Mediterranean Sea is land-locked, having lofty mountains along its northern coast, while to the southward lie the deserts of Africa. In this sea there often occur exceptions to the rule of the barometer and peculiarities of weather. There are the "Mistral" of the Gulf of Lyons, the "Bora" of the Adriatic, and the "White squall" of the Ægean Sea; "Tramontana" or winds off the mountains.

In the Mediterranean we also get, particularly in the Malta Channel, the "Scirocco," a hot southerly wind sometimes charged with the sands of the African desert occurring with suddenness, chiefly in the Autumn.

The "Gregale" or N.E. wind frequently blows with great violence in the winter at Malta.

In the Western Mediterranean, "Vendavales" or S.W. winds occur frequently in winter, accompanied by much rain. Land and sea breezes are common on the coast of Spain in summer.

"Contrastes," or opposing winds, are frequent off the southern coast of Spain. It is by no means a very uncommon sight to see sailing vessels in with the land and in the offing, steering nearly opposite courses, both with the wind aft or quartering. The name Capo Spartivento given to the southern point of Italy, "Cape split the wind," is significant (*spartire*, to divide: *vento*, wind). The "Mistral" and "Bora" are usually preceded by cloud-caps over the mountains which often continue while the wind lasts, and there are other signs known locally, all of which, when observed, should be noted in the Meteorological Log, in order that by publication in this Journal they may become more generally known. Indeed, Marine Observers can do much in every part of the World by remarking in their logs upon peculiarities of weather phenomena, but such remarks recorded in the Mediterranean may be of special value, for the Meteorological Office has a branch at Malta, where, for successful forecasting, this information may be valuable.

Though the barometer in the open ocean may be an unfailing guide to wind, there are exceptions in the vicinity of high land, of which the following is an example:—

Excessive Wind for Barometric Gradient.

CHART LXIX FOR THE MORNING OF 31ST DECEMBER, 1921.

It will be noted that pressure is Low over the Gulf of Genoa and High over the Atlantic west of Portugal, the wind being N.W. at Pic du Midi, where the air temperature is 21° F., altitude 9,380 feet, and at Perpignan the wind is W.N.W. with air temperature 57°, altitude 104 feet. At sea off Marseilles, the air temperature is also 57°, and off Barcelona it is 56°, as observed by *Tottori Maru* and *Antilochus*.

The P. & O. S.S. *Nyanza*, Captain C. D. FORBES, left Marseilles at 8.39 a.m. on 31st December, wind W.N.W., a fresh breeze, though it should be noted that at 8 a.m. *Tottori Maru*, not far off Marseilles, logged the wind as force 7.

Noon, wind W.N.W. 6 increasing, barometer 1016.8 (30.02), air temperature 58°, wet bulb 54°, which gives humidity 76 per cent., weather *b*. Cirrus and Cumulus are logged as covering 1/10th of sky. (We should like to know if these clouds were over the mountains or nearer the zenith?)

4 p.m., wind N.W. 9, barometer 1017.3 (30.04), air temperature 55°, wet bulb 50°, humidity 70 per cent., weather *b*.

At 6.30 p.m. the wind from N.W. increased to storm force 11, with very high steep sea. Ship labouring heavily. Hove to with ship's head N.N.E.

8 p.m., wind N.W. force 11, barometer 1020.8 (30.14), air temperature 49° (the wet bulb reading was by this time probably affected by salt-water spray, so that humidity cannot be found), weather *b*.

CHART LXX is made from ships' observations only, taken at 8 p.m. on 31st December. Comparing it with CHART LXIX it will be seen that during the day the "Low" which was over the Gulf of Genoa has moved south and is now over the Straits of Bonifacio, also that the barometric gradient over the Gulf of Lyons is much less steep than would be expected for so much wind.

Herefordshire bears N. 72° E. 116 miles from *Nyanza*, the line of bearing is nearly at right angles to the isobars, and there is only a difference of 4 mb. (.12 inches) in their corrected barometer readings; while *Antilochus* bears S. 34° W. 236 miles from *Nyanza*, this line of bearing is at an angle of about 4 points to the isobars, so that the distance for gradient would be about 167 miles, with barometers only differing 2 mb. (.06 inch).

It should also be noted that between noon and 8 p.m., *Nyanza's* barometer had risen 4 mb (.12 inch), the ship having made S. 48° W. 60 miles during this time, the depression also moving south.

With a wind of storm force out in the open ocean the difference in barometers, 60 miles apart, and on a line of bearing at right angles to the isobars, would be about 6.8 mb. (.20 inch). *See* Table, CHAPTER X.

The Mistral.

At noon, with wind W.N.W. 6, the temperature of the air was 58° and humidity 76 per cent. By 4 p.m. the wind had veered to N.W. and increased to a strong gale, while the temperature fell 3° and the humidity 6 per cent. By 8 p.m. the air temperature had fallen 9° altogether since noon, and the wind was then N.W., force 11.

Now in the morning the "Low" was over the Gulf of Genoa and the general direction of the wind from W.N.W. over the Franco-Spanish boundary, where the Pyrenees Mountains, rising to a height of 11,000 feet, lie in an E.S.E. and W.N.W. direction. North of the Pyrenees, the Cevennes Mountains, rising to 5,000 feet, extend in a N.N.E. direction.

The "Low" travelled south during the day, which would tend to a veer of the wind from a more northerly point of the compass with slight increase in force in the Gulf of Lyons, due to slight steepening of the barometer gradient. The cold, dry, heavy air over the tops of the mountains accelerates the N.W. wind by gravitation and rushes down to the sea as the "Mistral."

The cold, dry, heavy air striking downward on the surface of the sea no doubt accounts for the well-known fact that the sea rises with extraordinary rapidity in the Mediterranean with Northerly winds, of which we had many unpleasant experiences in the light, fast, little ships of the Fleet messenger service during the late War.

CHART LXXI shows the conditions on the morning of 1st January, 1922. It will be noted that the "Low" is now over the Tyrrhenian Sea, and that the gradient has steepened over the Gulf of Lyons, conforming more to the force of the wind. During the day, the wind moderated until at 4.20 p.m. *Nyanza* was able to proceed on her course with a fresh N.N.W. gale on the starboard quarter, the air temperature having risen again to 53° F. and barometer to 1026.3 mb. (30.31).

During several winters in the Mediterranean, and on many passages through it, I have noticed when bound in or out of Marseilles and Toulon, that with the wind from northward of west, if it increases round about noon it almost invariably blows with gale force before midnight, and doubtless others will have noticed the same.

With a clear sky the air at the mountain tops, already cool due to altitude, is further cooled by terrestrial radiation at night, hence the "Mistral" usually blows hardest with a clear sky.

The "Mistral" may be concurrent with the southerly passage of the right semi-circle of a deep depression; when this happens the pressure gradient will be more nearly proportional to the wind.

The following example will not only serve to illustrate this, but it will also demonstrate the utility of wireless reports in these waters:—

"Mistral" with steep Barometer Gradient in rear of a Depression.

The Bibby Line S.S. *Oxfordshire*, Captain B. W. ADAMSON, was approaching Marseilles outward bound on December 28th, 1923.

They sent out a weather report addressed to "All Ships" as usual, but received none.

The Bibby Line steamers call at Marseilles, and it is important to these ships and to all mail and passenger steamers with a schedule to maintain, to know in winter time if a "Mistral" may be expected during the time of their call, for often it may be desirable, if the "Mistral" is likely to be violent, to anchor in l'Estaque Roads, not going inside the breakwater for fear of delay.

It has often been found advantageous to embark passengers in this roadstead by tender in a strong "Mistral," for with that wind it is often not safe to attempt to go to sea from the harbour within the breakwater.

Had *Oxfordshire* received reports from other ships and intercepted the Eiffel Tower message, by making a weather chart, she could probably have seen that a heavy "Mistral" was to be expected, and that it would probably last until some time after noon on December 29th, when she was due to sail.

In the Western Mediterranean the station reports and ships' reports contained in the Eiffel Tower message are particularly useful, for the latter cannot sometimes be received direct from the Eastern North Atlantic because of the interference of the land. A selection of these reports will give the general pressure distribution over the Eastern North Atlantic and Western Europe, and, with ships' reports received direct, a sufficiently complete chart for the purpose may be made.

In CHART LXXII we have such a Chart FOR THE MORNING OF DECEMBER 28TH, 1923.

By it, *Oxfordshire*, and ships in the Gulf of Lyons, could have seen that there was a large and fairly deep depression centred north of Paris, and that with the barometer rising quickly at Holyhead in its rear, falling at Paris and Lyons, and falling rapidly at Zurich, that this depression would probably travel in a direction to the south-eastward. Such a movement of the depression would cause the wind over the mountains to the westward and north-west, which by the trend of isobars and observation at Perpignan was from the westward, to veer to the N.W. and so cause the air to flow down the mountain slopes with increasing velocity. Further, with this depression moving to the S.E., the wind would be from a north-westerly direction at Marseilles due to pressure until the depression had passed away a considerable distance to the S.E. With this combination of the effects of gravitation and barometer gradient a heavy and fairly long spell of "Mistral" would be expected.

Oxfordshire arrived at Marseilles in the forenoon, and was in harbour throughout the strength of this "Mistral"; her meteorological log was not continued until she proceeded to sea.

The meteorological logs of S.S. *Clan Malcolm*, Captain C. J. HIGGINS, and S.S. *Orsova*, Captain C. G. MATHESON, indicate that the "Mistral" blew with very great severity over the Gulf of Lyons from the evening of December 28th until the morning of December 30th, 1923.

CHART LXXIII shows the conditions on the morning of December 29th, 1923, when the depression was centred west of Rome. There is a steep gradient over the Gulf of Lyons, where the wind from off the mountains is reported by *Orsova* and *Clan Malcolm* to be storm force, and it will be noted that in this vicinity the air temperature has dropped 8 degrees since yesterday morning.

CHART LXXIV MORNING OF DECEMBER 30TH, 1923.

Oxfordshire is at sea again, and has a light N.N.W. breeze in rear of the depression. *Clan Malcolm*, though no longer under the influence of the depression, is still experiencing the "Mistral," or mountain wind, from the northward, the gradient in her vicinity being shallower than would cause a wind of force 10, due to pressure.

High Seas.

This "Mistral" set up a very high, steep sea in the Gulf of Lyons on December 29th, 1923, *Clan Malcolm* and *Orsova* both being obliged to heave to. Captain HIGGINS, who is one of our most experienced "excellent" observers, estimated the sea to have been 45 feet high at 4 p.m. when *Clan Malcolm* was distant only some 180 miles from the "weather" shore. The fact that the sea compelled *Orsova* to heave to is sufficient to indicate the severity of the weather. The question has been asked, "Why is it that heavier seas occur with northerly winds in northern latitudes, and southerly winds in southern latitudes?" The following is possibly an explanation.

The barometric gradient is usually steeper and wind stronger in the rear of depressions than in front of them, and, therefore, in middle and high latitudes where depressions are usually moving eastward stronger winds occur from polar directions.

Further, polar winds being composed of comparatively cold, heavy air appear to set up more sea disturbance than equatorial winds composed of warmer, moist, light air. The matter requires investigation and observations and remarks upon sea and wind will be very welcome.

The length of waves is influenced by the "fetch." The highest sea reported of recent years was that encountered by *Majestic* on the night of December 29th, 1922, in the North Atlantic, in approximate Latitude 49° N., Longitude 20° W., when Sir BERTRAM HAYES and his officers estimated that the sea reached a height of 80 feet. Upon investigation of the weather conditions, Captain HENNESSY found that this month in the North Atlantic had been remarkable for the frequency and strength of its gales. The phenomenal seas were caused not only by storm winds in the vicinity, but also by reinforced waves due to westerly winds which had been blowing continuously for at least 36 hours over an area extending 800 miles west, aided further by heavy westerly swell entering this area from the westward.

The inclusion of sea in weather reports has not been suggested in Ships' Wireless Weather Reports, because winds reported usually give a very good idea of what sea may exist or be expected. Swell is an essential element to report. There are, of course, localities where the sea is far more dangerous than in others with the same amount of wind, as, for example, off the South African coast on the edge of the Agulhas Bank. Captain TOYNBEE remarks in his "Report on the Gales of the Ocean District adjacent to the Cape of Good Hope": "In some cases the sea was tremendous, the eastern edge of the Agulhas Bank (where there is a strong current setting to the south-westward) is remarkable for its extremely high and confused seas, more especially in south-westerly gales, which blow counter to the current."

Squalls.

Apart from increase of wind force due to gravitation of cold air from mountain tops, the cold "front" or line of demarcation in a depression where the cold and warm winds converge is a place of conflict where squalls occur. Sometimes this line is marked by a sudden squall with a shift of wind, heavy rain, thunder and lightning, a sudden fall of temperature and a very rapid short rise of the barometer extending for hundreds of miles. This is a Line-Squall. More often squall lines are shorter and less well defined following in quick succession. The conditions which prevailed in the Mediterranean on December 20th to 22nd, 1923, were typical of squally weather.

CHART No. LXXV FOR THE MORNING OF DECEMBER 20TH, 1923 indicates that a depression was centred over the Adriatic with northerly winds in the Gulf of Lyons taking cold air to the southward of the Balearic Islands, while to the southward of a line indicated approximately by the pecked line on the chart the wind is westerly and S.W. and comparatively warm. The depression is moving S.E. and the cold "front" will probably travel in the same direction so that s.s. *Maimyo*, Captain G. HAMILTON, from Port Said to London might predict wind veering with squalls and rain.

CHART No. LXXVI shows the conditions on the morning of December 21st, 1923 *Maimyo* is now near the line of the cold " front," the air temperature has dropped 10° the wind veered 5 points and increased to a gale with squalls, great atmospheric instability may be expected. According to her report on this day between 4 and 5 p.m., there were frequent shifts of wind between south, west and north, and at 5 p.m., in Latitude 36° 40′ N., Longitude 12° 50′ E., there were frequent violent squalls from N.W., with thunder and lightning.

CHART No. LXXVII shows the conditions on the morning of December 22nd, 1923.

The French airship *Dixmude* was lost at about this time. It seems likely that the violent vertical winds, as well as the horizontal wind and thunder and lightning which were observed in the squalls experienced by *Maimyo* at 5 p.m. on the 21st, may have caused the loss of *Dixmude* not far from Malta.

The advantage to aircraft of information of actual squalls or observations which may indicate the growth or prevalence of squally weather broadcast by selected ships to C.Q. will be evident.

System applicable to all Parts of the Oceans.

Throughout these Chapters we have kept before us the aim set in the " Foreword "—" to give suitable guidance to Mariners for the making of charts and forecasts by a simple and quick process by using the observations of marine observers, and giving experiences and suggestions for the application of the method in all seas from which sufficient synchonised observations are available."

Examples and suggestions have been given for all the permanent atmospheric pressure zones shown upon the CHARTS OF THE WORLD XXV AND XXVI, except those of the Polar regions. That is, we have dealt with weather at sea in all Latitudes covered by the trade routes; broadly the same procedure is applicable in the same Latitude in other Longitudes over the Oceans.

Examples of all seven fundamental shapes of isobars which were generalised in Chapter II have been given. Marine observers, having read these Chapters as they were received month by month, are now asked to peruse them as a whole. Weather at any place is connected with the general circulation of the atmosphere and, therefore, a world-wide conception of the conditions of the atmosphere must be kept in view. The forecaster on shore is dealing with weather systems passing or developing over his area; he has been given a very large range of reports of recent years by means of wireless telegraphy. The mariner is continually passing over the oceans not only through weather systems which are passing or developing, but through the great zones of different atmospheric pressure in which are attendant all types of weather. His should indeed be a wide outlook and wireless telegraphy has enabled him to " see," with the assistance of other observers ashore and afloat, up to several thousand miles distant; whereas, not more than 30 years ago, his range of communication was that of vision bounded by the horizon, and his predictions were more conjectural.

Prediction of the Movement or Change of Weather Systems.

The examples given in previous chapters show how important it is to consider the relative position and movement of the ship to the weather system she is in or those which may approach her position or path.

In using the barometer tendency observed in ships at sea, the influence of course and speed should ever be borne in mind.

When that has been considered, with ships' reports and reports from coast stations of barometer tendency plotted on a chart, it will often be possible to tell in which direction pressure is reducing, in which it is increasing, and in which there is little or no change, and so to gauge approximately the path of the depression; also as to whether it is becoming deeper, remaining the same depth, or filling in.

In the Norwegian method, see Chapter IX, the line of advance of a cyclone is said to be at a tangent to the warm " front " at the centre of the depression or parallel to the isobars in the warm sector.

With tropical revolving storms, so much may depend upon the direction that one of these storms will move in, to the navigator, that there is no more important matter for prediction. Since the 2nd Edition some progress has been made, and it is important to note what is said in Chapter V. With each year's investigations of tropical revolving storms in those regions where there have been sufficient observations to make synoptic charts during hurricanes, we have found that usually the pressure distribution has indicated the path.

The tendency of the barometer in ships or at coast stations coming under the influence of a tropical revolving storm will often give more definite indications of movement than in the case of depressions of higher latitudes, because the isobars are more uniform in shape and are closely packed near the centre. Wind direction and its changes are a further guide. With upper air observations and an intricate and extensive organisation of reports over areas traversed by tropical storms, weather offices are making progress in the prediction of movement, and issue warnings containing forecasts of probable direction of advance, particulars of which, with much other information broadcast by wireless or made by visual, are given in " Weather Signals " month by month in THE MARINE OBSERVER for all parts of the world.

Weather Signals.

We have confined our suggestions and experiences entirely to the application of weather reports received and charted on board ship by the navigator himself, and there is little doubt that as this method gains popularity at sea it will have far-reaching results, its success must mainly depend upon marine observers.

In areas adjacent to coasts of countries with weather services and in ocean areas from which numerous reports can be constantly and regularly received at routine times without fear of interruption, very effective forecasts may be made ashore and broadcasted for the information of shipping and no doubt in time this practice will be considerably extended.

The " Weather Shipping " Bulletin was adopted by the British Meteorological Office with a view to assisting the mariner by both methods; it provides weather reports from coast stations, with which and ships' reports he may construct his chart and form his own conclusions; as well as forecasts for defined areas and districts for a definite period also giving the " further outlook " when possible. Reports for two far northern stations in this message are of particular value for ascertaining the movement of depressions passing between Scotland and Iceland.

Having regard to the movement of weather systems when forecasts are broadcast—the receiver cannot see the weather map—it should be remembered that the message refers to a definite place or area and is for a definite period. In fairness to this system, all who receive and use the signals—wireless or visual—should give due consideration to the explanations published for their information. There is a mutual moral responsibility.

Coast station reports provide a basis for the mariner to work on; the broadcasting of these reports has already had a profound influence upon barometer observation at sea, and has enabled seamen to make weather charts at sea in many parts of the world; thus permitting those at sea to form their own conclusions and to judge as to how much weight they may attach to the Forecasts made ashore and broadcast to them.

The British " Weather Shipping " Bulletin is the outcome of a very large expression of nautical opinion, and as such is recommended as a pattern upon which to base Weather Shipping Bulletins in other parts of the world but especially within the British Empire. Many British seamen have advocated uniformity of code and method in these bulletins so that time and trouble may be saved in their use at sea.

Ships' Weather Signals.

All who have practised wireless and weather as an aid to navigation agree that Ships' Reports should be made in a form which enables the receiver to plot the observation quickly and without trouble and that the observations must synchronize. That the barometer observation should represent the correct atmospheric pressure at sea level and give a fairly accurate indication of the tendency or change in pressure with course and speed of ship and that wireless traffic should not be jammed.

Therefore the form of report given in Chapter I and in Weather Signals should be used and until some method of regulating times of communication to prevent jamming and to facilitate reception as suggested in Chapter III under the heading "Some Considerations as to Time of Observation and Transmission of Wireless Weather Reports, Range and Utility," with uniform Greenwich times of observation for all longitudes has been adopted, Marine Observers should be guided by that part of Chapter III, following the heading "The Existing System which Marine Observers are invited to practise for the benefit of all ships fitted with Wireless Telegraphy."

The provisions of the Meteorological Office authorise the loan of sets of tested instruments to the Captains of British merchant ships for the purpose of the collection of reliable observations of weather at sea. These observations are required to provide data for research, for compiling information required for navigation, for the general purposes of meteorology ashore, and for central forecasting.

The provisions of the Meteorological Office do not permit the loan of instruments to ships for their own exclusive purposes, but where instruments are lent for the first, it is understood that they should be used also for the second, and so there are about 150 British merchant ships with highly efficient official instruments on board, which may be used for the general advantage of shipping on the high seas in all parts of the world.

In 1921, in "Weather Forecasting in the Eastern North Atlantic and Home Waters for Seamen," published when the principle of giving actual observations at British coast stations by W/T to shipping was first adopted, it was stated:—

"The greatest assistance which shipowners can give in furthering this aid to navigation is to provide their ships with good mercurial barometers."

It would seem that many shipowners are now realising more truly the value, to those navigating their ships, of a reliable barometer; and there are now on our list over one hundred ships with mercurial barometers in their outfits, which with the 150 ships with official instruments make about 260 in our total of 500 regular observing ships which have a good mercurial barometer and are invited as "Selected Ships" to make routine reports to "All Ships."

Not only is the number of selected ships regularly performing this most useful voluntary service steadily increasing, but the distribution of these reporting ships on any day along the trade routes of the world is steadily improving.

Since January, 1926, when we commenced to keep a record of the number of "Selected Ships" regularly making routine reports to all ships when at sea the number of ships so doing has multiplied by six and the rate of multiplication steadily increases.

Reciprocation of these reports at sea provides an aid to navigation both on the sea and in the air; reception of ships' reports at Weather

Weather Charts made at Sea indicating Mastery of Subject by Seamen.

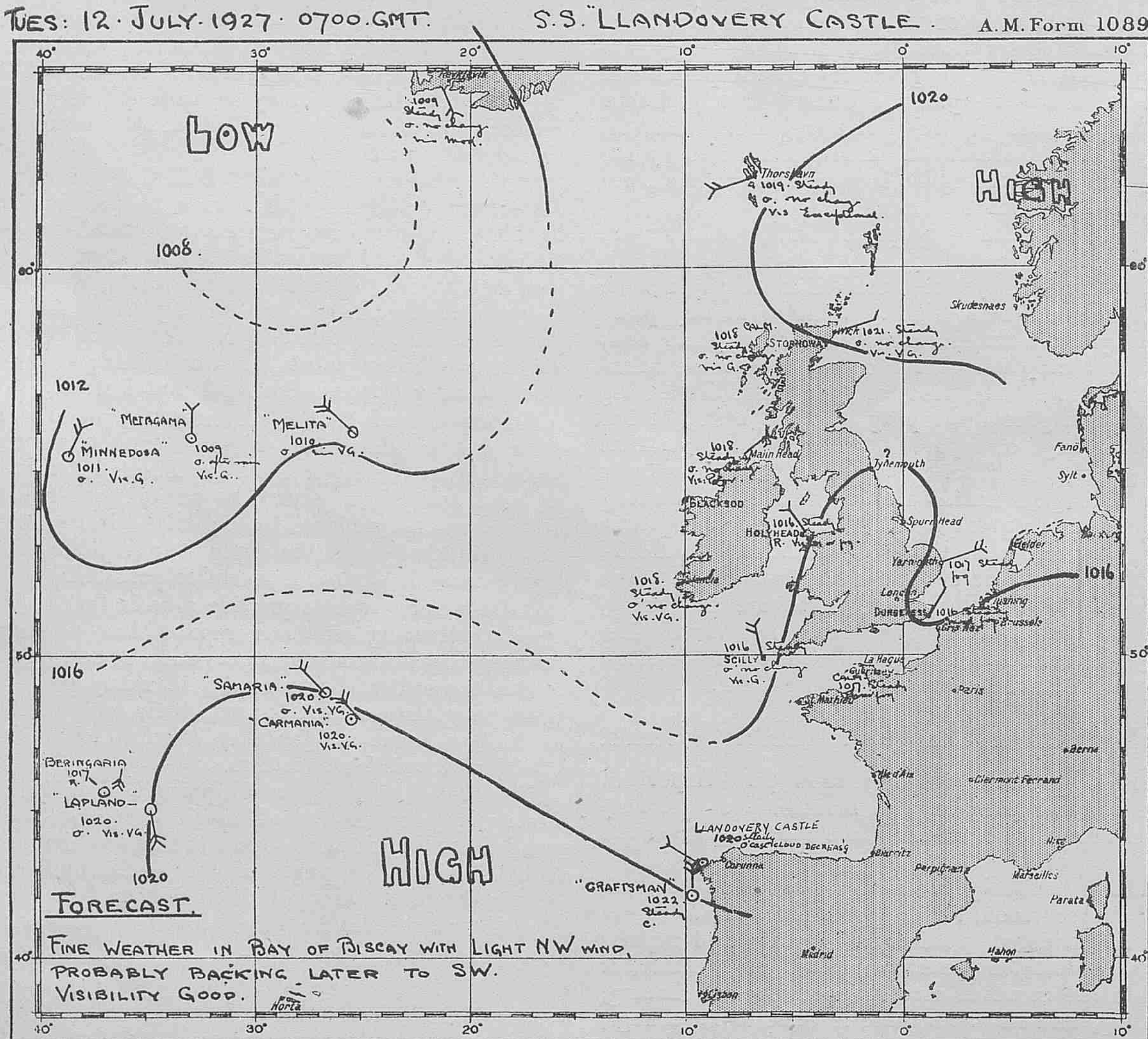


Figure 47.—Weather Chart of Eastern North Atlantic and Forecast made on board S.S. *Llandovery Castle*, Captain G. OWENS, from Marseilles to London, by Lieutenant C. H. WILLIAMS, R.N.R., Extra Second Officer. It will be remembered that Mr. C. H. WILLIAMS made the first weather charts on board a ship at sea with British Coast Station observations broadcast by Wireless Telegraphy in September, 1921.

According to the Meteorological Log of *Llandovery Castle* she actually experienced light airs from N.W. and W.N.W. during the forenoon and afternoon of July 12th, and in the dog watch there was a light breeze from W. by S., the wind being variable approaching Ushant. The visibility, 8 by scale, and it was fine, *i.e.*, no rain.

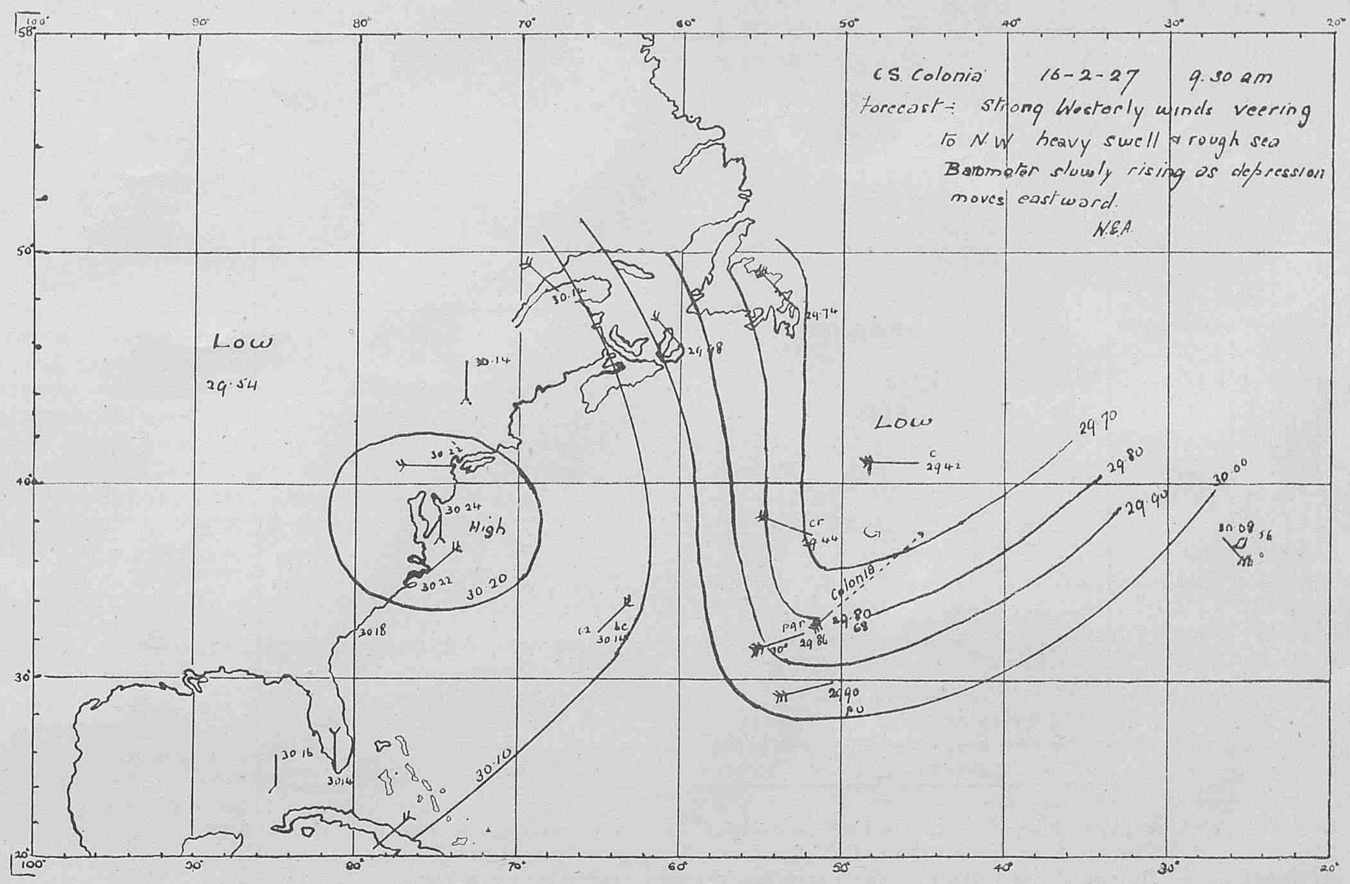


Figure 48.—Weather Chart of Western North Atlantic and Forecast made on board Cable Ship *Colonia*, Commander G. F. Carlton, O.B.E., R.N.R., from Colon to London, by Lieutenant W. E. Allen, R.N.R., Second Officer.

According to *Colonia's* Meteorological Log she experienced a strong breeze to moderate gale from W.S.W., which veered to N.W., the sea being 6 to 7 by scale, and later she had a heavy N.W. swell, the barometer steadily rose after 4 p.m.

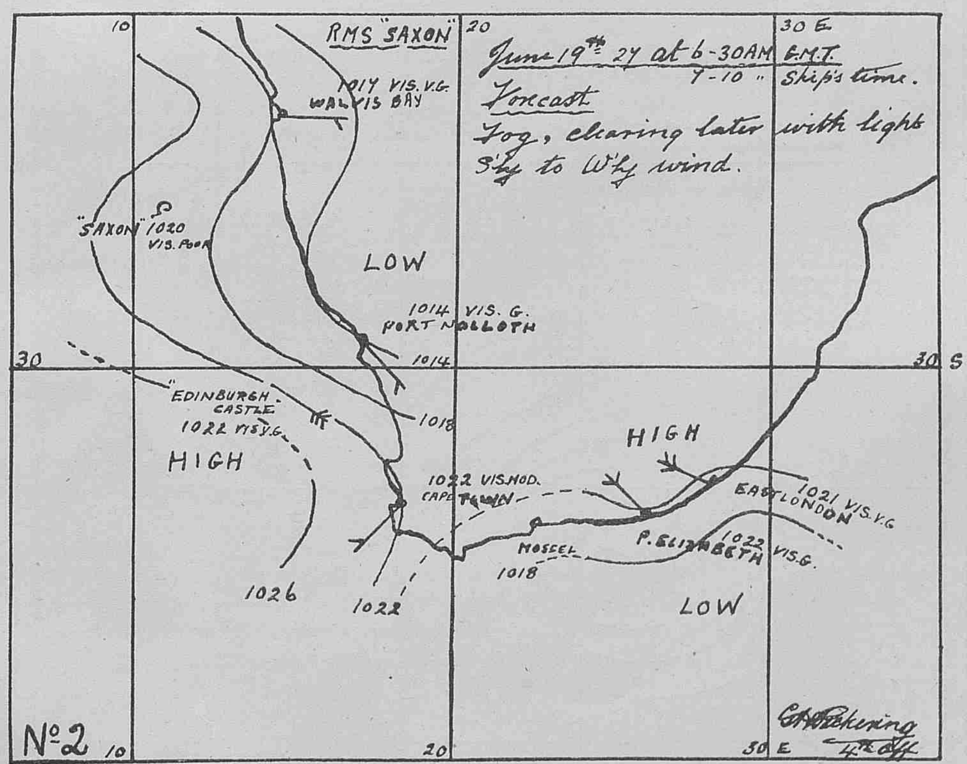


Figure 49.—Weather Chart of South African Waters and Forecast made on board R.M.S. *Saxon*, Captain T. M. Lang, from Cape Town to Southampton, by Mr. G. H. Pickering, Fourth Officer. The weather actually experienced was thick fog, which cleared with light E.S.E. airs during the forenoon. At noon there was a light W.N.W. breeze which gradually backed to S.E.

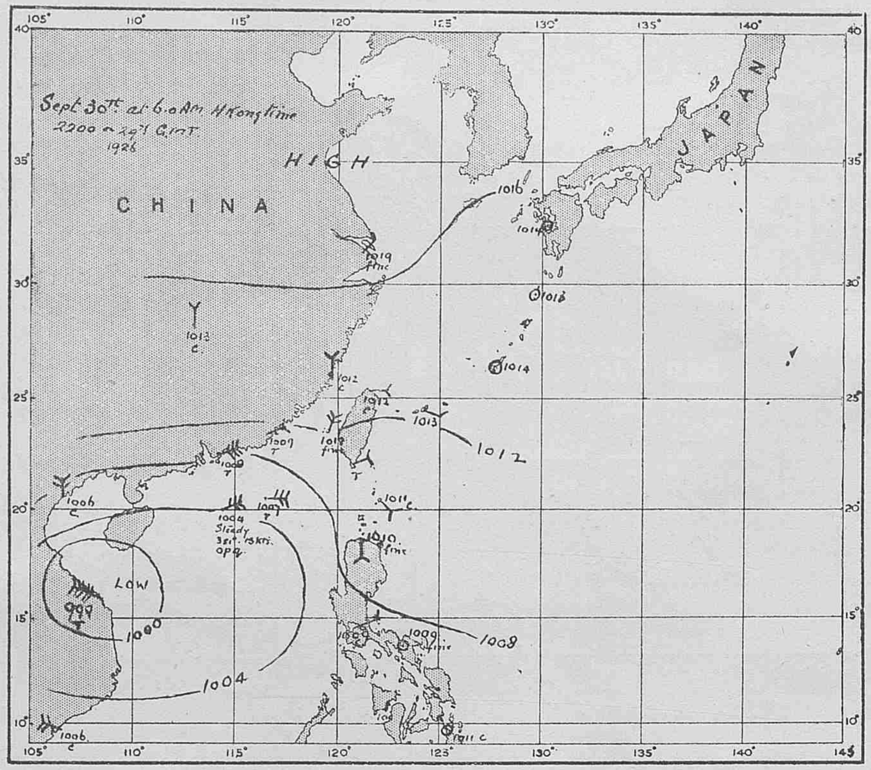


Figure 50.—Weather Chart of the China Sea made on board S.S. *Khyber*, Commander C. HESTER, R.N.R., from Singapore to Hong Kong, by Mr. C. B. ROCHE, Chief Officer. The chart for the day before was published in "The Marine Observer's Log," which indicated that the ship could maintain her course with safety. This chart shows the typhoon at some distance on the port quarter of *Khyber*, with wind now a whole gale in the S.W. quadrant of the system near the centre where the day before the wind was light.

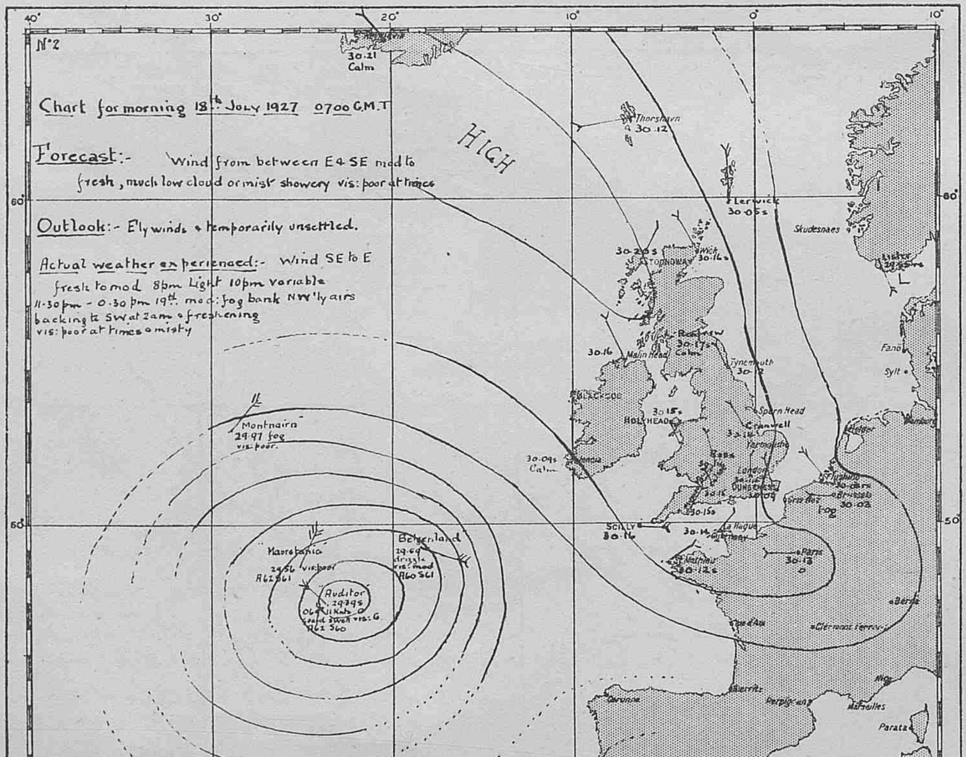


Figure 51.—Weather Chart of the Eastern North Atlantic made on board S.S. *Auditor*, Captain W. T. OWEN, Tampico to Rotterdam, by Mr. T. E. STEEL, Third Officer.

Offices not only is the means of aiding navigation by the issue of forecasts and warnings to shipping from the shore, but they have a profound effect upon weather intelligence generally.

In the great stock and grain districts of the Dominions overseas, fore-knowledge of rain or drought may contribute considerably to production. For example, it is thought that the strength of the North-East Trade in the Atlantic may be associated with rainfall in the cornfields of Canada.

Supposing it is, ships reporting weather in the North-East Trade would possibly contribute indirectly to the production of grain cargoes to be shipped to England.

It is certain that the navigator with a Weather chart before him is far better able to form an idea of what wind, sea, visibility and current he will experience, than the navigator who has nothing but his own isolated observations to go upon, or, indeed, a forecast made for him by people on shore, much though this latter will help him.

The making of a weather chart becomes a simple matter with practice; the difficulty at sea is to get sufficient of the right kind of reports, and here is where the Wireless Operator can give valuable assistance. It is well worth the trouble to Marine Observers to interest him.

In the middle of last century MAURY wrote in capital letters in that book beloved by sailormen, "The Physical Geography of the Sea":—

"The greatest move that can now be made for the advance of Meteorology is to extend this system of co-operation and research from the sea to the land, and to bring the Magnetic Telegraph regularly into the service of Meteorology."

Very shortly afterwards Admiral FITZROY set an example to the world in the use of the Electric Telegraph for weather reporting ashore. **"Selected Ships" on our list are invited to set an example in the use of Wireless Telegraphy for weather reporting to "All Ships."** A space has been provided in the Meteorological Log and in Form 911 in which they may record exactly what they have broadcast.

The ways of commerce over the Oceans and the hereditary chivalry of the sea are beyond doubt more adaptable to voluntary Meteorological Service than to obligatory Service.

Economical Passage Making.

We repeat what we said on the North Atlantic Chart for November, 1922:—

"Concerning passages, there are many ways in which prediction of weather may have an economic bearing as well as contributing very largely to safety.

"Take the passage from the Straits of Gibraltar to Channel ports as concerning mail and passenger steamers with ample speed and a time-table to keep, the weather which may be expected in the Bay, off Ushant and in the Channel is frequently a source of anxiety to the commander, who wishes to arrive at his disembarkation port on time. Without information of the conditions ahead and what those conditions are likely to be in the near future, it is often considered wise to assume that they may be unfavourable—i.e., fog, dirty weather or strong head winds. With W/T some idea may be obtained by intercepting reports from ships ahead and to the westward, from whence most weather comes, together with reports from land stations, and on occasions it may be possible to forecast with some accuracy that fine clear weather is most probable.

"In the first case it is usual to steam at a speed in excess of the average required to arrive on time, and when sufficient is considered to be in hand to ease down; thus, if the weather remains favourable, more coal than necessary is consumed.

"In the second case, if reports indicate that clear favourable weather is reasonably probable, provided confidence is sufficient, a speed very little in excess of the required average will be steamed from the commencement of the passage."

When I wrote this I referred to steamers with reciprocating engines such as those I had commanded before coming to the Meteorological Office. It is now desirable that commanders of steamers with turbine engines and oil fuel, and motor vessels should give us the benefit of their experience regarding economies of fuel and weather.

"The term 'Forecast' was introduced by Admiral FITZROY as meaning a statement of weather which may be expected in the near future, but of recent years the term appears to have conveyed to many the meaning that a prophecy of weather was intended. This is not so, for all the forecaster can do, be he meteorologist, with a highly organised system of quickly reported observations from a great many stations over a large area, or a seaman, with a number of ships co-operating with him by means of W/T, is to chart his observations, and then from experience of what has happened before with similar pressure distribution, winds and weather over the area under consideration, state what the probabilities are. If reports received contain false observations, the forecast may miscarry, pending changes may be overlooked, and, as we know only too well at sea, Divine Providence often ordereth the elements at sea to act in ways beyond the comprehension of man. Still, experience shows that it is worth trying at sea," and the charts here reproduced by photography, FIGURES 47 to 51, show something of what seamen are doing to master this subject which I was told when making early attempts to simplify its practice at sea, was beyond them.

It has ever been for British seamen to achieve what seemed "impossible."

The End.

CURRENTS IN THE NORTH ATLANTIC OCEAN.

Summarised from the Current Charts published in "The Marine Observer" to date.

PREPARED IN THE MARINE DIVISION BY E. W. BARLOW, SENIOR PROFESSIONAL ASSISTANT.

SIX sets of quarterly charts of the currents on the main trade routes of the North and South Atlantic have now been published in THE MARINE OBSERVER as follows:—

(1) Currents on direct Cape Blanco—Table Bay Track (Volume 1).

(2) Currents on the Track from the Latitude of Cape Blanco to the Brazils (Volume 2).

(3) Current Charts, Channel to Latitude of Cape St. Vincent (Volume 2).

(4) Charts of Currents for the Routes from Latitude of Cape St. Vincent to Latitude of Cape Blanco (Volume 3).

(5) Currents on the Trans-North Atlantic Tracks (Volume 3).

(6) Currents on the West Indies and Panama Route (Volume 4).

In the majority of these cases articles relating to the charts have also been published, while the remainder have been referred to in notes by the Marine Superintendent and in Chapters on "Wind and Set and Drift of Current" in "Wireless and Weather, an Aid to Navigation." As is well known to the Corps of Voluntary Marine Observers, the current charts have been drawn with the intention of providing more accurate information of the mean set and drift of currents, and more especially the vagaries of current, than has previously been available. The purpose of the present article is to consider the North Atlantic current system over the trade routes as a whole, in so far as the new information enables this to be done. It is, however, desirable at the outset to formulate a caution. The observations from which THE MARINE OBSERVER charts are plotted were made during periods from 1910 to the date when the chart was constructed, the war years 1914-1918 being represented by few observations. In selecting 1910 as the commencement of the period of observation consideration was given to the improvement in navigational aids which has taken place and to the question of handling the data. While, therefore, the charts are the best that can be drawn at the present time, it must not be overlooked that the averages of these periods may not be the same as the true averages obtained from a longer period, particularly in those cases where a mean current arrow or a current rose is drawn from a relatively small number of observations. Any revision that is made in the future is however more likely to affect the minor details, particularly of the lesser or more variable currents, than seriously to alter the validity of the general remarks on the essential characteristics of the main currents. The latter part of this article is devoted to a recapitulation and extension of the remarks on the modern theories of current formation which have been given in the articles already published in THE MARINE OBSERVER. It is not possible in the present state of our knowledge to give a complete theory of ocean current formation, nor to explain in detail how the flows of individual currents are compensated. An effort has, however, been made to set down what we do know on these matters in so far as it can be done from a practical standpoint.

The numerical information afforded by THE MARINE OBSERVER Current Charts makes it possible for the first time to obtain figures showing the relative mean strengths of the well-defined North Atlantic drift and stream currents for each of the four seasons. Several considerations forbid the computation of exact figures in this connection, one of the chief being the great variation in the number of observations for different currents. The drifts are, therefore, given in TABLE I only to the nearest mile per day, the number of observations for each current and season being also shown. For the purpose of this Table, and also of the descriptive remarks given below, the more extensive currents have been divided into suitable sections, the Gulf Stream together with the North Atlantic Drift, for example, being shown in five parts, the mean strength of each part being separately computed. The current areas corresponding to TABLE I are shown in FIGURE 1, the order in the Table proceeding in clockwise direction round the permanent North Atlantic high-pressure system, starting with the Portugal Current on the north-east side and finishing with the eastern portion of the North Atlantic Drift. With the exception of the Guinea Current, which is inserted in the Table, the various well-known counter-currents are only partially covered by THE MARINE OBSERVER charts, which therefore do not give sufficient information for values of mean strength to be obtained. These currents are however referred to in the text, with such information as is available.

Table I.

North Atlantic Ocean.

Mean Quarterly Resultant Current Drift.
(Miles per day.)

Current.	Spring.		Summer.		Autumn.		Winter.	
	Mean Drift.	Number of Observations.	Mean Drift.	Number of Observations.	Mean Drift.	Number of Observations.	Mean Drift.	Number of Observations.
1. Portugal Current, Latitude 45° N. to 37° N.	3	463	3	473	3	392	2	374
2. Canaries Current (Cape Route), Latitude 37° N. to 20° N.	5	655	4	656	5	574	3	546
3. Canaries Current (South America Route), Latitude 33° N. to 20° N.	5	138	4	118	5	108	3	116
4. African Coast Current (Cape Route), Latitude 20° N. to 8° N.	5	253	2	281	3	255	3	253
5. North-East Trade Drift (South America Route), Latitude 20° N. to 10° N.	5	217	4	215	3	142	5	179
6. Guinea Current (Cape Route) ...	7	91	6	122	9	130	6	105
7. South Equatorial Current (Cape Route), Latitude 3° N. to 6° S.	7	276	12	344	8	335	8	272
8. South Equatorial Current (South America Route), Latitude 4° N, to 6° S.	8	278	11	286	12	194	13	234
9. Equatorial Current (Caribbean Sea), Longitude 66° W. to 82° W.	10	299	12	267	11	330	12	322
10. Bahama Current, Longitude 50° W. to 70° W.	3	286	5	235	5	327	3	334
11. Gulf Stream I, Latitude 22° N. to 36° N.	30	125	29	139	19	116	23	87
12. Gulf Stream II, Latitude 36° N. to 38° N., Longitude 62° W. to 74° W.	19	84	18	118	13	97	14	51
13. Gulf Stream III, Latitude 38° N. to 42° N., Longitude 46° W. to 70° W.	9	1,565	10	2,211	9	989	9	460
14. North Atlantic Drift, Western Portion, Longitude 38° W. to 46° W.	—	—	5	1,082	5	809	3	546
15. North Atlantic Drift, Eastern Portion, Longitude 6° W. to 38° W.	3	2,619	3	2,876	2	1,579	3	1,325

The currents or current sections will now be considered in such detail as the limits of this article will allow, the information given being almost wholly derived from an examination of THE MARINE OBSERVER charts. As is well known to all navigators, the set and drift even of well-defined currents are subject to frequent fluctuations, and it is strictly true to say that the most constant feature of any current is its variability. The current roses published in THE MARINE OBSERVER give the navigator for the first time a good idea of how much variability to expect by showing him the percentage number of occasions on which currents of stated drifts have been observed to flow in various directions. From this he can at once estimate the probability of a current of specified set and drift flowing on the day on which he is making his course through the region referred to by the rose. In the present article it must be understood that all remarks on the strength of a current refer to the mean current, the mean resultant flow, as shown by the current arrows in the charts or by the figures in TABLE I for larger areas. These figures were obtained by taking the resultant of a number of mean current values on the charts in the same way as the latter were obtained by taking the resultant of a number of actual current observations. Remarks on variability or on maximum actual drifts observed are included in appropriate cases. The areas covered by THE MARINE OBSERVER charts are more extensive than those shown in FIGURE 1 because the figures in TABLE I have only been obtained for the regions of well-defined current. In order to save space the four quarters into which the year is divided for the purpose of THE MARINE OBSERVER charts will be referred to as Spring (February, March and April), Summer (May, June and July), Autumn (August, September and October), and Winter (November, December and January).

The mean speed of the **Portugal Current between Latitudes 45° N. and 37° N.** is appreciably less during Winter than in the other seasons, and an examintion of the charts indicates that while the drift is fairly constant for nine months of the year, there is probably a slight increase during Summer. The reduction in Winter is most marked in the extreme south, between the Latitudes of Lisbon and Cape St. Vincent, where the flow of current is halved. The currents may set in to the land at any time of the year, but it is worthy of note that the mean current for Latitude 43° N. to 44° N. (Cape Finisterre) shows a definite set off the land in all seasons except Spring, the set being W.S.W. or W., changing to S.S.W. in Spring. As noted on the charts, observations indicate that there is a marked tendency for the current to set to N.E. between Latitude 40° N. and 45° N. in February, and also a tendency to set to N.W. between Latitude 42° N. and 46°N. in June. The charts, which extend to 48° N., indicate that between Latitudes 45° N. and 48° N. the set of mean current is variable during Spring and Winter, but in Summer the Portugal current extends to Latitude 46° N. and in Autumn to Latitude 48° N. This northward extension of the current will be referred to at a later stage.

The Canaries Current, Cape St. Vincent to Cape Blanco, Cape Route, shows similar characteristics to the **Canaries Current, South America route.** Both are at a minimum of about 3 miles per day in Winter and at a maximum of about 5 miles per day in Spring and Autumn, Summer showing a slight reduction of drift, which is probably more marked in the case of the South America Route, further from the land. The Winter reduction of drift is very striking in certain areas, of which two may be cited as examples. North of Palma, on the South America Route, the mean current in Spring is 6.5 miles per day, and in Winter 2.1 miles, based on the same number of observations. Off Cape Blanco, on the Cape Route, the figures are 8.1 and 3.5 miles per day, respectively, the number of observations being nearly the same in the two seasons. There are some seasonal variations in set, the most conspicuous being in Latitude 32° N., south of Madeira on the South America Route. The current on the Cape Route south of the Canaries is the steadiest as regards set, being almost constant at S.W. throughout the year. The maximum observed drift reported is 48 miles per day, N. 11° W., by S.S. *Somerset* on March 11th, 1924 (Latitude 27° 51′ N., Longitude 16° 10′ W.).

The African Coast Current (Cape Route) is variable both in set and drift. The set is most constant during Spring and Winter, the mean set being S.W. as far as Latitude 10° N. in the former season. As shown by the Table, the mean drift of the current as a whole is greatest in Spring when it is about 5 miles per day. From the

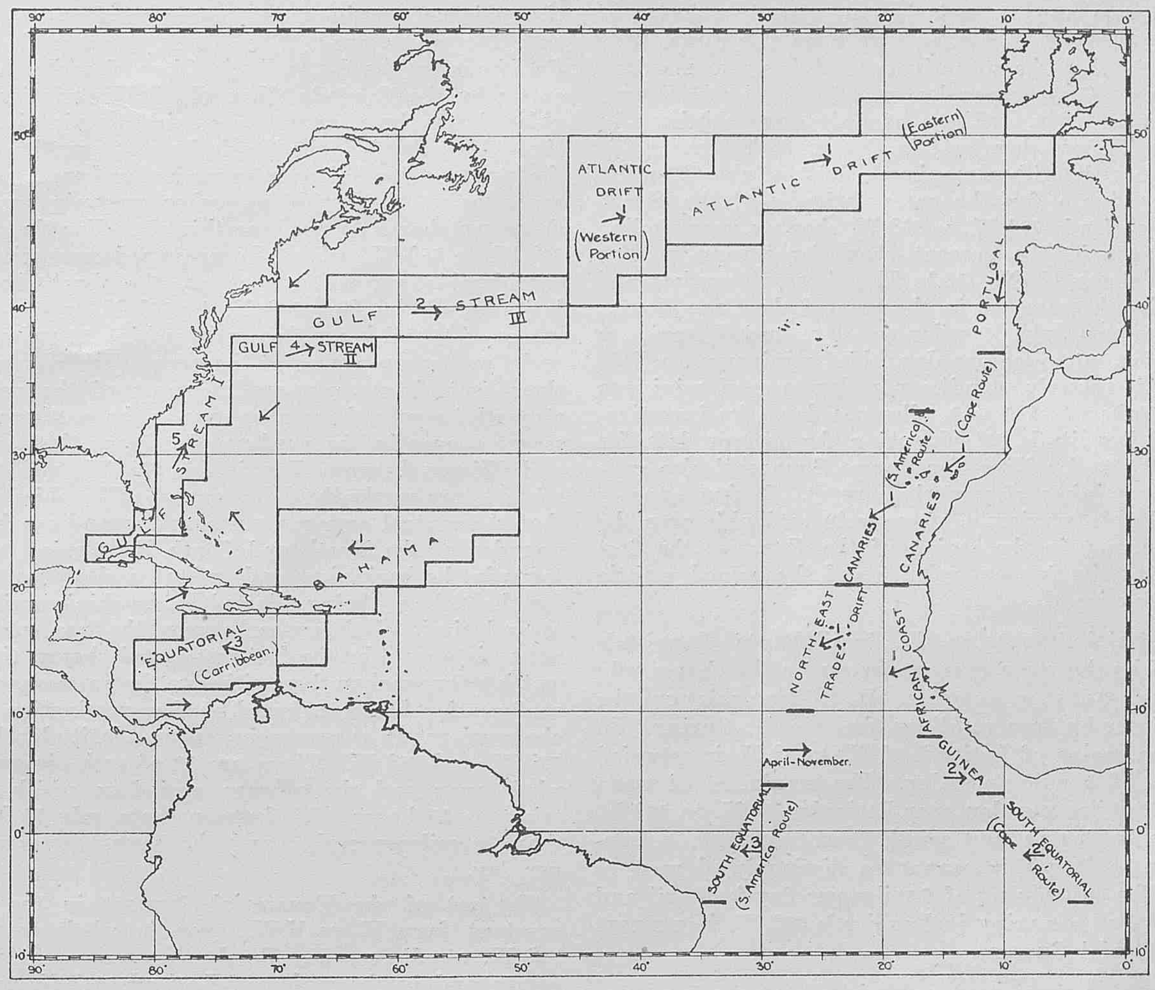


Figure 1.—Sections of Current referred to in Table I. The arrows indicate the mean annual set and the figures show the mean annual drift on the following scale:—

1 = 3–4 miles per day. 4 = 16 miles per day.
2 = 7–9 ,, ,, ,, 5 = 25 ,, ,, ,,
3 = 11 ,, ,, ,,

Arrows outside the current sections indicate the mean annual set of counter-currents referred to in the text.

inset figure which was published in the current chart for the spring quarter (The Marine Observer, Volume I,. No. 1), we see that the percentage frequency of easterly sets between Latitudes 15° N. and 18° N., in the neighbourhood of Cape Verde, increases rapidly in early Summer, attaining a maximum of 33 per cent. in July and falling off gradually during the remainder of the year.

The section of the **North-East Trade Drift** between Latitudes 20° N. and 10° N. (South America Route) shows mean drifts of 5 miles per day during Winter and Spring, falling to a minimum of less than 3 miles in Autumn. Its set is very constant, mainly S.W. during Spring and Summer, but lies between W.S.W. and W.N.W. in Winter. The season of least drift, Autumn, is also the season of variable set.

Two separated sections of the **South Equatorial Current**, on the Cape and South America Routes respectively, come within our survey. In order to deal with these sections in their entirety it is necessary to consider the region from Latitude 3° N. to 6° S. in each case. The section on the **Cape Route** shows a marked maximum of drift, 12 miles per day, in Summer, with a drift of from 7 to 8 miles during the rest of the year. The sets lie between N.W. and W.S.W. throughout the year. The maximum drift reported is 50 miles per day,. N. 63° W., by S.S. *Port Caroline* on August 11th, 1920 (Latitude 2° 25′ N., Longitude 11° 31′ W.). The section on the **South America Route** is a stronger current, the mean drift attaining a maximum of 13 miles per day in Winter and falling below 11 miles per day only in Spring. As the Table shows, the strength of the current is half as much again, during Autumn and Winter, as that on the Cape Route section. Drifts of 40 miles per day and over have been recorded in all months from June to August inclusive, the months of weakest observed drift being January, April and December. The maximum recorded is one of 69 miles per day, N. 53° W., by S.S. *Julia Park* on August 3rd, 1913 (Latitude 3° 55′ N., Longitude 29° 35′ W.).

Table II.

Mean Drifts.

South Equatorial Current (miles per day, South America Route).

Latitude.	Spring	Summer.	Autumn.	Winter.
4°—2° N. ...	5	10	11	13
2°—0° N. ...	4	10	14	18
0°—2° S. ...	6	9	14	12
2°—4° S. ...	13	16	12	14
4°—6° S. ...	13	13	12	13

The mean drifts for the region between Latitude 4° N. and 6° S., taken from the charts, are given in Table II, which indicates how the strongest part of the South Equatorial current is found progressively northward as the seasons advance. The figures given against Latitude 0°-2° S. for Summer and Winter are smaller than those for latitudes both north and south of this region. An examination of the actual currents shows that this is explained by the fact that the westerly currents are relatively weaker and also that a larger proportion of easterly sets occur. There is thus a tendency for the current to divide into two streams during Summer and Winter, the line of weaker current lying to the south-west of St. Paul Rocks. The inset figure published in the current chart for Autumn on the Cape Route in The Marine Observer, Volume I, No. 7, gives the average annual variation of westerly velocity of the Equatorial Current between 0° N. and 2° N. on this route. The figure shows decisively that the westerly current has two maxima, the first in June, about 27 miles per day, and the second in December, about 13 miles per day. There are also two minima, in February, about 2 miles per day, and in October, when the set is reversed, becoming easterly with a maximum drift of about 2 miles per day. A similar figure for the same latitude of the South America Route in Longitude 20° W. to 25° W. shows a very similar curve (see inset figure in the current chart for Spring in THE MARINE OBSERVER, Volume II, No. 13.) The times of maxima and minima are not quite the same as in the case of the Cape Route; they are:—chief maximum July, 23 miles per day, second maximum November to December, 21 miles per day, chief minimum April to May, when the set is easterly, 6 miles per day, second minimum October, with a westerly set of 8 to 9 miles per day. An investigation carried out for Longitude 30° W., using the current data for 1854-1871 in the "Charts for Nine Ten degree Squares," also gave two maxima and two minima of westerly current. It thus appears probable that the double maximum of westerly set holds over the whole Equatorial current in the region of the Equator, the first maximum occurring at the Summer solstice and the second a little before the Winter solstice.

The Counter-Equatorial Current on the Brazil Route (Longitude 28° W.) is indicated by the mean current arrows on the charts only in the Summer and Autumn quarters. It is traceable on the current rose for Winter but not at all on the rose for Spring. In this latter season the region of Latitude 4° N. to 8° N. is occupied by a westerly drift of 5 miles per day. The maximum of mean easterly current is 11 miles per day over Latitudes 4° N. to 10° N. This current varies in length and width from season to season, and from December to March it cannot be distinguished west of Longitude 25° W. The easterly set of 6 miles per day in April and May mentioned above as occurring in Longitude 30° W. forms part of the Counter-Equatorial Current.

The Guinea Current is experienced eastward of Longitude 20° W. to 25° W. during Winter and Spring. In Summer when the Doldrums are in higher north latitude it forms one current with the Counter-Equatorial current, giving a continuous easterly current from a point further to the west. At all times of the year there is a sharp line of demarcation between the Guinea Current and the South Equatorial Current. This line is least well-defined in October when easterly sets occur south of the Equator. The average seasonal variation of the southern boundary of the Guinea Current is shown in the inset FIGURE 2 in the current charts of THE MARINE OBSERVER, Volume I, No. 1. There are two northward maxima, in July (3° 30′-4° N.), and November (3°-3° 30′ N.), and two northward minima, in February (1° 30′-2° N.), and October (0° N.). The periods of greatest northward displacement of the Guinea Current coincide very nearly with the periods of greatest westerly set of the South Equatorial Current. The maximum mean strength of the Guinea Current is in Summer about 15 miles per day and the minimum in winter, about 10 miles per day. Of observed drifts, the greatest recorded is 40 miles per day, N. 76° E., by S.S. *Clan Macfadyen* on July 22nd, 1910 (Latitude 5° 50′ N., Longitude 14° 53′ W.). In the months of January, February, June, September, November and December, no drift as great as 30 miles per day has been reported since 1910.

We will now deal with the currents of the Caribbean. The erratic nature of these currents and the difficulty of the navigator in knowing what to expect are well brought out by the valuable notes received from Captains and published in "The Marine Observer's Log" in the present volume. The **Equatorial Current (Caribbean Sea)** is shown by TABLE I to be on the average a strong current in all seasons, of approximately equal strength in Summer and Winter, 12 miles per day, and somewhat weaker in Spring and Autumn, 10 and 11 miles per day. The charts show that the maximum mean drift is experienced in the region Latitude 12° N. to 14° N., Longitude 74° W. to 78° W., at all seasons, the greatest value being 21.0 miles per day in Summer and the least 16.9 miles in Spring The region of Latitude 12° N. to 14° N., Longitude 78° W. to 82° W., shows on the chart a value of 23.6 miles per day in Autumn, but this is based on only five observations, whereas the above statement as to the region of maximum current is based on 211 observations spread over the whole year. The North Equatorial Current enters the Caribbean by the Santa Lucia Channel while the South Equatorial enters by the Grenada Channel. In descriptive works and in the older charts these currents are said to maintain their independence throughout the Sea, the North Current near its northern shores and the stronger South Current near its southern shores, the intervening space being filled with a weaker westerly current. THE MARINE OBSERVER charts do not bear this out. For the region of Longitude 66° W. to 68° W., where the presumed separation of the regions of considerable current is greatest, the chart shows for the central latitudes of the Sea, 14° N. to 16° N., mean currents mainly in excess of 10 miles per day and reaching 16 miles per day in Spring and Summer over part of the area. The charts further show that these central currents are for part of the year intermediate in strength between the weaker ones in the northern Caribbean and the stronger ones in the southern Caribbean, but that during Autumn and Winter between Longitudes 70° W. and 74° W. the central currents are markedly the strongest. The objection might be raised that the central currents are spurious and on the average are compounded of the North and South Equatorial currents encountered towards the beginning and end of a day's run, the mean current for the 24 hours being allotted to the ship's position at midnight in the relatively slack water between the two currents. That this is not so is proved by the fact just stated that at times the central current is stronger than those either to the north or south of it. A further confirmation has been found by the examination of the short period observations of currents in central latitudes between Longitudes 70° W. and 78° W. There are 50 of such observed currents for the whole year and the average period to which they refer may be taken as 12 hours. Of these currents only 10 have a drift of less than 10 miles per day and the remainder range up to 40 miles per day.

The set of the Equatorial Current in the Caribbean is very constant, from W. to N.W., over the whole area east of Longitude 78° W. at all seasons. Further west the set varies more with the season and in the region of Latitude 14° N. to 16° N., Longitude 74° W. to 82° W., there is an unexpected weakness of drift in Spring, 2.8 miles per day (17 observations). The maximum individual drift for the whole area is 76 miles per day, N. 56° W., recorded by S.S. *Colonial* on October 12th, 1922, in Latitude 17° 46′ N., Longitude 75° 36′ W. Another interesting feature is the marked seasonal variation shown in the region of Latitude 20° N. to 22° N., Longitude 82° W. to 86° W., south-east of Cape San Antonio (see Table III).

Table III.

Currents off Cape San Antonio.

Set in to land.	*Set.*	*Drift.*	*Number of Observations.*	Set off the land.	*Set.*	*Drift.*	*Number of Observations.*
Summer...	N.N.W.	7.1	7	Spring...	S.W.	5.6	5
Autumn...	N.N.W.	7.4	17	Winter...	S.S.W.	2.9	10

No current rose is available for this area but the probable explanation of the changes of mean set lies in the variations in strength or position of the Cuban counter-current off the Cape. It may be remarked that the counter-current is most conspicuous farther east on the charts in Spring, which is the season when, as shown in the above Table, the S.W. set off Cape San Antonio is strongest. This explanation accords very well with the remarks on the shift in position of the Central American counter-current off Port Limon by Captain W. T. FORRESTER in THE MARINE OBSERVER, Volume IV, page 168.

As was stated in THE MARINE OBSERVER, Volume IV, page 120, "Discrimination must always be exercised in the near neighbourhood of the West Indian Islands and the Coast of South America as in these regions there appear to be inshore currents of no great width which cannot be sufficiently defined by the method of D.R. and observed position." Some information about the **main counter-currents of the Caribbean** may be derived from the charts. The **Central American Counter-current** in Latitude 10° N. to 11° N., Longitude 78° W. to 82° W., (north of Colon) has a set and drift of

S.E., 5.5 miles per day in Spring, N.E., 11.0 miles per day in Summer increasing to E.N.E., 12.3 miles in Autumn. In Winter, however, the mean set and drift are N.W., 5.9 miles, the counter-current being so reduced as to disappear on the chart. For Latitude 10° N. to 12° N., Longitude 74° W. to 78° W., the counter-current is traceable on the roses in all seasons but only shows in the mean current arrow during Autumn, the set and drift being N.E., 8.0 miles per day. Observed currents exceeding 49 miles per day, setting E. or S.E., have been experienced in Summer and Autumn, with maximum drifts in Summer. The greatest of these is 60 miles per day, E., recorded by S.S. *City of Rangoon*, on July 30th, 1922, Latitude 10° 02′ N., Longitude 79° 25′ W. On the current roses for Latitude 18° N. to 20° N., Longitude 74° W. to 78°W., the **Cuban Counter-Current** is traceable in all seasons, most strongly in Spring and Summer and least in Winter, but on the mean current arrows it is only to be found in Spring, when a N.E. set with a drift of about 2 miles per day is shown in the region mentioned and also in Latitude 20° N. to 22° N., Longitude 78° W. to 82° W. During Winter a mean set of 8.6 miles per day, N.W., is shown in the latter area. The continuation of this current south of Haiti can be seen on the current roses, also at least strength in Winter.

For the consideration of the **Bahama Current** the region extending up to Latitude 26° N. has been chosen. This has been done because THE MARINE OBSERVER charts afford strong evidence that on the average this current extends as a homogeneous whole during Autumn up to the parallel mentioned. The mean strength of this current increases progressively from less than 3 miles per day in Winter to rather more than 5 miles in Autumn. In Summer the strength is nearly as great as in Autumn but the set of the current over the extended area is less uniform. On the United States Pilot Charts and on the chart drawn by Captain J. M. ISAACSON, THE MARINE OBSERVER, Volume IV, page 45, two Bahama Currents are shown, the northern one being the Bahama or Antilles Current and the southern a current which flows westward and passes between Cuba and Bahama Islands. North of Porto Rico, about Longitude 66° W., these currents are shown as approaching one another within a distance of less than 1° of latitude and Captain ISAACSON has found slack water between them. The scale of THE MARINE OBSERVER charts is too small to confirm this separation of the two currents but it is probable that the currents are merged into one in the Autumn even if separately recognisable during other seasons. It may be noted that the mean current strength has also been computed for the region of Latitude 18° N. to 20° N., Longitude 62° W. to 70° W., covering a section of the South Bahama Current, but is not given in the Table. The relative seasonal strength shows an Autumn maximum (6 miles per day) similar to that experienced in the extended area, the minimum (2 miles per day) occurring in Spring. These figures are based on 177 observations during the year. This section therefore presents essentially the same features as the larger area.

An examination of the Autumn chart in THE MARINE OBSERVER, Volume IV, No. 45 shows that the broad belt of the Bahama Current during this season sweeps round eastward of the Bahamas with sets passing successively through N.N.W. and N.W. until the Gulf Stream is joined. During other seasons this connecting flow is partial and interrupted and is least evident in Winter; these facts are borne out by the sea surface temperatures which decrease more slowly northwards from the West Indies and eastwards from the Gulf Stream in Autumn than during the rest of the year. In this connection a curious fact may be remarked; if the seasonal charts are examined it will be seen that the current in the region of Latitude 24° N. to 26° N., Longitude 74° W. to 76° W., is very constant both in mean set and mean drift throughout the whole year, the set varying between 6.8 and 7.4 miles per day, and the drift between N.N.W. and N. During Spring the rose shows that currents with an E.S.E. set and a drift of from 25 to 48 miles per day occur on 4 per cent. of the days close to the northward of the Mona Passage. An example of a strong easterly set in the northern part of the Bahama Current area is provided by the observation of S.S. *Hubert* on July 12th, 1923, when a current E., 38 miles per day, occurred in Latitude 25° 26′ N., Longitude 65° 20′ W. The maximum westerly drift in the region since 1910, was observed by S.S. *Ionic* on January 27th, 1921, N. 85° W., 45 miles per day, in Latitude 20° 16′ N., Longitude 64° 53′ W.

In THE MARINE OBSERVER, Volume IV, page 109, a note on a **Counter-current off Eleuthera Island, Bahamas,** was published. The observations were made by H.M.S. *Capetown*, Captain G. H. KNOWLES, D.S.O., R.N., and showed on March 13th and 20th, 1926 a current off Abaco and Eleuthera Islands, inside the Bahama Current, possibly 50 to 60 miles wide, setting approximately S.E. with a drift of from 35 to 60 miles per day. Further observations of current in this region would be welcomed in order to determine whether this current flows more or less regularly.

The first section of the **Gulf Stream, from the western extremity of Cuba to Latitude 36° N.** shows an appreciable reduction of drift in the second half of the year, most marked in Autumn. The mean drift for Autumn, 19 miles per day, is about two-thirds of that for Spring and Summer. It must not be overlooked that the number of observations in the second half of the year is less than that of the first half; nevertheless it exceeds 200 and the reduction of drift shown is probably substantially correct. The separate areas for which mean current arrows are drawn in THE MARINE OBSERVER charts within the section show large differences of mean drift and the drifts are also markedly variable from season to season in the same area. The region of Latitude 26° N. to 28° N., Longitude 78° W. to 80° W., which includes the channel between Jupiter, Florida and Grand Bahama Island, shows the greatest mean drift at all seasons, varying from 69.5 miles per day in Summer to 43.3 miles per day in Winter. These figures are based on a small number of observations per season but it may be noted that the Admiralty Current Charts also indicate the flow to be greatest in the region mentioned for most of the months in the year. The maximum observed drifts as shown in the current roses and the tables which appear on the chart tend to confirm the statement that the Gulf Stream is at a maximum during the first half of the year. Six drifts exceeding the rate of 100 miles per day have been reported during the months February to June inclusive, the largest being at the rate of 120 miles, E., experienced by S.S. *Empress of Britain* on February 23rd, 1922, Latitude 26° 47′ N., Longitude 79° 26′ W. From July to January no drift reaching the rate of 100 miles per day has been observed, the maximum being 94 miles, N. 86° E., by S.S. *Philadelphian* on August 16th, 1925, Latitude 37° 40′ N., Longitude 69° 12′ W.

A special investigation has been carried out in order to see whether the actual observations on which THE MARINE OBSERVER charts were based are sufficiently widely scattered to indicate with precision the boundaries of the Gulf Stream. For this purpose all the currents for the Spring quarter were plotted, but no result could be obtained.

The set of the various mean arrows of the section of the Gulf Stream under consideration is seen from the charts to be fairly constant, but there is nevertheless a certain amount of fluctuation. The most striking feature is the weakness of current setting due north in Autumn in the region of Latitude 28° N. to 32° N., Longitude 76° W. to 80° W., compared with that in the rest of the year, as shown by the current roses. Sets in southerly or westerly directions may occur infrequently in the Gulf Stream itself. A discussion of these reverse sets will be found in THE MARINE OBSERVER, Volume III, page 213.

The second section of the **Gulf Stream, Latitude 36° N. to 38° N., Longitude 62° W. to 74° W.,** is seen from TABLE I to present exactly the same relative seasonal strength as the first section does. Again the number of observations is appreciably smaller in the second half of the year. The mean sets remain nearly constant throughout the year and become successively more easterly, being practically due E. between Longitudes 62° W. and 66° W.

The mean strength of the third section of the **Gulf Stream, Latitude 38° N. to 42° N., Longitude 46° W. to 70° W.,** is practically constant throughout the year at 9 miles per day, increasing to 10 miles only in Summer. This constitutes the steadiest portion of the entire Gulf Stream and North Atlantic Drift. The part of the current flowing between Latitudes 38° N. and 40° N. is the strongest at all seasons and the area of greatest mean current for the year (18.4 miles per day) is that in Latitude 38° N. to 40° N., Longitude 62° W. to 66° W. During Spring and Summer mean drift decreases progressively from Longitude 66° W. to 46° W. within the two degrees of latitude above mentioned, but during the rest of the year irregularities develop and the region of Longitude 46° W. to 50° W. shows a marked accession of strength. On the other hand, the mean current of Latitude 38° N. to 40° N., Longitude 50° W. to 54° W. falls away to only 1.9 miles per day during Winter through both a weakening of easterly set and an increase of westerly set.

A few remarks on **Counter-Currents adjacent to the Gulf Stream** may now be made. Some traces of the influence of the cold southerly counter-current flowing between the Gulf Stream and the shores of North America may be discerned on the charts in lower latitudes, but off Nantucket and up to Latitude 44° N. this current is indicated by the mean arrow in all seasons except Autumn. Its mean strength is greatest in Winter and is 4.9 miles per day, set S.W., for the region of Latitude 42° N. to 44° N., Longitude 66° W. to 70° W. During this season also the mean arrows show it to attain its greatest easterly point, Longitude 58° W. in the same latitude, in which region it is known as the **Cabot Current.** Its considerable fluctuation of mean strength has evidently no relation to the mean strength of the Gulf Stream in this region which we have seen to be practically constant all the year. The **Labrador Current** lies outside the region covered by the charts, but its influence can be detected in the roses for Latitude 42° N. to 44° N., Longitude 50° W. to 58° W., i.e., immediately to the east of the Cabot Current and north of the Gulf Stream. In this border area the influence of the Labrador Current shows a minimum in Summer and a maximum in Winter as would be expected.

A relatively weak **counter-current with sets between W. and S. flowing on the east side of the Gulf Stream** is shown in THE MARINE OBSERVER Charts. An explanation of this current will be found in THE MARINE OBSERVER, Volume IV, page 120. Considering first the region east of the Gulf Stream up to Latitude 34° N., the charts show this counter-current to be strongest on the average in Spring and weakest in Autumn. This accords well with the previous remarks on the N.W. to N. set of the Bahama Current past the Bahama Islands up to the Gulf Stream, which was shown to be strongest in Autumn and weakest in Spring and Winter. The greatest mean strength of the counter-current is 8.8 miles per day, set S.S.W., in Latitude 28° N. to 30° N., Longitude 74° W. to 76° W., during Winter. The counter-current is also traceable on the mean current arrows in several areas further northward and eastward, in the form of sets between N.W. and S.W. to the southward of the easterly-flowing Gulf Stream. Here again it is least shown in Winter.

Information relating to the **North Atlantic Drift, Western Portion,** is incomplete for the Spring quarter. The mean strengths during the rest of the year given in TABLE I are 5 miles per day in Summer and Autumn and 3 miles in Winter. Probably the drift is slightly greater in Summer than in Autumn, to the extent of half-a-mile per day. The set lies between N.E. and E., but in Winter in the northern part of the area inclines to E.S.E.

The **North Atlantic Drift, Eastern Portion,** has a nearly constant mean strength of between 2 and 3 miles per day at all seasons, least in Autumn, the maximum strength probably occurring in Summer and Winter. The mean set shows slight fluctuations during Summer, Autumn and Winter, but is mainly E. In Spring it is mainly E.N.E. The actual current may set in any direction over the North Atlantic Drift as a whole.

The currents over the high pressure area in the North Atlantic, i.e., in the area contained between those which have been described above, are usually weak and variable and of comparatively little practical concern to the navigator. They may set in any direction, and the mean drift in any limited area rarely exceeds 6 miles per day. Drifts of 40 miles per day and upwards have, however, been observed on the eastern section of the West Indies and Panama Route in the months of February, March, July and October, the greatest being 47 miles per day, S. 87° E., by S.S. *Discoverer* on October 8th, 1924, in Latitude 39° 46′ N., Longitude 45° 48′ W. It is worthy of note that the limits of the Sargasso Sea are not traceable on the current charts, implying that the currents therein are neither greater nor less than those in other parts of the central area. One interesting feature which has emerged from the study of the region is that the currents on the southern portion of the West Indies and Panama Route, from Latitude 40° N., Longitude 22° W., to Latitude 28° N., Longitude 46° W. (including the region of the Azores), show a definite south-westerly tendency in Autumn. It will be remembered that the Bahama Current is strongest and widest also in Autumn and that in this season the Portugal Current is extended northwards to Latitude 48° N. There is probably a definite relation between these three phenomena, the explanation of which may possibly be found in the variations of the North-East Trade Wind, which on the eastern side of the Atlantic blows from its most northerly latitude, about 38° N., in August.

Theoretical Considerations.

Turning now to the second part of our subject, it may be said that the ultimate cause of ocean currents, using the term to include all non-tidal movements of the water, lies in the difference of solar heat radiation received by tropical and polar regions. Putting the matter in another way, the motive power of oceanic circulation is precisely the same as that which is the real origin of the varied phenomena and changes of climate and weather. It should further be noted that the effect of radiation is both direct and indirect, the latter acting by means of meteorological influences, such as wind, rainfall, etc. As examples, the heating of the ocean in equatorial regions is a direct result of radiation, while the frictional result of the steady North-East Trade Wind and the lessened salinity in the neighbourhood of the mouth of a great river are indirect effects. The immediate causes of ocean currents are therefore a number of factors which constitute the direct and some of the indirect effects of solar radiation. These causes may be classified in various ways, but the following grouping is probably the best:—

(1) Differences of pressure between one part and another of the water of the oceans, produced by differences of density of the water. Differences of density result from variations in the internal state of the water which, so far as practical considerations are concerned, are confined to differences of temperature and salinity.

(2) Wind friction at the surface.

(3) Differences of external pressure, viz., the variations of atmospheric pressure on the oceans.

Of these factors the first two are of major importance, the third being of negligible effect.

Whatever the immediate cause or causes of any specified current, the rotation of the Earth has acted upon it as a modifying factor in such a way that the observed set of the current lies in the Northern Hemisphere to the right of what it would have been if the Earth has not been rotating. In other words the deflective effect is in a clockwise direction for the Northern, and in an anti-clockwise direction for the Southern Hemisphere. It cannot be too clearly emphasised that there is no observed change of set from this cause; however strong and permanent the current or however weak and transitory the effect of the Earth's rotation is impressed upon it from the start. The Earth's rotation does not appear in the above classification because it is not a cause of current in the sense of producing a current where none existed before; it is merely partly responsible for the set of the current. A second important modifying factor is the influence of the coastline. Unlike the Earth's rotation this factor is operative only in some cases. Here again a current will not be produced save by another agency acting in conjunction with the coastline factor.

Different types of surface currents will now be considered and the remarks will be illustrated by reference to the chief North Atlantic currents. In order to round off the subject it has been thought desirable to refer in one or two instances also to the South Atlantic. The explanations of the origin of actual currents are the best that can be given at the present time and represent a real advance on the older ideas of current formation, but should nevertheless not necessarily be considered as final statements. By the theory worked out by W. T. EKMAN a steady wind blowing over an ocean of great extent will produce a surface drift current, the set of which is not, as was formerly supposed, in the line of the wind direction but is inclined to the right of this direction at an angle of 45° for the Northern Hemisphere. This is due to the effect of the Earth's axial rotation, referred to above. All simple drift currents should show a deflection of this character. An investigation of the relationship between wind direction and observed drift current direction was made for a part of the North Atlantic Ocean (Latitude 47° to 53° N., Longitude 10° to 30° W.) outside the main current system; the result in the form of a rose was published in THE MARINE OBSERVER, Volume III, page 100, and also in Volume IV, page 153. The rose shows decisively that the point of greatest current frequency is directed 45° to the right of the wind, in accordance with theory. All other current directions are nevertheless represented, indicating that there are a considerable number of cases in which the current flows more or less contrary to theory. It must, however, be remembered that in order to simplify the working out of the theory the ocean was regarded by EKMAN as being of unlimited extent, with the wind blowing everywhere in the same direction, and therefore the results of the theory are not strictly true for an actual ocean. Such simplifications are frequently employed in mathematical investigations of physical phenomena where the actual circumstances are so complex that the problem could not otherwise be usefully tackled, and it does not follow that because the results so obtained are not entirely or universally true that the theory is useless or wrong. Other practical investigations of the relation of wind and drift current are referred to in an article by H. W. HARVEY on " Stream and Drift Currents and Effect of Wind," THE MARINE OBSERVER, Volume IV, page 182. We may sum up by saying that the deflection of a drift current is an established fact though it is not necessarily one of 45° in all actual cases.

A further investigation was made to determine the relationship between wind force and current drift, the figures (taken from THE MARINE OBSERVER, Volume III, page 100) being given below for Latitude 45°.

Beaufort Wind Force ...	2	3	4	5	6
Current, miles per day ...	1·2	1·9	3·0	4·2	5·3

To obtain values for other latitudes these quantities have to be multiplied by the following factors: —

Latitudes	20°	30°	40°	50°	60°
Factor	1·4	1·2	1·0	1·0	0·9

In low latitudes the factor increases rapidly.

We see from these figures that the frictional effect of wind in producing drift currents is greatest in low latitudes.

In the present state of our knowledge no complete explanation of the fluctuations of drift currents can be given. All wind fluctuation, either of speed or direction, has an effect on these currents but the point of importance is not so much that there is an effect as whether the effect is of sufficient magnitude to produce the observed fluctuations of current. The figures just given show that outside the Tropics, even with a strong breeze, the average velocity of current directly produced by wind does not attain 6 miles per day and therefore wind alone seems an insufficient cause of the vagaries of current. A theory which may account for some of the observed fluctuations was explained in THE MARINE OBSERVER, Volume III, page 101. Briefly summarised, this theory is that cold water from the depths is constantly being drawn up towards the surface over small areas by passing cyclones, with the result that two currents are set in motion, both parallel to the track of the cyclone, the one on the right hand side of the track (in the Northern Hemisphere) running in the same direction as the cyclone and the one on the left-hand side running in the opposite direction. This theory does not, however, explain the vagaries of current in the great high pressure area of the North Atlantic Ocean.

In the case of a simple drift current the frictional effect of wind is not propagated very far downwards. By EKMAN's theory the effect of the wind ceases altogether at a depth which varies according to the speed of the wind and the latitude, but which may on the average be taken at about 50 fathoms. With increasing depth below the surface the current produced becomes successively smaller, with a deflection to the right increasing from the surface value of 45°. A little before the depth of no influence is reached the small current produced is opposite to the wind direction. It will be seen, however, in what follows that no important or permanent current is a simple drift current.

The theory of EKMAN, to which frequent reference has been made in THE MARINE OBSERVER, provides an explanation of some of the chief North Atlantic currents, but it does not give a complete theory of surface currents, since the only factors taken into account are wind friction and the modifying influences of the Earth's rotation and the coastlines. In other words the density factor of our classification is left out. The most important mode of current formation which the theory has given us is the effect of a steady wind blowing over a coastline. Space will not permit of a detailed explanation of this process here and the reader is referred for illustrative diagrams to the article by M. CRESSWELL, on " Tides and Currents," THE MARINE OBSERVER, Volume III, page 138, and to articles by C. S. DURST, in THE MARINE OBSERVER, Volume III, page 211, and Volume I, page 91, where the origin of the Gulf Stream and the Benguela Current is explained on this principle. The essential point of this cause of current production is that a steady wind blowing obliquely over, or parallel to, an extended coastline which is on the right hand with one's face to the wind (in the Northern Hemisphere) tends to draw water away from the coast and so produces a definite but extremely slight slope of the water upwards from the coast. The pressure gradient due to this slope, in conjunction with the Earth's rotation, gives rise to a current, in middle depths just outside the continental shelf, running parallel to the coast. This current is called by EKMAN the midwater current and BUYS BALLOT's Law determines which way it will run along the coast. The surface current experienced by the navigator is the resultant of the midwater set and a set inclined at 45° to the wind direction, the latter being the set that would be actually experienced in the absence of the coast line. In general the effect of the coastline is to make the current flow more swiftly and more nearly with the wind than in the open ocean. Also the depth of current is much greater than that of a simple drift current. FIGURE 2 illustrates diagrammatically the set of the four great currents in the North and South Atlantic which are explained in this manner. It was formerly thought that occasional gales piled up water against a coast or removed water from the coast and in old books the origin of the Benguela Current is explained in this way. It is well known that gales may produce transitory alterations of sea level near the coast and in harbours and thus give rise to transitory local currents, but the magnitude of the effect is now known to be far too small to produce the permanent currents shown in FIGURE 2. The operative winds for these currents are (1) the North-East Trade for the Portugal, Canary and North-East Trade Drift; (2) the South-East Trade for the Benguela Current; (3) the South-West wind on the western side of the North Atlantic high pressure area for the Gulf Stream; and (4) the North-East wind on the western side of the South Atlantic high pressure area for the Brazil Current.

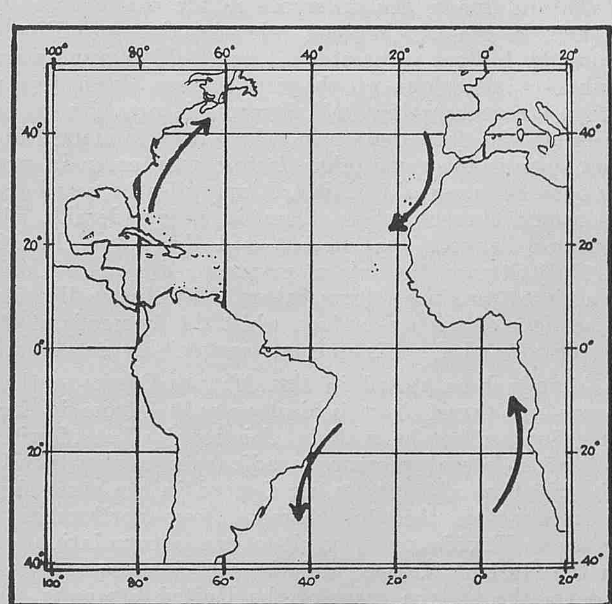


Figure 2.—Diagrammatic representation of the set of coastline-formed currents.

If the coastline were on the left hand with one's face to the wind in the Northern Hemisphere, water would be banked against the coast and the flow of current would be in the opposite direction to that which has been described. If the wind were at right angles to the coastline there would be neither banking nor lowering, the coastline having, therefore, no effect at all. Neither of these cases arises in connection with the permanent currents of the Atlantic Ocean.

The midwater or gradient current runs with a nearly constant set determined by the average wind direction of the season or the year. The actual surface set is more variable according to the wind direction, but it must be remembered that currents of the type we are now considering are only formed in regions of relatively constant wind direction. The effect of transitory and local winds is almost negligible, being of the same order as that previously referred to in connection with simple drift currents. An investigation that was undertaken for a part of the Gulf Stream region showed that no appreciable relationship existed between the wind and the current, though probably the wind fluctuation affects the surface drift to the extent of a mile or two per day. The effect of a steady wind of unusual direction blowing for some days, especially over a considerable surface of the current, might be quite considerable. Where there is a definite seasonal change of wind there will be a corresponding variation in the actual sets of surface and midwater currents. An example of such a variation will be found in the Brazil Current and is given in detail in THE MARINE OBSERVER, Volume II, pages 164-5. In connection with simple drift currents a theory was referred to above whereby certain transitory currents were formed as the result of the passage of a depression. It is possible that the same theory will account for a temporary variation or even reversal of a coastline-formed current, the upwelling of cold water in this case taking place up the steep slope of the continental shelf. This is referred to for the case of the Gulf Stream in THE MARINE OBSERVER, Volume III, page 213, where examples of reverse sets will be found.

Before leaving the subject of currents of the coastline type it may be of interest to mention that on EKMAN's theory a current of this nature is deflected to the right (in the Northern Hemisphere) when it is moving over a gradually shallowing depth and to the left when the water is becoming deeper. The northern edge of the Gulf Stream appears to be deflected by the southern end of the Grand Banks in this manner; this will be seen by reference to the current roses for the region of Latitude 42° to 44° N., Longitude 50° to 54° W., and also by the current arrows for Spring. A further point, which will have been noticed by the reader who has compared the explanations given in THE MARINE OBSERVER for the Gulf Stream and the Benguela Current, is that the factor of temperature is given greater prominence in the case of the Gulf Stream. This is due to the difference in the character of the continental shelf in the two regions, whereby the upwelling of cold water from the bottom is greater in the Gulf Stream area. This factor enhances the slope of the sea surface down towards the coast and so strengthens the Gulf Stream; it provides an excellent illustration of the fact that even where the fundamental origin of two currents is the same other factors may enter in producing the actual current as we know it. It may also be noted that in a coastline-formed current where there is a considerable difference of temperature between the current and the water close inshore, as in the Gulf Stream, the axis of maximum drift is not coincident with the axis of maximum temperature. The latter lies along the crest of the slope of the sea surface, while the former is at the point where the downward slope is steepest, appreciably nearer the shore.

It has already been stated in THE MARINE OBSERVER that ocean currents are not thrust from behind or pulled from in front, but that water flows either by a direct frictional effect of wind or as the result of a lateral pressure gradient in a very similar way to that in which wind currents are formed in the atmosphere. By the old explanations the Gulf Stream flows northwards through the Straits of Florida as a result of an accumulation of warm water in the Gulf of Mexico, and the cold inshore counter-current flowing down the eastern coast of the United States is caused by the pushing effect of the cold Labrador current. There is one point on which some misconception appears to have arisen with regard to the new theories. There is nothing in those which denies the fact that a given mass of water may be actually transported over a great distance by means of current. Thus, if the older theory be accepted in its entirety, the whole of the water composing the Gulf Stream off, let us say, the Grand Banks would have come out of the Gulf of Mexico. In accordance with the newer ideas at least a part of the water will have performed the whole journey, and there still remains the fact that a drifting object set free, say, in the Gulf of Mexico may, but will not necessarily, be carried along by the Gulf Stream and possibly even right across the Atlantic by the North Atlantic Drift.

On the older theories the fact that some feasible explanation has been found for the four currents shown in FIGURE 2 would have been held sufficient to account for the whole great clockwise circulation of the North Atlantic, and the analogous anticlockwise circulation of the South Atlantic, at any rate in their rough outlines. We are not now in the same happy position, and the fact that we have given an explanation of the cause of the Gulf Stream proper does not entitle us to say that we have thereby explained its continuation, the North Atlantic Drift. This current enables us to consider a somewhat different mode of formation. When adjacent areas of the sea surface are at different temperatures, a slope of the sea surface must be produced, the level of the warm water being the highest and that of the cold water the lowest. Though such a slope is of different origin to the slope produced by wind acting in conjunction with a coastline, its effect in originating a current is exactly the same. In the case of the North Atlantic Drift we have relatively warm water to the south and colder water to the north, owing to the difference in the radiation received, and this, in conjunction with the frictional effect of the prevailing, though not steady, westerly wind, is probably sufficient to account for the flow of this comparatively weak current. As we should expect, the current roses show the variability of this current to be very considerable.

The slope due to temperature difference may alone operate in current formation. The weak south-westerly counter-current, which flows south-eastwards of the Gulf Stream, is explained by the difference between the warmer water of the Gulf Stream and the colder water lying to south-eastward. In this case the current flows exactly opposite to the direction of the average wind, which tends to neutralise it. It should be noted that this current is quite distinct from the south-westerly sets sometimes encountered within the confines of the Gulf Stream itself, previously referred to.

A tentative explanation of a somewhat different character may be offered for the southward flowing counter-current between the Gulf Stream and the eastern coast of the United States. This current is confined to soundings, and it appears likely that the slope of the surface which actually produces it is connected with the steepness of the side of the continental shelf. The drawing away of water from the coast by the wind, which is the primary cause of the Gulf Stream, gives rise to an upwelling of cold water from the depths between the Stream and the coast. The theory of the counter-current is that this cold water passes rapidly up the steep side of the continental shelf and so gives rise to a region of maximum density in the shallow water just above the edge of the shelf, with a consequent very slight slope of the water upwards to the coast. If this is correct, there will be three separate adjacent slopes of the sea surface in this region; proceeding outwards from the coast there is first a very slight downward slope to the edge of the shelf, a relatively big upward slope to the point of maximum flow of the Gulf Stream and then the slight downward slope of the S.W. counter-current.

The North Equatorial Current provides an example of a current of more complex origin. One factor is the frictional effect of the easterly wind of low latitudes, but in addition there will be a slight downward slope of the surface towards the Equator due to two distinct causes. The first of these is the general upwelling of cold water which takes place in Equatorial regions; the second gives us a fourth method by which a slope may be produced. This method, explained by EKMAN, is similar to that of a coastline-formed current, but instead of the wind blowing over a coastline it blows in the present case towards a steady current flowing in a different direction. In other words, the N.E. Trade Wind tends to draw water away from the northern boundary of the North Equatorial Current and by so doing strengthens that current.

It will now have become apparent that while wind is an important factor in the formation of the majority of surface currents it is not a universal one. It will also be seen that the old hard and fast division of ocean currents into drift and stream currents requires modification. None of the great permanent currents are true drift currents because wind friction alone is insufficient to produce them. One of the most familiar examples of a drift current on the older classification is the current on the eastern side of the North Atlantic, part of which is sometimes referred to as the N.E. Trade Drift, yet the coast is an essential part of its formation. With regard to stream currents we do not now conceive of a drift current coming up against a coast and being deflected by it into a new direction. The presence and direction of the coastline, together with the wind blowing over it, account wholly for the current, though the final result is the same, viz., a current flowing nearly parallel to the coast.

With one exception we have dealt only with the currents of the open ocean. The currents of shallow coastal waters depend to a greater extent on the strength and direction of the wind and on bottom and coastal configuration and on them is superimposed the periodical currents of tidal origin. In the open ocean the tidal rise and fall is extremely small and while this must tend to influence the currents the magnitude of the influence is too small to have any practical result.

The navigator is directly interested only in surface current, which may be defined as the movement of water at a depth of half the draught of his vessel, such movement representing the average effect of the current on the ship as a whole. It is for this reason that the subject of surface currents has been dealt with in some detail. We shall conclude with some remarks on sub-surface currents and the circulation of an ocean in its entirety. In considering the general circulation of an ocean it is important to realise that whenever any volume of water is removed by a current from a given part of the ocean a precisely equal volume must by some means return to the same place. In other words the permanent currents must be exactly compensated by equal permanent return flows of water and the weak transitory currents due to transitory causes must also be compensated during the time of their existence. It will of course be understood that a permanent current means the average flow of a current which is in the long run fairly constant in set and drift. As has been strongly emphasised, even the most "permanent" of such currents is subject to constant variability and therefore not only has its average flow to be exactly compensated, but every variation has also to be compensated with considerable rapidity, for no alteration in the volume of water in a given region of the open ocean, that is no transitory alteration of sea level locally, can persist for a few days or even a few hours.

If all ocean currents and their compensating return flows consisted only of surface water, or of water of quite shallow depth, it would be comparatively easy, with the material which THE MARINE OBSERVER Charts places at our command, to explain in detail the actual method by which such compensation was effected. This is, however, not the case and the replacement of water is partly, and possibly in some areas of the oceans mainly, from below. Thus the North-East Trade Drift and the other currents which feed the Equatorial Current in the Atlantic Ocean are relatively weak so that a portion of the water of the latter must come from sub-surface sources. The figures given in TABLE 1 provide another good illustration of this fact. If surface currents were wholly compensated by other surface currents we should find that the season of greatest strength of the Gulf Stream, say between Latitudes 22° and 36° N., was the same as that of its chief surface-feeders, the Equatorial Current in the Caribbean and the Bahama Current. The table shows no such relation, Spring, the season of strongest Gulf Stream, being the season of weakest Caribbean and Bahama Currents.

Knowledge of sub-surface currents has been obtained for certain depths by various oceanographical expeditions, but only for restricted areas. An example of one such group of currents in the north-eastern Atlantic was published in THE MARINE OBSERVER, Volume IV, page 121. Even in such instances only the broader outlines of these currents can be deduced and it may be said that at present we have little exact knowledge of the details of flow of current, either horizontally or vertically, in sub-surface waters. The complete explanation of surface current compensation is therefore as yet quite impossible. Observations of the temperature and salinity of the water of the Atlantic Ocean at various depths are, however, sufficiently numerous to enable their vertical variations to be charted in main outline. Much information relating to this subject will be found in an article by Lieutenant J. R. LUMBY on "Temperature and Salinity" in THE MARINE OBSERVER, Volume II, No. 16, to which interested readers are referred. Some information as to the sub-surface flow of water may be deduced from the charts of temperature and salinity. Thus the charts for a depth of 550 fathoms show that warm salt water flows abundantly into the Atlantic from the Mediterranean at that level, its place being taken by lighter water from the Atlantic flowing in near the surface. The reason for this flow is that the salinity is increased by evaporation in the Mediterranean area more than the outflow of rivers lessens it.

With regard to the vertical circulation of the Atlantic Ocean the only fact that can as yet be presented with any confidence is that there is a slow upwelling of water from the depths in equatorial latitudes, this flow being compensated by down-flows in regions of relatively high north and south latitude. The bottom water of the North Atlantic is largely composed of surface water which has at some time moved northwards from the Tropics till it has cooled sufficiently to sink. Polar water is prevented from creeping out of the arctic basin along the bottom of the North Atlantic by the submarine ridge which runs from Greenland to the Shetlands. It has been found that it is only for a depth of about 55 fathoms that the uppermost layer of water is warmest at the Equator, and at a depth of 220 fathoms the temperature is 16° F. warmer near the Bermudas than in the neighbourhood of St. Paul Rocks. This is accounted for by the upwelling of cold water at the Equator and the absence of such upwelling in the latitude of the Bermudas. The upwelling must be slow otherwise the equatorial water at the surface and at moderate depths would be much colder than it actually is. The complexity of the sub-surface currents must decrease with depth, but it is not yet possible to say at what point they cease to flow. Probably this occurs at an intermediate depth, below which the movements of the water are extremely small and very slow. In other words in the ocean depths there are no real currents, but on the other hand there is also no complete absence of motion. The sum-total of the very small gradual flows is of vital importance in maintaining the circulation of the ocean as a whole. Below the coastline-formed currents, such as the Gulf Stream, it has been stated that the midwater current extends downwards nearly to the ocean bottom, but the probability is that this is not the case in reality owing to the operation of the density factor.

We have seen that wind is an important, and generally a predominant factor in the formation of surface currents, though wind alone would not produce the currents as we know them. For the oceanic circulation at all depths as a whole it seems that differences of density provide the main motive power. In this connection it is of interest to note that variations in salinity have more effect on the density than variations of temperature under prevalent conditions. Surface water which is tending to become less dense through rising temperature is at the same time tending to become more dense because of increased salinity due to evaporation. By this means variations of density are greatly reduced and if such were not the case the vertical circulation and ocean currents in general would be much greater than they actually are.

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

MEAN SEA SURFACE TEMPERATURES.

SOUTH ATLANTIC.

PREPARED IN THE MARINE DIVISION BY H. KEETON, PRINCIPAL CLERICAL ASSISTANT.

The following notes draw attention to some of the more outstanding features disclosed by an examination of the monthly charts of sea surface temperatures of the South Atlantic, which have appeared in this Journal during the present year.

As in the North Atlantic the deviations of the sea isotherms from an east to west direction are mainly due to the existence of warm and cold surface currents, whose influence can be clearly traced throughout the year.

On the whole the South Atlantic is colder than the North Atlantic at corresponding latitudes; while the eastern half is considerably colder than its western half, except off the southern coast of Africa where on account of the current, it is warmer.

One of the principal currents of the South Atlantic is the Antarctic Drift Current, a slow moving current of cold water which crosses the ocean from west to east, between Latitude 40° and 60° S. A portion of this current after rounding Cape Horn turns northward between the Falkland Islands and the mainland, and, known as the Falkland Current, extends as far north as Latitude 30° S. during the southern winter. The effect of this current is clearly shown in the upward bend of the isotherms off the Argentine coast throughout the year.

The Agulhas current flowing down the south-east coast of Africa carries warm water from the Indian Ocean well to the southward of the Cape; one marked result of this current being that the sea temperatures on the east coast of South Africa are several degrees higher than on the west coast in the same latitude. Where the Agulhas Current mingles with the Antarctic Drift there are large variations of mean sea temperatures, the change amounting to as as much as 29° F. in 10° of latitude.

Off the south-west coast of Africa is the northerly flowing Benguela Current, which is mainly caused by the action of the persistent and steady South-East Trade Wind. That wind has a tendency to draw surface water away from the African coast, with the result that the deep colder water rises to the surface, and is shown in all months by a marked strip along the coast from Table Bay to Mossamedes, where the surface temperatures are considerably lower than farther seaward.

Under the influence of the trade wind a large volume of comparatively cool water is carried up the eastern side of the South Atlantic, and is reflected in the north-east trend of the isotherms in this region each month.

Further north the Benguela Current merges into the South Equatorial Current, and flows westward across the Ocean to South America, where it is divided by Cape St. Roque into two portions. The southern portion, known as the Brazil Current, flows southwestward off the coast of Brazil; and carries warm water down the western side of the South Atlantic, until it meets the Falkland Current. At the meeting of these two currents there are large differences of temperature.

The change in temperature month by month varies considerably in different areas. Owing to the slowness of sea water in responding to temperature changes, seasonal and otherwise, the sea does not reach its highest temperature until late in the southern Summer (February) nor its lowest temperature until August.

From September to November the changes in mean surface temperatures over the whole Ocean are comparatively small; but from December to February the seasonal rise is general, the increase in temperature varying with locality. The greatest range is in the vicinity of the River Plate where the difference between mean winter and summer surface temperatures amounts to 20° F; while the region of smallest range lies between Latitude 0° and 10° S., west of Longitude 30° W. where the monthly mean does not fluctuate more than 3° to 4° F. throughout the year. Off Cape Horn the mean ranges from 41° F. in Winter to 48° F. in Summer.

March shows very little change from February, but from April to July there is marked seasonal decrease in temperature.

WEATHER SIGNALS.

II.—WIRELESS WEATHER BULLETINS.

SOUTH AMERICA.

CHILE.

Spark Issues.

Valparaiso W/T Station, approximate Latitude 33° 01′ S., Longitude 71° 39′ W., call sign **CCE,** broadcasts a weather bulletin in code commencing with the letters OMC (Oficina Metéorologica de Chile) at 0100 and 1700 G.M.T. on a wave-length of 1,000 metres (spark).

The message gives observations from the following stations:—

Indicator Letter.	Station.	Position (approx.). Latitude.	Longitude.
V	Valparaiso	33° 06′ S.	71° 40′ W.
T	Talcahuano	36° 43′ S.	73° 08′ W.
C	Corral	39° 53′ S.	73° 35′ W.
J	Juan Fernandez	33° 42′ S.	78° 45′ W′
M	Mocha	38° 25′ S.	74° 00′ W.
G	Guafo (or Huafo)	43° 35′ S.	74° 45′ W.
R	Raper	46° 50′ S.	75° 38′ W.
P	Punta Arenas	53° 08′ S.	70° 56′ W.
O	Puerto Montt	41° 30′ S.	72° 58′ W.
Q	Coquimbo	29° 57′ S.	71° 20′ W.

The observations are contained in one group, consisting of a key letter and four figures for each station.

The first two figures give barometer corrected in whole millimetres, the initial 7 being omitted (see Table XV, p. 57, Vol. IV, No. 39, to convert to mbs. and ins.).

The third figure gives wind direction true:—

1 = N.	3 = E.	5 = S.	7 = W.
2 = N.E.	4 = S.E.	6 = S.W.	8 = N.W.

The fourth figure gives wind force by Beaufort scale. When this is greater than 9 it will be given in words, thus:—

Diez = 10, once = 11, and doce = 12.

When necessary the following words will be added:—

Temporal = gale.	Neblina = fog.
Lluvia = rain.	Sol = sunny.

An "X" will replace the figure for any missing observation, but if all the values for any station are missing, the word "No" will precede the key letter, thus "No T."

The bulletin at 0100 G.M.T. will also contain a summary of the weather changes that have taken place during the day.

Each bulletin will conclude with a meteorological forecast, and a statement regarding the probable approach of bad weather.

Talcahuano-Rocuant, W/T Station, Latitude 36° 44′ S., Longitude 73° 06′ W., call sign **CCK,** broadcasts at 0130 and 1730 G.M.T. on a wave-length of 1,900 metres (spark), a repetition of the messages broadcast from Valparaiso at 0100 and 1700 G.M.T. respectively.

ARGENTINA.

Spark Issue.

Buenos Aires-Dãrsena Norte W/T Station, approximate Latitude 34° 36′ S., Longitude 58° 22′ W., call sign **LIH**, broadcasts a weather bulletin, *en clair*, in Spanish, at 0205 G.M.T., on a wave-length of 1,000 metres (spark). The bulletin will also contain a weather forecast for the ensuing 24 hours for the Rio de la Plata.

BRAZIL.

Spark Issues.

(a) Wireless Weather Reports on the Brazilian Coast.

The Brazilian W/T coast stations given in the list below transmit, **every four hours**, the state of weather and sea, as well as the force and direction of the wind. The elements so transmitted are direct observations made at the W/T stations. They are sent in Portuguese, *en clair*, and owing to uniformity can be easily understood by ships of other nationalities.

W/T Station.	Position (approx.). Latitude.	Longitude.	Call Sign.	Times of Sending. G.M.T.
Belém (Para) ...	1° 27′ S.	48° 30′ W.	SPB	0245, 0645, etc., etc.
S. Luiz (Maranham)	2° 32′ S.	44° 17′ W.	SOM	0300, 0700, etc., etc.
Natal	5° 47′ S.	35° 18′ W.	SNR	0330, 0730, etc., etc.
Olinda (Pernambuco)	8° 01′ S.	34° 51′ W.	SPO	0345, 0745, etc., etc.
Amaralina (Bahia)...	13° 01′ S.	38° 28′ W.	SPA	0315, 0715, etc., etc.
Fernando Noronha...	3° 51′ S.	32° 25′ W.	SPN	0315, 0715, etc., etc.
Abrolhos	17° 58′ S.	38° 45′ W.	SNN	0320, 0720, etc., etc.
C. St. Thomé ...	22° 02′ S.	40° 59′ W.	SPT	0330, 0730, etc., etc.
Santos	23° 56′ S.	46° 20′ W.	SPS	0245, 0645, etc., etc.
Florianopolis ...	27° 36′ S.	48° 30′ W.	SOV	0315, 0715, etc., etc.
Juncçaõ (Rio Grande do Sul)	32° 04′ S.	52° 07′ W.	SPJ	0345, 0745, etc., etc.
Rio	22° 54′ S.	43° 10′ W.	SOH	1200, 1500, 1800, 2100, 0000.

The wave-length used by the above stations for the transmission of the messages is 600 metres (spark) in each case.

(b) Special Messages, including forecasts for the South Coast of the State of Rio Janeiro, the remainder of the Southern Brazilian Coast, and to Buenos Aires.

Ilha do Governado—Rio de Janeiro—W/T Station, approximate Latitude 22° 48′ S., Longitude 43° 13′ W., call sign **SOH**, broadcasts daily two special weather bulletins at 1800 and 0100 G.M.T., both on 1,800 metres (spark).

These bulletins are divided into three parts; the first part contains respectively the 1200 and 2100 G.M.T. observations in New International Code of various Brazilian, Uruguayan and Argentine meteorological stations given below; the second part contains upper air observations in code; the third part contains detailed weather forecasts in Portuguese, *en clair*, expressed in a small collection of terms which can be easily understood by ships of other nationalities.

Indicator Number.	Station.	State.	Position (approx.). Latitude.	Longitude.
01	Ondina	Bahia	13° 00′ S.	38° 31′ W.
02	Caetité	„	14° 03′ S.	42° 37′ W.
03	Victoria...	Esp. Santo ...	20° 10′ S.	40° 18′ W.
04	Bello Horizonte ...	Minas Geraes	19° 55′ S.	43° 56′ W.
05	Uberaba...	„ „	19° 45′ S.	47° 57′ W.
06	Pirapora	„ „	17° 18′ S.	44° 57′ W.
07	Juiz de Fora	„ „	21° 45′ S.	43° 20′ W.
08	Rio de Janeiro ...	Rio de Janeiro	22° 54′ S.	43° 10′ W.
09	Cabo Frio	„ „	22° 52′ S.	42° 01′ W.
10	S. Paulo...	São Paulo ...	23° 33′ S.	46° 38′ W.
11	Santos	„ „ ...	23° 56′ S.	46° 19′ W.
12	S. Paulo dos Agudos ...	„ „ ...	22° 28′ S.	49° 00′ W.
13	Cuyaba	Matto Grosso...	15° 35′ S.	56° 05′ W.
14	Coxim	„ „ ...	18° 28′ S.	54° 45′ W.
15	Tres Lagoas	„ „ ...	20° 47′ S.	41° 42′ W.
16	Curityba	Paranà ...	25° 25′ S.	49° 16′ W.
17	Florianopolis	S. Catharina...	27° 36′ S.	48° 30′ W.
18	Palmas	Paranà ...	26° 28′ S.	51° 58′ W.
19	Porto Alegre	Rio G. Sul ...	30° 01′ S.	51° 13′ W.
20	Uruguayana	„ „ ...	29° 45′ S.	57° 05 W.
21	S. Luiz das Missões ...	„ „ ...	28° 23′ S.	54° 58′ W.
22	Rio Grande	„ „ ...	32° 01′ S.	52° 05′ W.
23	Bagé	„ „ ...	31° 20′ S.	54° 06′ W.
24	S. Victoria do Palmar	„ „ ...	33° 31′ S.	53° 21′ W.
25	Sta. Izabel	Uruguay ...	32° 45′ S.	56° 32′ W.
26	Montevidéo	„ ...	34° 54′ S.	56° 12′ W.
27	Buenos Aires	Buenos Aires	34° 36′ S.	58° 22′ W.
28	Oran	Salta	23° 06′ S.	64° 20′ W.
29	Adalgala	Catamarca ...	27° 30′ S.	66° 26′ W.
30	Corrientes	Corrientes ...	27° 27′ S.	58° 49′ W.
31	Santa Fé	Santa Fé ...	31° 40′ S.	60° 42′ W.
32	Mendoza	Mendoza ...	32° 53′ S.	68° 49′ W.
33	Victorica	Pampa Central	36° 10′ S.	65° 21′ W.
34	Cipoletti	Rio Negro ...	38° 56′ S.	68° 08′ W.
35	Bahia Blanca	Buenos Aires...	38° 45′ S.	63° 15′ W.
36	P. Madryn	Chubut... ...	42° 49′ S.	64° 58′ W.
37	Sarmiento	„	45° 30′ S.	69° 00′ W.
38	16 de Outubro	„	42° 12′ S.	71° 08′ W.

1800 G.M.T. Bulletin (1500 45th Meridian Time).

First part of Bulletin (observations of 1200 G.M.T.) Code used:

Brazilian Stations (01–24) I_n I_n BBBDD, FwwTT,
Uruguayan „ (25–26) I_n I_n BBBDD,
Argentine „ (27–38) I_n I_n BBBDD

in which

I_n I_n = Indicator number of station.

BBB = Barometric pressure corrected, in millimetres and tenths (initial 7 omitted). (*See* Table XV, p. 57, Vol. IV, No. 39 to convert to mbs. and ins.).

DD = Wind direction true (Table III, p. 19, Vol. IV, No. 37).

F = Wind force by Beaufort scale.

ww = Weather at time of observation (Table V, p. 19, Vol. IV, No. 37).

TT = Air temperature in whole degrees C. (*See* Table XVII, p. 58, Vol. IV, No. 39, to convert to Fahr.).

Second Part of Bulletin sent in code preceded by the word "Pilot" contains upper air observations.

Third Part of Bulletin contains night weather forecasts and is preceded by the word "Previsão."

0100 G.M.T. Bulletin (2200 45th Meridian Time).

The First Part of the Bulletin contains the 2100 G.M.T. observations (in code) of stations 08, 09, 11, 17, 22 and 24, in exactly similar form as for stations 01-24 in the 1800 G.M.T. Bulletin.

Second Part of Bulletin contains upper air observations in code and is preceded by the word "Temp Alegrete."

Third Part of Bulletin contains weather forecasts for the following day for the south coast of the State of Rio de Janeiro, remainder of the Brazilian coast and to Buenos Aires, in Portuguese *en clair*, preceded by the word "Previsão."

NOTE.—Missing figures replaced by hyphens.

WIRELESS STORM WARNINGS.

SOUTH AMERICA.

CHILE.

Spark Issues.

Valparaiso W/T Station, call sign **CCE**, broadcasts storm warnings when necessary, after the weather bulletins at 0100 and 1700 G.M.T. on a wave-length of 1,000 metres (spark).

III.—WIRELESS TIME SIGNALS.

CHILE.

Spark Issue.

W/T Station.	Call Sign.	Wave-length Metres.	G.M.T.
Valparaiso Lat. 33° 01′ 04″ S. Long. 71° 39′ 27″ W.	**CCE**	1,000 (spark).	h m s h m s 00 55 00–01 00 00

SYSTEM.—The T.S. commence at 00h 55m 00s G.M.T. and continue for 5 min. During this period every beat (represented by a dot) of the Standard clock at the even second is transmitted *except* the 29th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th and 59th.

The dot at the final second of each minute is the T.S. (which ends at 01h 00m 00s G.M.T.).

NOTES.—(1) Sent daily except Sundays.

(2) T.S. controlled by the Hydrographic Office.

(3) In the event of failure or irregularities in the T.S., the word "Señal nula" (Signal annulled) will be made three times in succession, one minute after 0100 G.M.T.

BRAZIL.

Spark Issues.

W/T Station.	Call Sign.	Wave-length Metres.	G.M.T.
Ilha do Governador (Rio de Janeiro) ... ... Lat. 22° 48′ 00″ S. Long. 43° 13′ 00″ W.	**SOH**	1,800 (spark).	h m s 14 00 00 and 24 00 00

The Time Signals are relayed from Rio de Janeiro Observatory in accordance with the New International system of W/T Time Signals.

The procedure is as follows:—

G.M.T.	Signal.	Meaning.
h m s h m s 13/23 56 05 to 13/23 56 50	▬ ▬ ▬ every alternate 5 seconds.	
57 00 „ 57 50	▬ ▪ ▪ ▬ ▬ ▪ ▪ ▬ etc.	
	55 56 57 58 59 60	
57 55 „ 58 00	▪ ▪ ▪ ▪ ▪ ▪	Time Signal.
58 08 „ 58 10	▬ ▪	
58 18 „ 58 20	▬ ▪	
58 28 „ 58 30	▬ ▪	
58 38 „ 58 40	▬ ▪	
58 48 „ 58 50	▬ ▪	
	55 56 57 58 59 60	
58 55 „ 59 00	▪ ▪ ▪ ▪ ▪ ▪	Time Signal.
59 06 „ 59 10	▬ ▬ ▪	
59 16 „ 59 20	▬ ▬ ▪	
59 26 „ 59 30	▬ ▬ ▪	
59 36 „ 59 40	▬ ▬ ▪	
59 46 „ 59 50	▬ ▬ ▪	
13/23 59 55 „ 14/24 00 00	55 56 57 58 59 60 ▪ ▪ ▪ ▪ ▪ ▪	Time Signal.

The duration of the dash is one second, and that of the dot 0.2 of a second. The final dot, therefore, terminates at

14h / 24h } 00m 00.2s, G.M.T.

In the event of failure, the time signals are transmitted thirty minutes later—the word "Correcão" being sent in conjunction with this series of signals.

IV.—VISUAL STORM WARNINGS, SOUTH AMERICA.

CHILE.

Valparaiso.

From 15th April to 15th October, annually.—The following signals are exhibited from the Maritime Government Building:—

By day.	By night.	Barometer.	Significa-tion.
Flag D (Int.), close up ...	—	30·05	Fine weather.
Flag D (Int.), half-mast...	—	30·00	
Flag D (Int.), low down...	—	29·95	
One ball, close up ...	One blue light ...	29·94	Variable.
One ball, half-mast ...	Two blue lights ...	29·90	
One ball, low down ...	Three blue lights...	29·85	
Two balls, close up ...	One red light ...	29·74	Storms or bad weather.
Two balls, half-mast ...	Two red lights ...	29·65	
Two balls, low down ...	Three red lights ...	29·60	
No day signal	One red light and one blue light, hoisted in a vertical line.		Barometer falling rapidly.

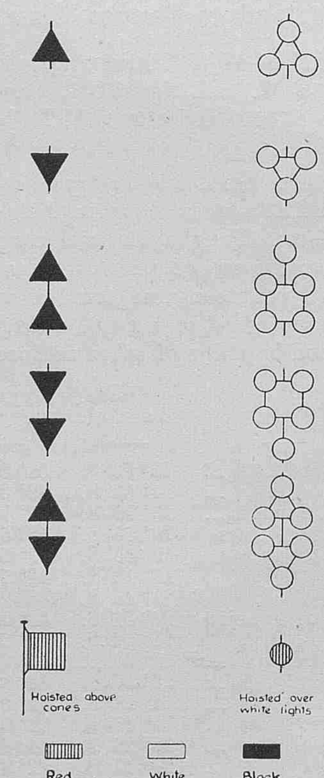
ARGENTINA.

Buenos Aires.

The following storm signals for the Rio de la Plata are exhibited, when necessary, from a flagstaff on the roof of the Ministry of Agriculture, situated near Dock No. 1:—

Signals for Local Gales—Probable up to the Next Day.

By day. **By night.** **Meaning.**



Gale from N.W. quadrant.

Gale from S.W. quadrant.

Gale from N.E. quadrant.

Gale from S.E. quadrant.

Hurricane.

Caution. Gales predicted are imminent or may occur on same day.

URUGUAY.

Montevideo.

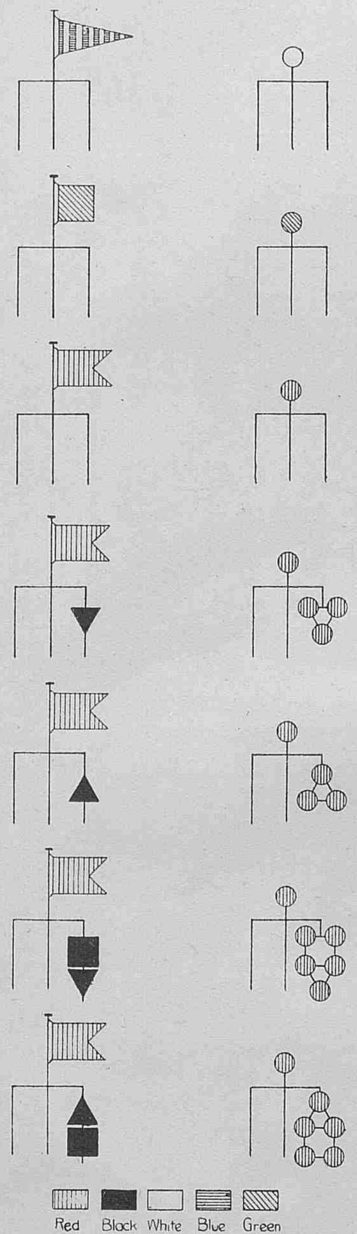
The following signals are exhibited from a flagstaff at the north-west angle of the **Custom House** to indicate the approach of storms or bad weather:—

By day.—Red and white flag hoisted *under* the national flag.

By night.—Red light in place of the flag.

The following signals are exhibited as necessary from the **Observatory semaphore**, 137 feet above mean sea level:—

By day. **By night.** **Meaning.**

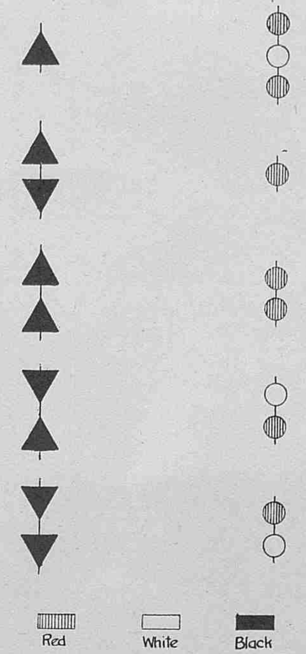


- Fair weather.
- Changeable.
- Bad weather.
- Southerly winds, strong.
- Northerly winds, strong.
- Southerly gale.
- Northerly gale.

BRAZIL.

The following system of Visual Storm Signals is in operation at Brazilian seaports, the symbols being hoisted when necessary:—

By day. **By night.** **Meaning.**



- Wind from any quarter, dangerous for small craft.
- Strong winds from S.E.
- Strong winds from N.E.
- Strong winds from N.W.
- Strong winds from S.W.

At Rio de Janeiro the signals are exhibited from the Time Signal Tower at the Observatory daily, also at Copacabana Fort, on the western side of the approach to the harbour, and from Ilha das Cobras; at Santos from the signal station on Monte Serrat; and at Cape Frio, from the signal station.

Special Notices regarding Personnel.

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

Obituary.

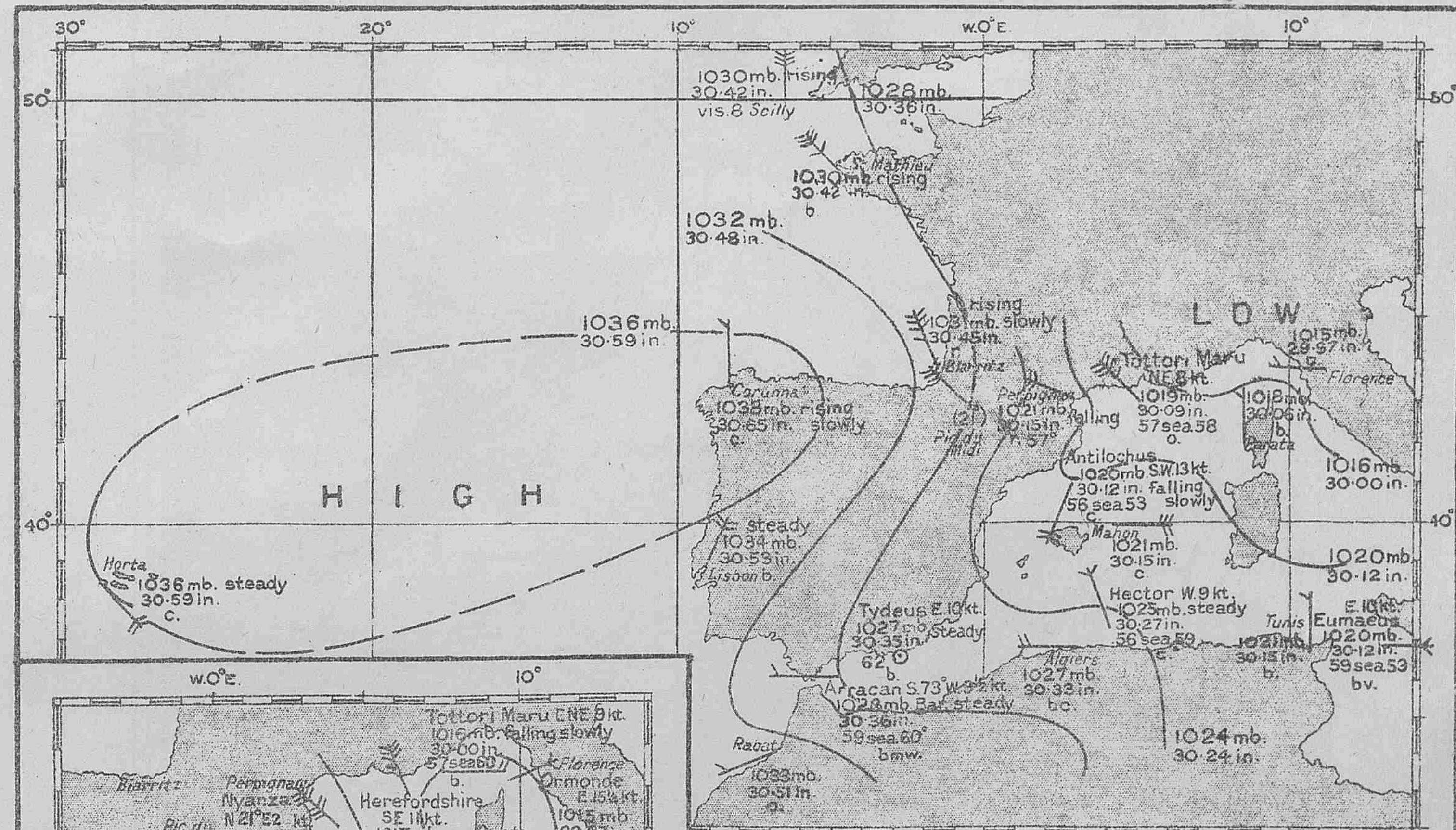
The death of Captain C. H. Langdon, S.S. *St. Julien*, at sea on September 23rd, 1927, is noted with regret.

Captain Langdon had been a member of the Corps of Marine Observers since August 1920, since when the ships under his command on the Weymouth-Guernsey Cross Channel Packet Service have regularly made telegraphic reports of weather in mid-channel, which have been of great value for forecasting wind and visibility in the British Wireless "Weather Shipping" Bulletin.

The death of Captain John George, O.B.E., Commander of R.M.S. *Arundel Castle*, which occurred on October 9th at Chandlers Ford near Southampton, is noted with regret.

Captain George joined the old Union Company as fourth officer in 1889 and obtained command in 1902, his ship being the *Harlech Castle*. Since then he commanded many of the Company's intermediate and Mail Steamers, his last ship being the *Arundel Castle* to which he was appointed in April last. He was shortly to have assumed command of the R.M.M.V. *Carnarvon Castle* on becoming Commodore of the Union Castle Mail Steamship Company's Fleet. Captain George had been a regular member of the Corps of Voluntary Marine Observers since 1920.

Chart LXIX — MORNING OF DECEMBER 31ST. 1921.



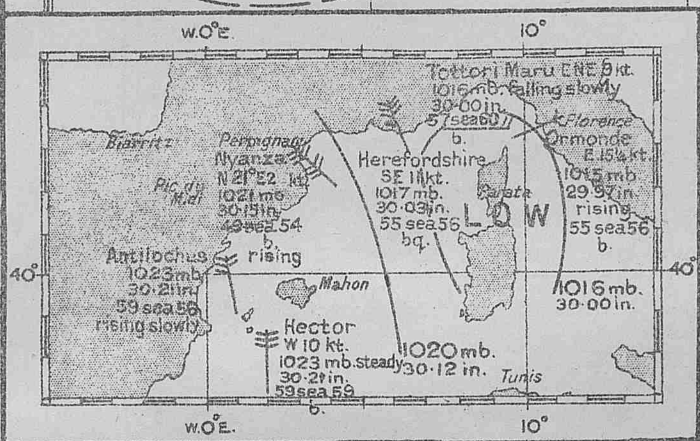


Chart LXX — Evening of December 31st, 1921.

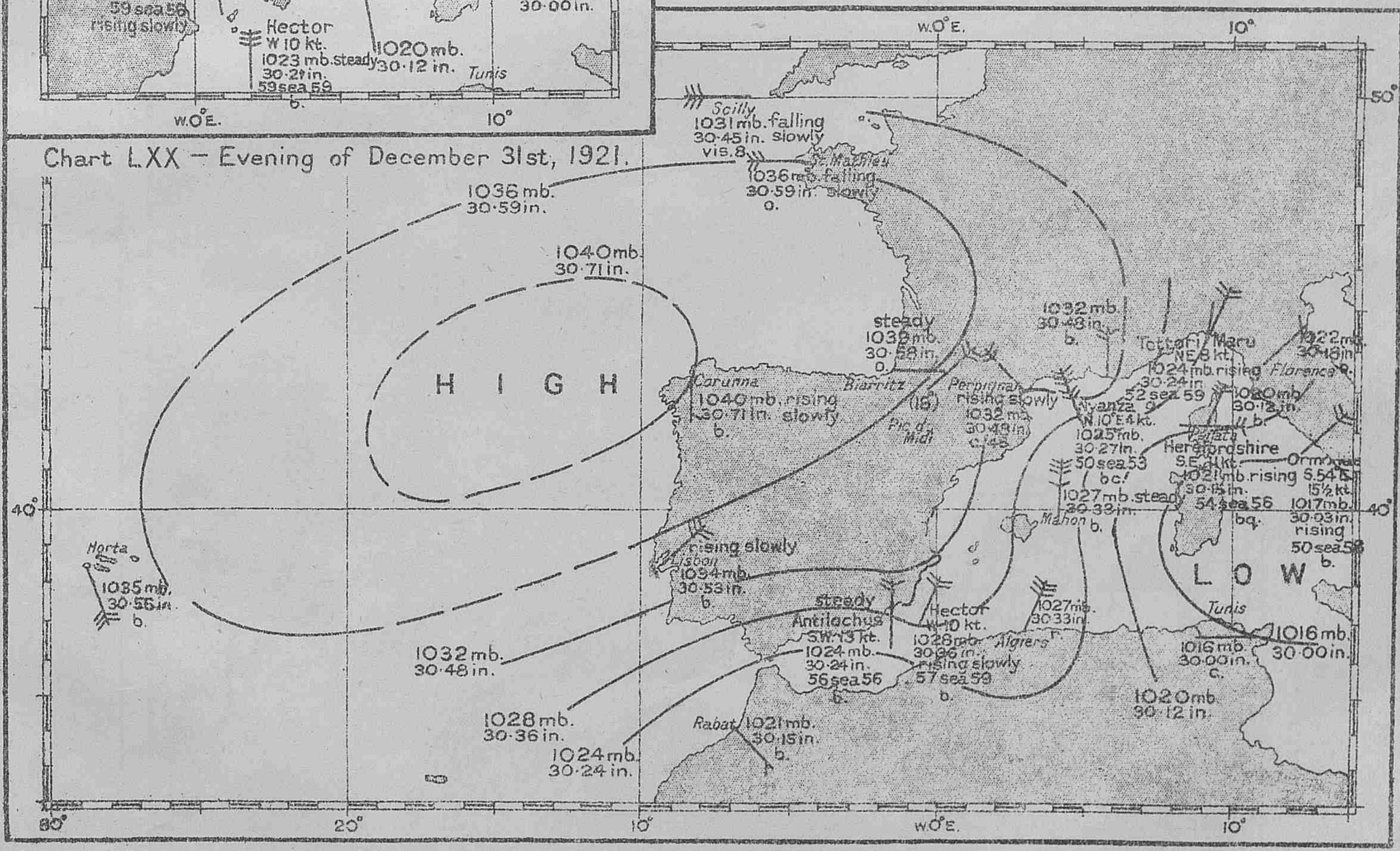


Chart LXXI — MORNING OF JANUARY 1ST. 1922.

WEATHER CHART MORNING OF DECEMBER 28TH. 1923.

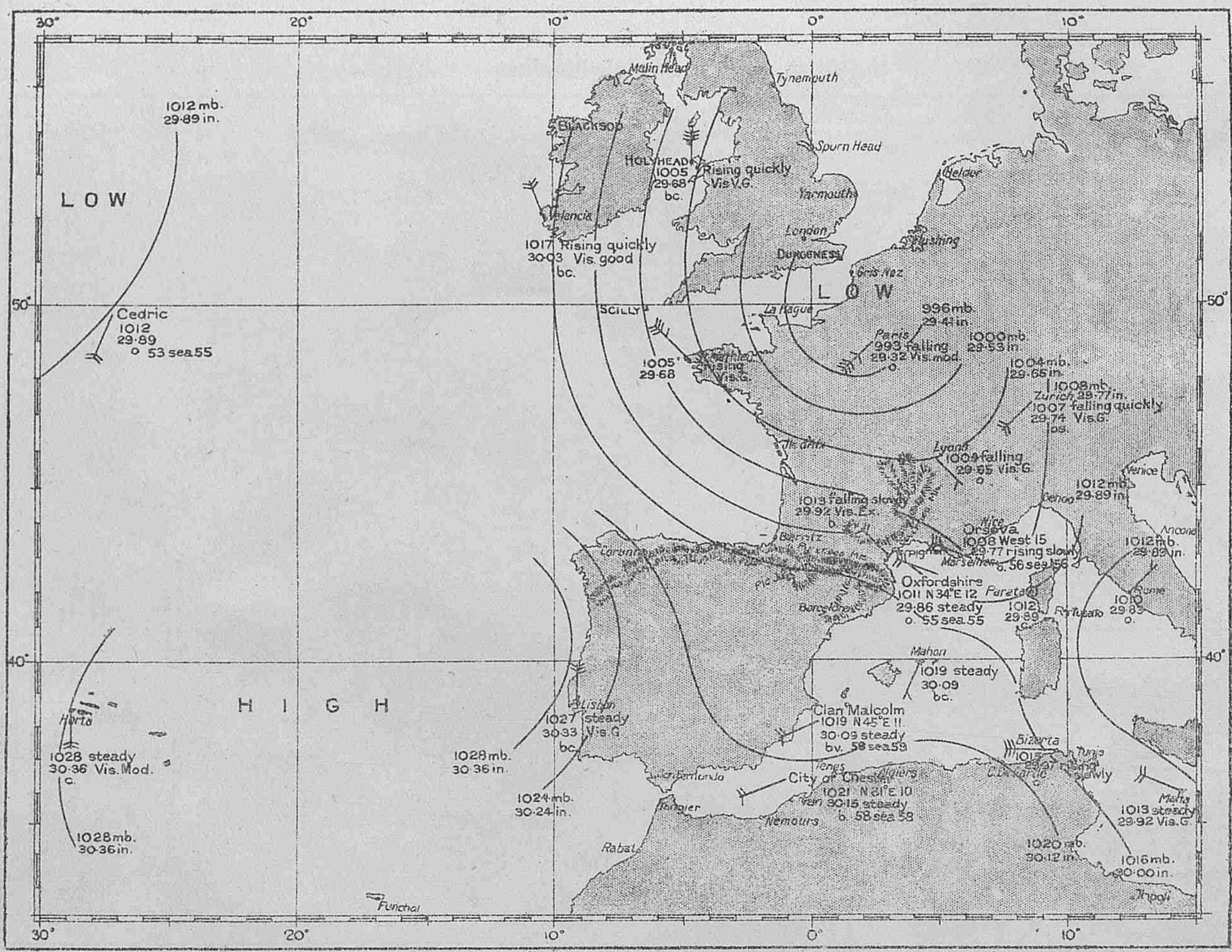


Chart LXXII —"Wireless and Weather."

WEATHER CHART MORNING OF DECEMBER 29TH. 1923.

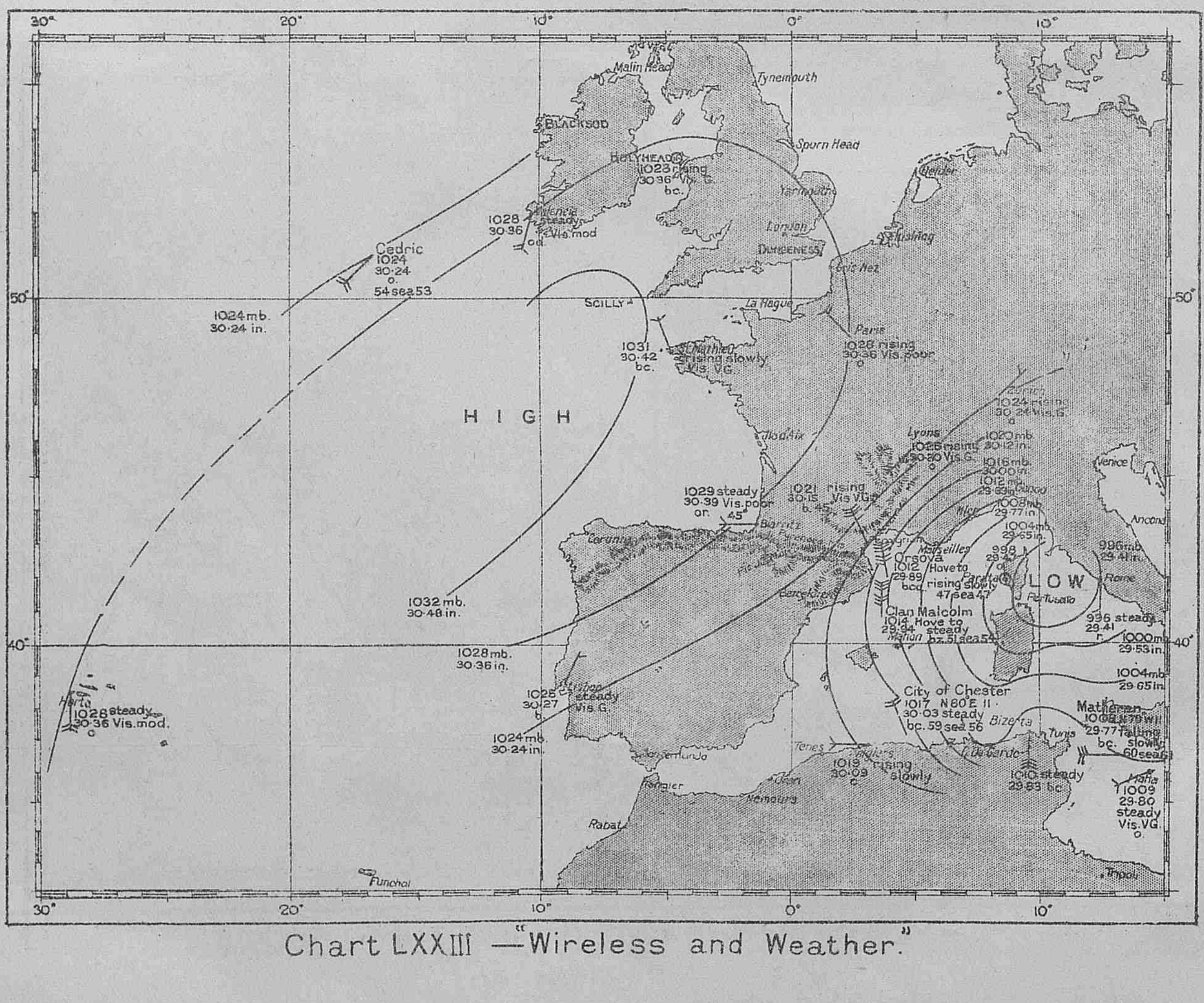


Chart LXXIII —"Wireless and Weather."

WEATHER CHART MORNING OF DECEMBER 30TH. 1923.

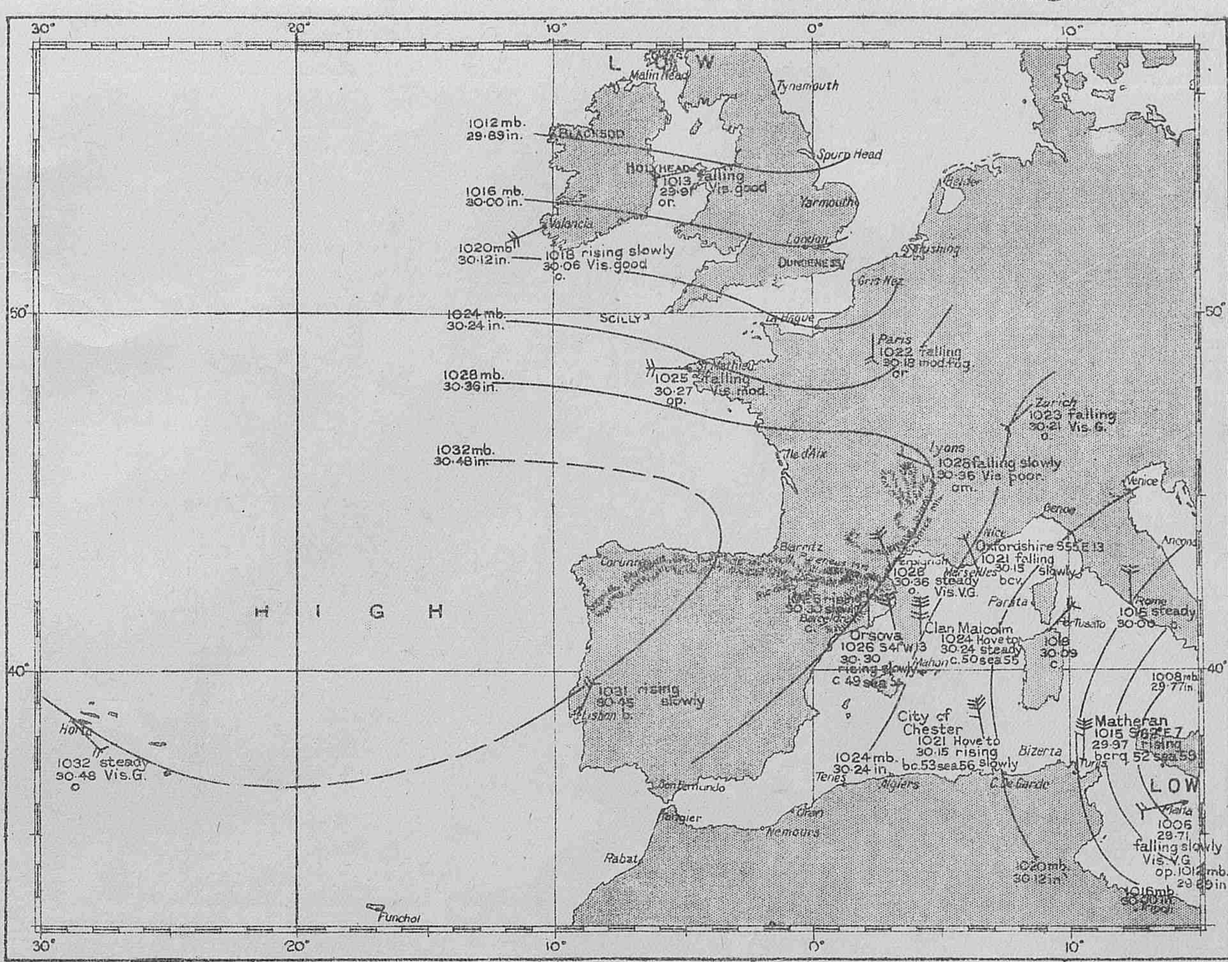


Chart LXXIV —"Wireless and Weather."

WEATHER CHART MORNING OF DECEMBER 20TH. 1923.

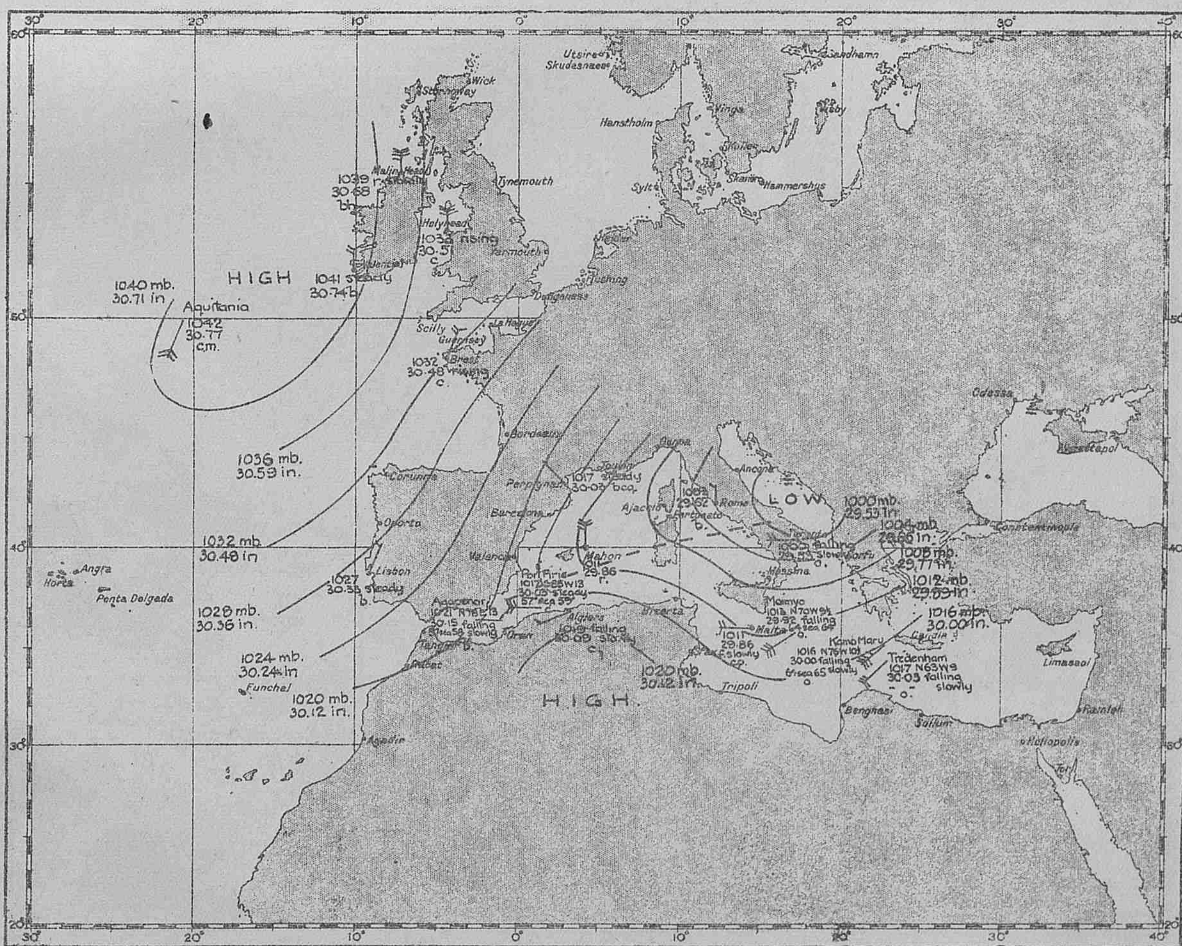


Chart LXXV. —"Wireless and Weather."

WEATHER CHART MORNING OF DECEMBER 21ST. 1923

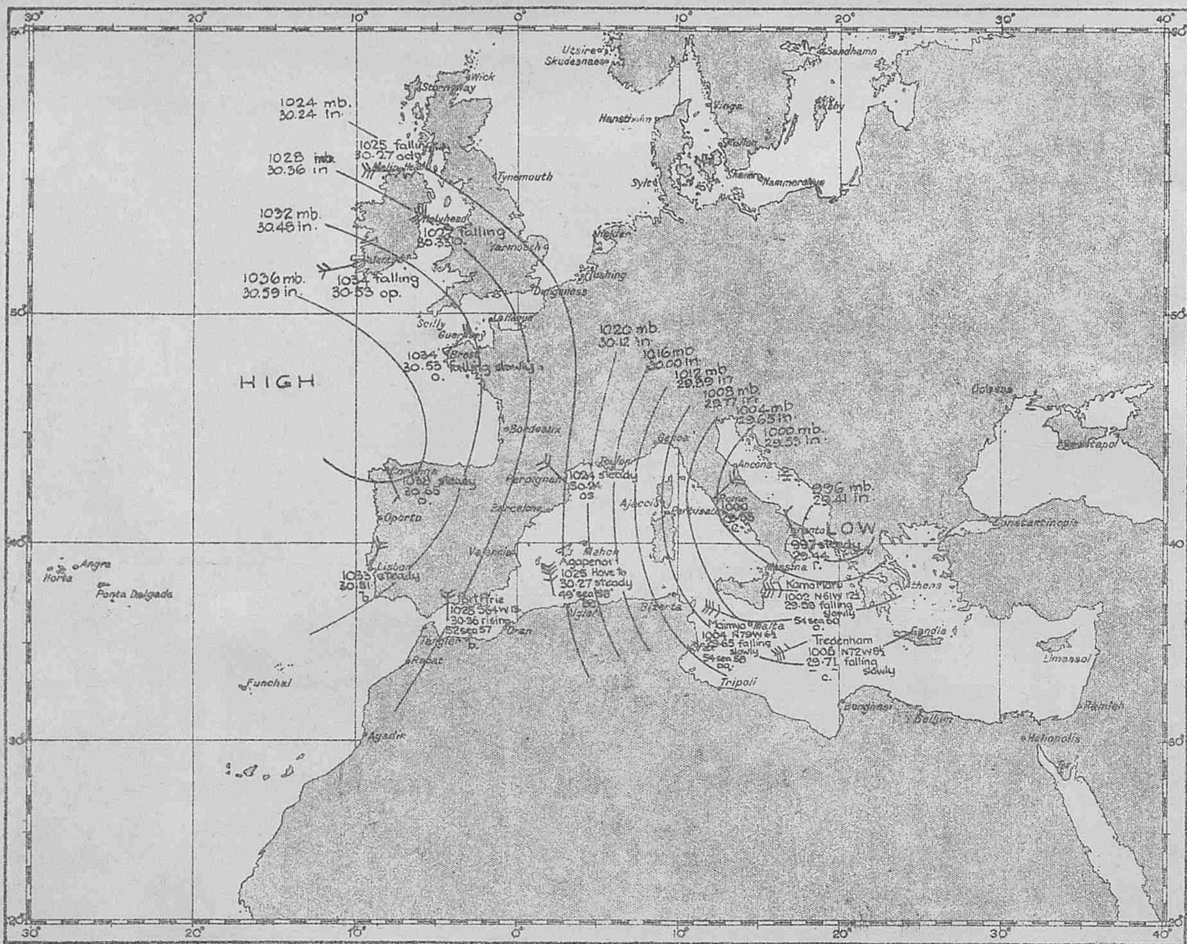


Chart LXXVI—"Wireless and Weather."

WEATHER CHART MORNING OF DECEMBER 22ND 1923.

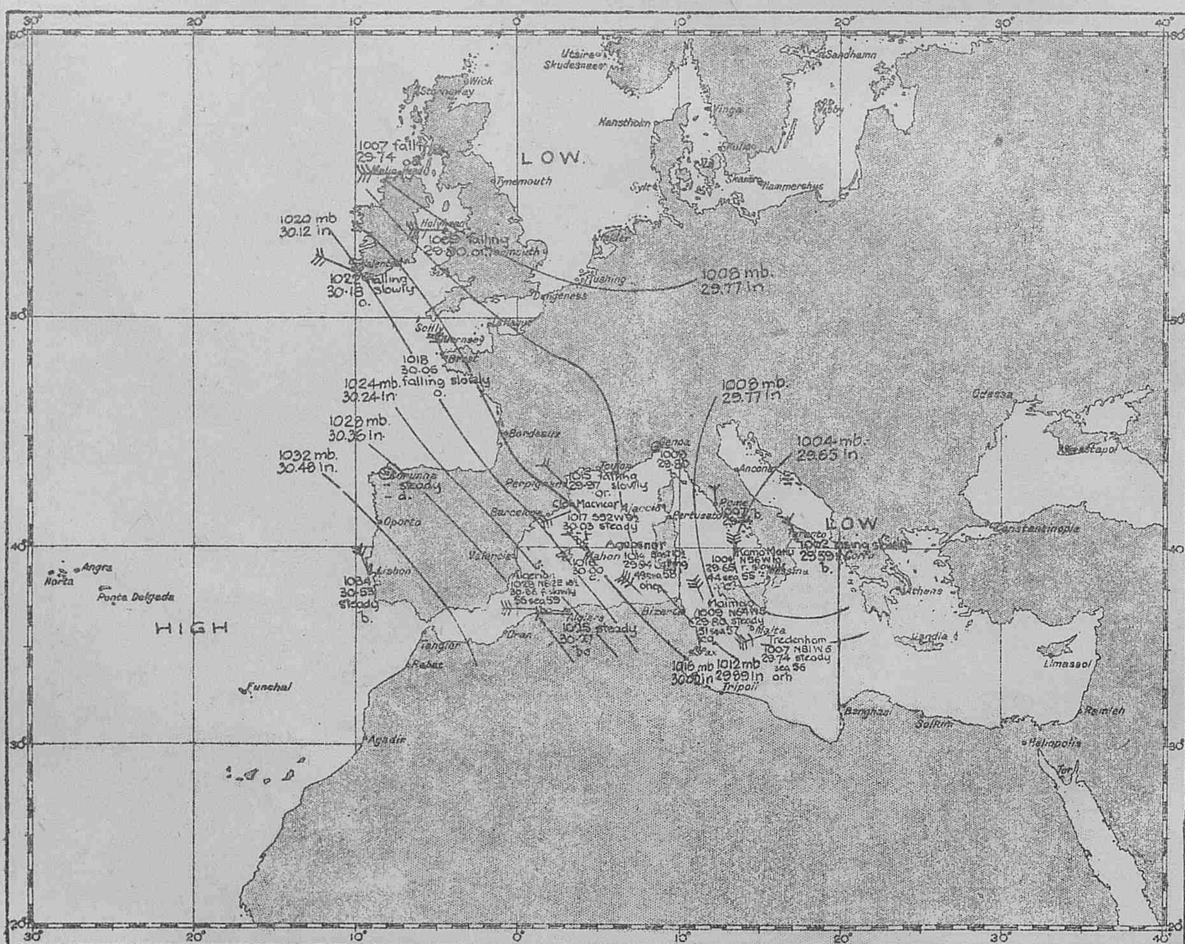
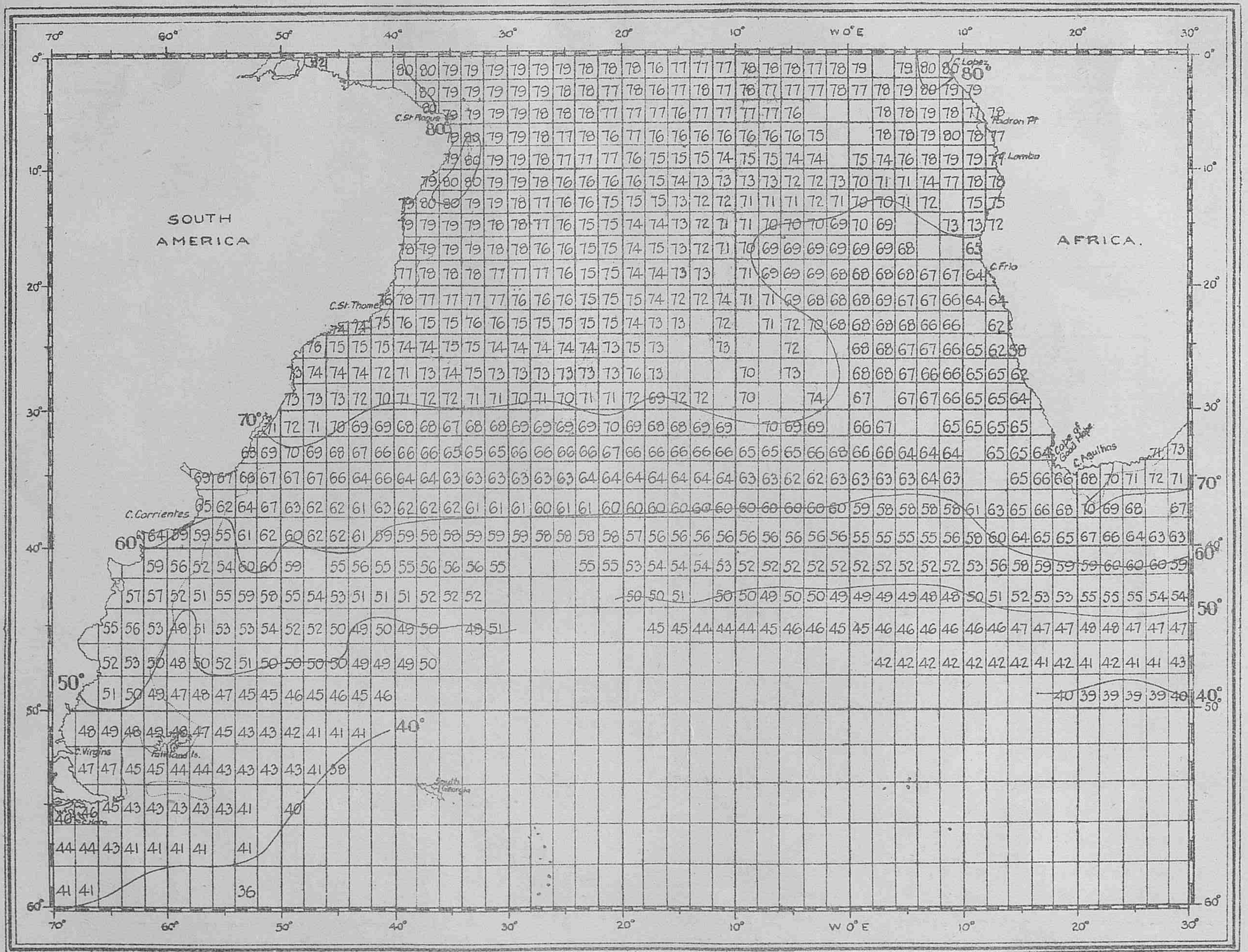


Chart LXXVII—"Wireless and Weather."

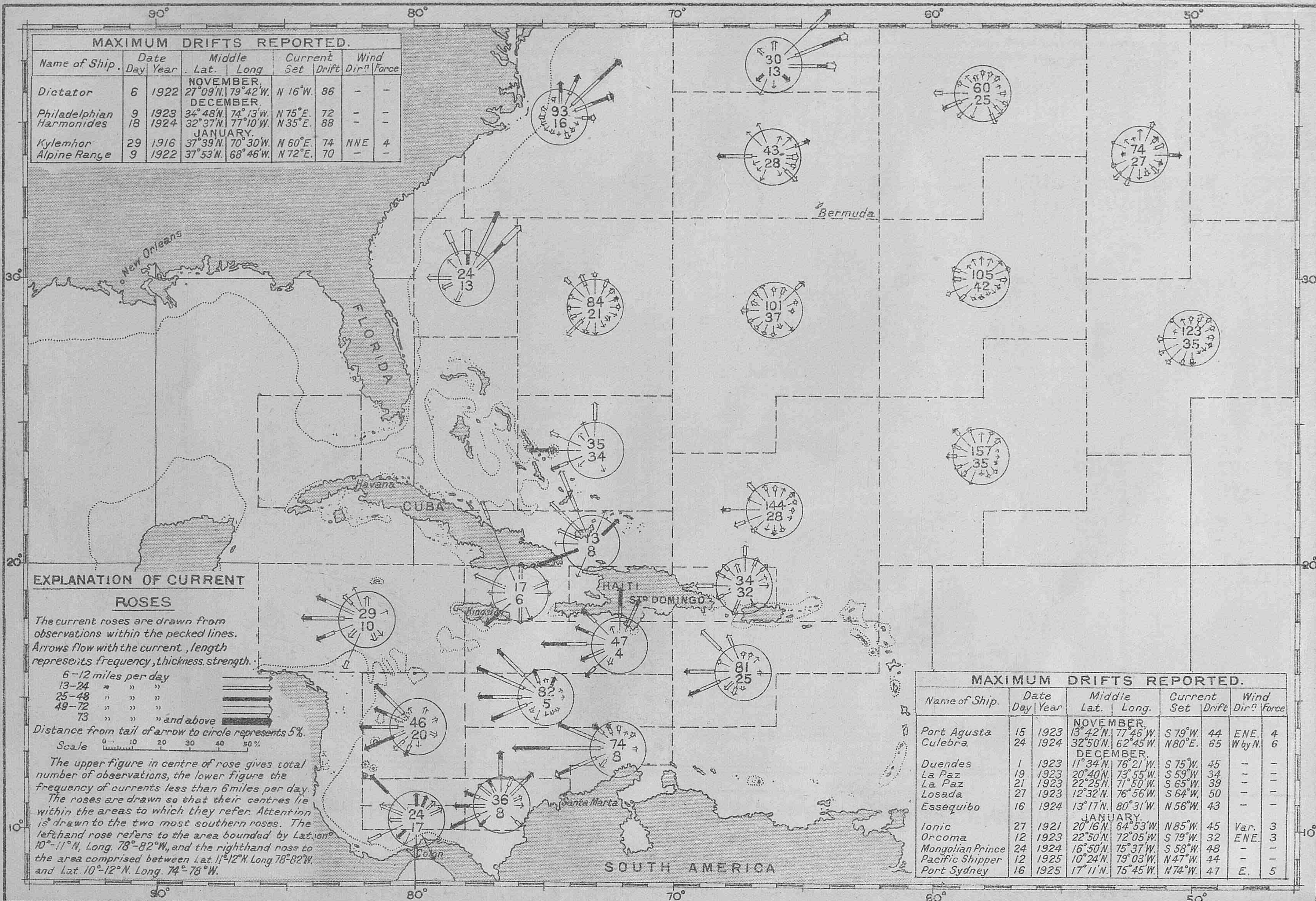
South Atlantic.

Mean Sea Surface Temperatures for month of DECEMBER



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.

CURRENTS ON THE TRACKS TO AND FROM THE WEST INDIES AND PANAMA.
(WESTERN PORTION)
NOVEMBER, DECEMBER AND JANUARY.
Observations of ships regularly observing for British Meteorological Office 1910–1925.



MAXIMUM DRIFTS REPORTED.								
Name of Ship.	Date Day	Date Year	Middle Lat.	Middle Long	Current Set	Current Drift	Wind Dirn.	Wind Force
			NOVEMBER.					
Dictator	6	1922	27° 09′N.	79° 42′W.	N 16° W.	86	–	–
			DECEMBER.					
Philadelphian	9	1923	34° 48′N.	74° 13′W.	N 75° E.	72	–	–
Harmonides	18	1924	32° 37′N.	77° 10′W.	N 35° E.	88	–	–
			JANUARY.					
Kylemhor	29	1916	37° 39′N.	70° 30′W.	N 60° E.	74	NNE	4
Alpine Range	9	1922	37° 53′N.	68° 46′W.	N 72° E.	70	–	–

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%.

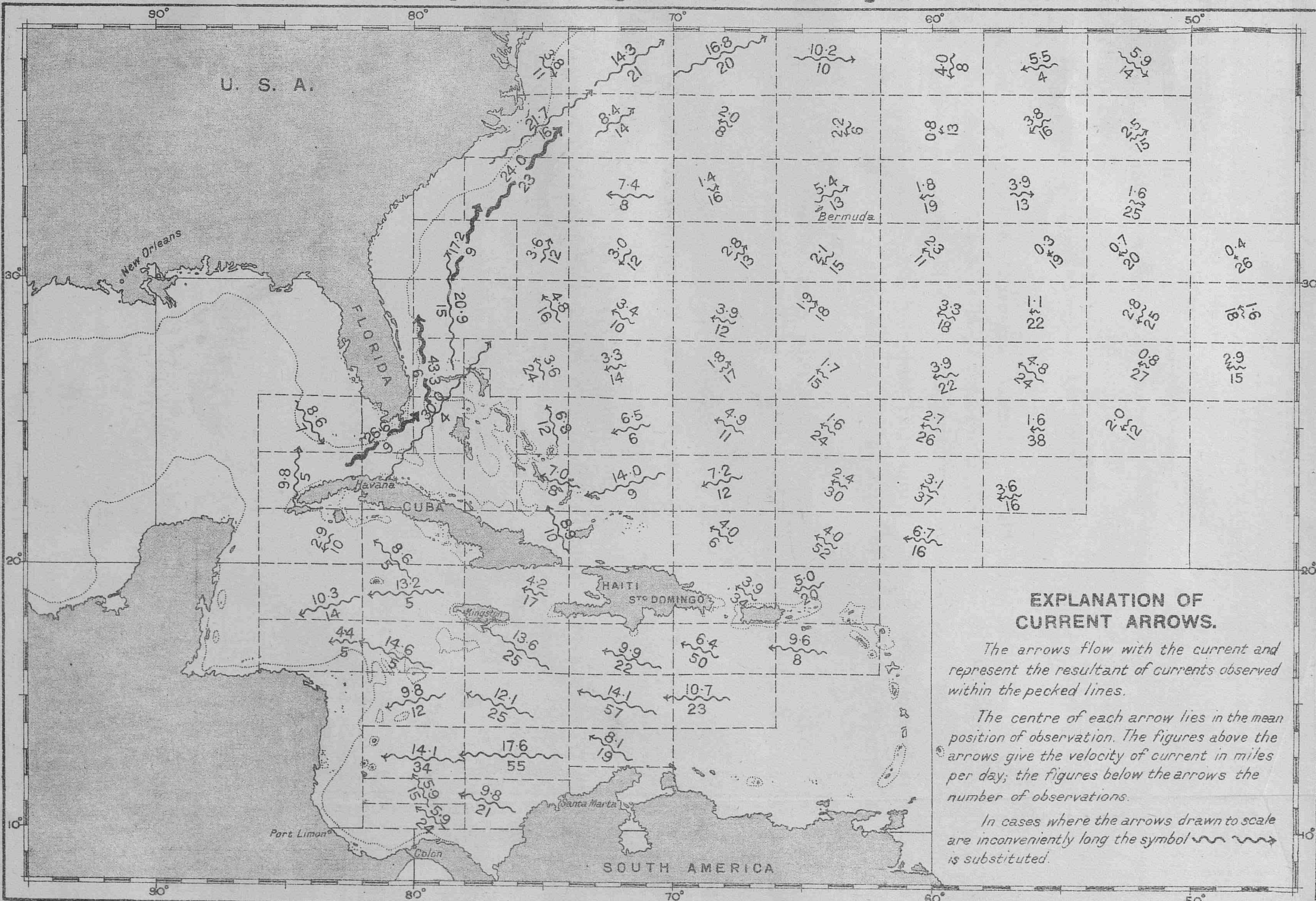
Scale 0 10 20 30 40 50%

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.

The roses are drawn so that their centres lie within the areas to which they refer. Attention is drawn to the two most southern roses. The lefthand rose refers to the area bounded by Lat. 10°–11° N, Long. 78°–82° W, and the righthand rose to the area comprised between Lat. 11°–12° N. Long. 78°–82° W. and Lat. 10°–12° N. Long. 74°–78° W.

MAXIMUM DRIFTS REPORTED.								
Name of Ship.	Date Day	Date Year	Middle Lat.	Middle Long.	Current Set	Current Drift	Wind Dirn.	Wind Force
			NOVEMBER.					
Port Agusta	15	1923	13° 42′N.	77° 46′W.	S 79° W.	44	ENE.	4
Culebra	24	1924	32° 50′N.	62° 45′W.	N 80° E.	65	W by N.	6
			DECEMBER.					
Duendes	1	1923	11° 34′N.	76° 21′W.	S 75° W.	45	–	–
La Paz	19	1923	20° 40′N.	73° 55′W.	S 59° W.	34	–	–
La Paz	21	1923	22° 25′N.	71° 50′W.	S 65° W.	39	–	–
Losada	27	1923	12° 32′N.	76° 56′W.	S 64° W.	50	–	–
Essequibo	16	1924	13° 17′N.	80° 31′W.	N 56° W.	43	–	–
			JANUARY.					
Ionic	27	1921	20° 16′N.	64° 53′W.	N 85° W.	45	Var.	3
Orcoma	12	1923	22° 50′N.	72° 05′W.	S 79° W.	32	ENE.	3
Mongolian Prince	24	1924	16° 50′N.	75° 37′W.	S 58° W.	48	–	–
Pacific Shipper	12	1925	10° 24′N.	79° 03′W.	N 47° W.	44	–	–
Port Sydney	16	1925	17° 11′N.	75° 45′W.	N 74° W.	47	E.	5

CURRENTS ON THE TRACKS TO AND FROM THE WEST INDIES AND PANAMA.
(WESTERN PORTION)
NOVEMBER, DECEMBER AND JANUARY.
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.

In cases where the arrows drawn to scale are inconveniently long the symbol ⟿ *is substituted.*

H.M. Stationery Office Press, Kingsway W.C.2.
Ps.68/1571. Wt.10A. D.I. 1300. 10/27.

IMPORTANT.

The special attention of Marine Observers is invited to the list of Agents overleaf, also to the notice headed "Marine Meteorology."

The Agencies exist for the purpose of assisting in the collection and dissemination of Marine Meteorological information and to encourage the practical application of meteorology in the Merchant Service.

Much time and correspondence may be saved by consulting the Agents at ports where Agencies exist.

Ships using ports where there are Agencies should hand their Meteorological Logs, Form 915, to the Agents. Wireless Registers Form 138 and Ships' Meteorological Form 911 should in all cases be sent direct to the Meteorological Office in London.

The Agents have all Forms, including Logs and Outline Charts required for the work at sea and have the necessary gear for equipping ships for keeping the Meteorological Log and replacing defective instruments.

The Agents are being provided with improved facilities and it is hoped that greater use will be made of the advantages now offered at the Agencies for the benefit of shipping and seamen.

The Captains and Officers of regular observing ships are requested to refer intending Marine Observers to the appropriate Marine Agent, Port Meteorological Officer or to the Marine Superintendent in London. Ports with Agencies are allotted an appropriate number of places in the list of regular observing ships, and it is intended that the observing fleet should be well and fairly distributed, not only in the different trades so as to maintain the best geographical distribution of observations, but also amongst ships sailing from different ports and amongst the different types and owners so that the number of ships to which we are limited shall be the best possible representation of the British Merchant Service.

COVER FOR MARINE OBSERVER.

Marine observers, regular recipients and subscribers to this Journal are hereby informed that a binding cover for Volume IV of "The Marine Observer" may be obtained from H.M. Stationery Office, through any bookseller, price 2s.

The arrangement for assembling the numbers for binding is described in this Number, page 230.

It should be clearly understood that this cover is not the cover used for binding "Excellent" awards, which is far superior; but it will be found to be of good quality and a useful means of preserving the yearly numbers, for which a title page is issued with each December number.

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.

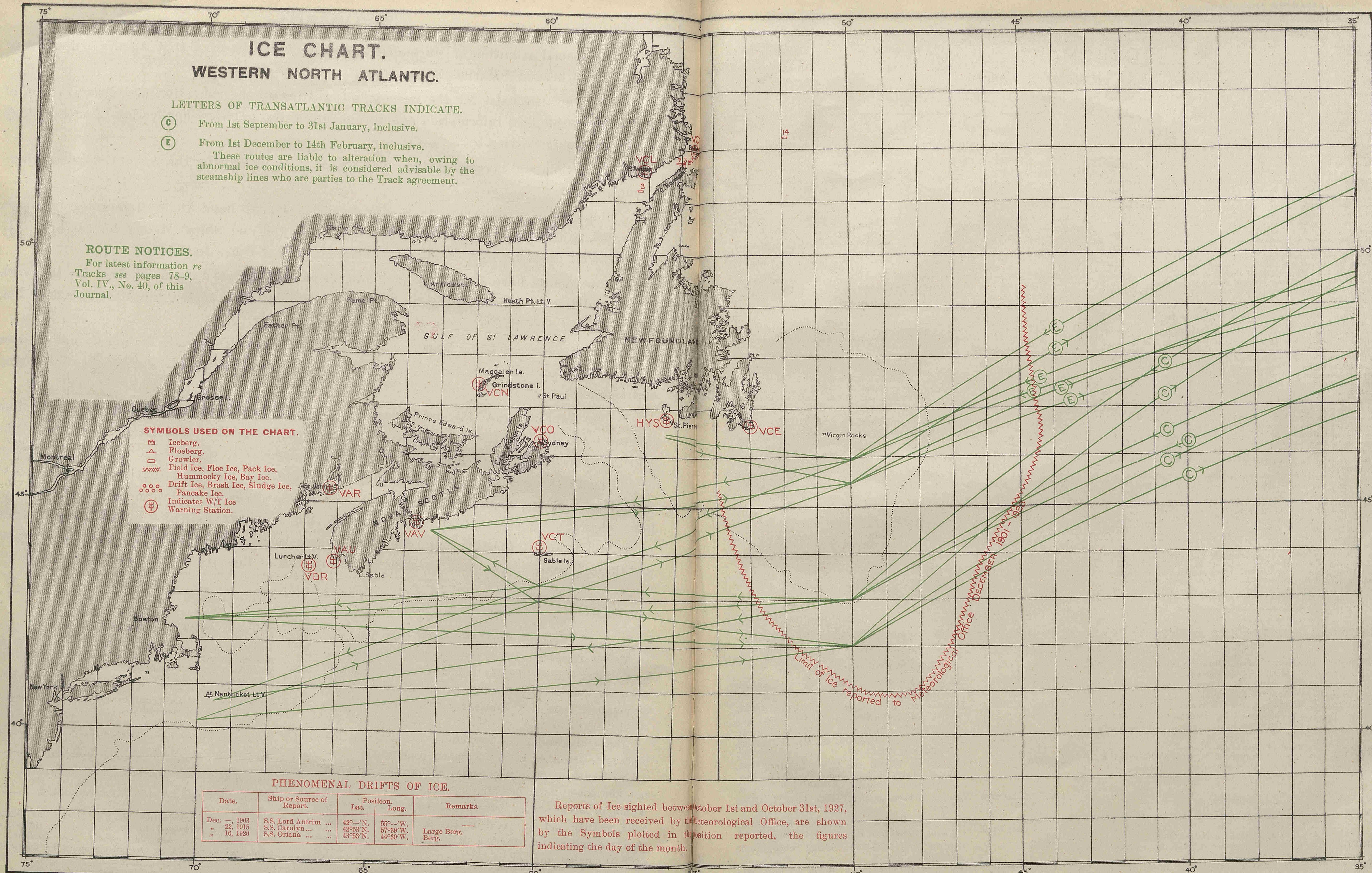
S.S.......................... *Captain*..............................

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.



PHENOMENAL DRIFTS OF ICE.

Date.	Ship or Source of Report.	Position. Lat.	Position. Long.	Remarks.
Dec. —, 1903	S.S. Lord Antrim ...	42°—'N.	55°—'W.	—
„ 22, 1915	S.S. Carolyn	42°53'N.	57°39'W.	Large Berg.
„ 16, 1920	S.S. Oriana	43°53'N.	44°39'W.	Berg.

Reports of Ice sighted between October 1st and October 31st, 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.

Ps. 68/1511. Wt. 10A. D.I. 1100. 11/27.

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

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. Latitude.	Longitude.	Description.
	NORTH SEA.		
5.10.27	57°20′N.	8°41′E.	Floating wreckage, apparently vessel bottom up between 100 and 150 feet long.
20.10.27	53°06′N.	4°26′E.	Mast about 3 feet above water, dangerous to navigation.
	BALTIC.		
14.10.27	56°32′N.	11°22′E.	Drifting wreck.
	ENGLISH CHANNEL.		
2.10.27	50°51′N.	0°59′E.	Wreckage, about 40 feet long with spar attached.
6.10.27	50°17′N.	2°41′W.	Large sunken boat, both ends above water.
12.10.27	3 miles N. 30° E. Alderney Lt. Ho.		Small boat without name or number, abandoned.
19.10.27	Owers Lt. V. bearing 10° 8 miles.		Cylindrical object, torpedo-shaped, newly painted red, floating on surface.
	NORTH ATLANTIC.		
1.10.27	11°58′N.	75°05′W.	Log about 3 feet in diameter.
2.10.27	39°27′N.	42°08′W.	Abandoned schooner in sinking condition.
3.10.27	30°50′N.	70°—′W.	Large red gas buoy marked "12A" showing flashing white light irregularly.
4.10.27	43°37′N.	44°23′W.	Large buoy with superstructure gone, buoy covered with heavy marine growth, showing about 3 feet out of water.
4.10.27	32°23′N.	62°13′W.	Heavy spar, 30 feet long by 4 feet 6 inches.
9.10.27	37°22′N.	74°40′W.	Steel ball-shaped object, about 3 feet in diameter, painted black with white numbers on one side.
12.10.27	43°36′N.	46°19′W.	Fisherman's dory half full of water, some planks stove in.
14.10.27	31°56′N.	73°27′W.	Br. Schooner, *Flowerdew*, in sinking condition, on fire.
22.10.27	42°37′N.	11°35′W.	Red conical buoy.
	GULF OF MEXICO.		
9.10.27	27°13′N.	88°28′W.	Large tree trunk, 50 to 60 feet long, 3 feet diameter, with roots and branches.
10.10.27	22°05′N.	87°54′W.	Large can buoy, painted black.
	CARIBBEAN SEA.		
7.10.27	10°40′N.	75°40′W.	Log about 25 feet long, 3 feet diameter.
	NORTH PACIFIC.		
4.10.27	47°08′N.	174°07′E.	Spar, showing about 6 feet out of water, apparently attached to submerged wreckage.

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

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

LIVERPOOL ... Lieut. Commander M. CRESSWELL, R.N.R., Port Meteorological Officer, Dock Office. (*Telephone No.: Bank 8959*).

Agents.

BELFAST ... ... Captain J. MCINTYRE, Harbour Master, Harbour Office. (*Telephone No.: Belfast 4090*).

CARDIFF ... ... Captain T. JOHNSTON, Technical College, Cathays Park.

CLYDE ... ... Captain M. C. CORRANCE, Board of Trade Surveyor's Office, 73, Robertson Street, Glasgow.

Agents (*contd.*).

FREMANTLE, W. Australia. Captain J. J. AIREY, Deputy Director of Navigation, 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 ILLUSTRATIONS APPEARING IN THE TEXT.

LIST OF PLATES PRODUCED BY LITHOGRAPHIC PROCESS, INCLUDING CHARTS AND OTHER LARGE DIAGRAMS WHICH APPEAR IN EACH NUMBER.

LIST OF WIRELESS WEATHER TELEGRAPHY TABLES WHICH APPEAR IN EACH NUMBER.

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

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

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

Only in special cases will individual letters be sent.

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

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

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

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

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

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

- M.L. = Equipped with tested Instruments for keeping Meteorological Log.
- W.T. = Equipped with tested Instruments for making coded W/T reports to the Meteorological Office, London.
- No. = Keeps Ships' Meteorological Report Form 911 with ship's instruments. Letter M after No. indicates ship's barometer Mercurial; A. ship's barometer Aneroid.
- C.C. = Equipped with tested Instruments for making Cross Channel Telegraphic Reports to the Meteorological Office, London.

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

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Aba ...	Yardley, H. A., D.S.C. Williams, T. E. ...	S. J. Bristowe, O. E. Jones, E. E. Roberts.	M.L.	Elder Dempster ...	Met. Log. 30.3.27 to 26.8.27	15.9.27
Abinsi	Millson, H. E. ...	E. W. Bascombe	No. A.	" " ...	Form 911 29.12.26 to 23.2.27... ...	3.3.27
Achilles	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
Actor	Haylett, E. ...	A. Frew, J. McKay, G. Morrice.	"	Harrison	" 7.5.27 to 17.8.27	1.9.27
Adda	Toft, J. T.	A. E. Longlen	M.L.	Elder Dempster ...	Form 911 11.5.27 to 19.6.27	22.6.27
50 *Adriatic* ...	Hickson, V. W., Lieut Commr. R.N.R.	R. G. Roberts, O. V. Lucas ...	W.T.	White Star	W.T. Reg. 19.9.27 to 8.10.27	12.10.27
Aeneas	Wallace, W. K. ...	E. R. Owen	No. A.	A. Holt	Form 911 20.8.27 to 30.8.27	9.9.27
Agapenor	Ramsay, J. ...	S. G. Ellams	" A.	"	" 22.7.27 to 25.8.27	8.9.27
Aidan	Pym, J.	J. S. Thompson	" A.	Booth	" 13.6.27 to 9.8.27	16.8.27
Alban	Welsh, A.	... ...	" A.	"	" 27.7.27 to 9.8.27	6.9.27
Alipore	Smith, H. E., R.D., Lt.-Commr., R.N.R.	D. A. C. Butler	" M.	P. and O.	" 29.5.27 to 8.8.27	30.8.27
Almanzora ...	Clarke, E. C.	D. O. Llewellyn	" A.	R.M.S.P.	" 14.5.27 to 27.6.27	29.6.27
63 *Albertic*	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	J. Farrell	W.T.	White Star	" 10.9.27 to 1.10.27	3.10.27
Alondra	Scott, L. S.	H. Peters	No. A.	Yeoward	" 27.8.27 to 18.9.27	22.9.27
Alynbank	Clayton, W. E. ...	... ...	No	A. Weir & Co. ...	... ...	...
Ampetco ...	Vandenkerckhove, A.	L. Brachs	No. A.	American Petroleum	Form 911 5.7.27 to 13.8.27	19.8.27
Andalucia ...	Thomas, R. J. ...	C. W. Vaughan...	" M.	Blue Star	" 21.7.27 to 6.9.27	13.9.27
Anchises	Woodgett, R. J. ...	... ...	" A.	A. Holt	" 27.3.27 to 15.4.27	9.5.27
Andes	Smith, W. E., D.S.O., R.D., Capt. R.N.R.	G. H. Elliott	" M.	R.M.S.P. Co.	" 30.7.27 to 12.9.27	20.9.27
Antilochus ...	Clark, J. W. ...	O. P. H. Wynne	" A.	A. Holt	" 16.6.27 to 5.7.27	9.8.27
Aorangi	Crawford, R. ...	G. H. Kime, E. Anderson, E. V. Bilger, D. Richards.	M.L.	Canadian-Australasian	Met. Log. 1.6.27 to 15.9.27	11.10.27
30 *Aquitania* ...	Charles, Sir J. T. W., K.B.E., C.B., R.D., Commodore R.N.R.	J. L. Croasdaile, J. Locke, D. MacLean.	W.T.	Cunard ...	W.T. Reg. 4.9.27 to 19.9.27 ... ... " 25.9.27 to 10.10.27... ...	23.9.27 13.10.27
62 *Arabic*	Bulman, J. B. ...	J. M. Appleby, W. Jackman, W. N. Jenkins.	"	White Star	" 13.9.27 to 8.10.27	13.10.27
Arafura	Gordon, A. S. ...	R. Lloyd Harry, C. G. Knight, B. W. Dun, C. Stratford.	M.L.	Eastern and Australian	Met. Log. 30.4.27 to 26.7.27	5.10.27
Arawa	Summers, W. G. ...	D. Aitchison, A. C. Jones, J. Jackson.	"	Shaw, Savill and Albion	" 30.3.27 to 28.7.27	11.8.27
Archimedes ...	Downs, E. B. ...	E. R. Hartley	No. A.	Lamport & Holt ...	Form 911 22.8.27 to 12.9.27	22.9.27
Argyllshire ...	Wallace, J. ...	J. M. Crone	" M.	Federal	" 22.4.27 to 12.5.27	2.6.27
Ariguani	Scudamore, J. H. H., D.S.C., R.D., Commr., R.N.R.	J. W. Kendal	M.L.	Elders & Fyffes ...	Met. Log. 15.1.27 to 14.5.27	4.7.27
Armadale Castle ...	Owen, S. H. ... Imlah, C. B. ...	A. B. Connon, G. D. Pennick, L. G. May.	"	Union Castle	" 31.10.26 to 24.4.27 ...	9.5.27
Arracan	Duncan, S. S.	J. Summers, J. Henderson, C. C. Weir.	"	P. Henderson ...	" 5.5.27 to 19.9.27	29.9.27
Arundel	Short, H.	Mr. Hill...	C.C.	Southern Rly. ...	Telegraphic Report 14.10.27 ...	14.10.27
Arundel Castle ...	George, J., O.B.E. ...	R. May	No. A	Union Castle ...	Form 911 23.7.27 to 11.9.27	13.9.27
Astronomer ...	Richards, J. ...	A. Brown, J. Glen, A. Thompson	M.L.	Harrison	Met. Log. 22.1.27 to 20.6.27	28.6.27
Ascanius	Agnew, J.	C. Houghton, R. Singleton, J. B. Marshall.	"	A. Holt	" 22.5.27 to 26.9.27	3.10.27
Athenic	Binks, J. W. ...	W. Hill	No. A.	White Star	Form 911 31.7.27 to 7.9.27	12.9.27
Atreus	Salter, G. H. ...	J. C. Stratford	" A.	A. Holt	" 6.9.27 to 4.10.27	8.10.27
Atsuta Maru ...	Shibutami, S. ...	A. Hurakami	" A.	Nippon Yusen Kaisha	" 12.2.27 to 13.6.27	17.6.27
Auditor	Owen, W. T. ...	T. E. Steel	" M.	Harrison	" 2.7.27 to 22.7.27	3.8.27
Autolycus	Dunlop, J. K. ...	... ...	" A.	A. Holt...	... ...	...

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Ausonia	Stafford, W., D.S.C., R.D., Lt.-Commr., R.N.R.	J. J. Wiseman	No. A.	Cunard	Form 911 21.8.27 to 8.10.27	11.10.27
Avon	Hannam, F. S.	E. S. Dunch	„ M.	R.M.S.P.	„ 10.11.26 to 20.1.27	8.2.27
Balfour	Carr Jones, D. J.	W. J. Roberts	„ A.	Canadian Pacific	„ 10.8.27 to 6.9.27	9.9.27
Balranald	Townshend, W. P., Commr., R.N.R.	C. Hannen, F. Ward, — Cowell, — Davis.	M.L.	P. & O. Branch	Met. Log. 25.12.26 to 1.5.27	7.5.27
51 *Baltic*	White, E. R., R.D., Commr., R.N.R.	J W. Paine, J. Boyce, J. Law	W.T.	White Star	W.T. Reg. 5.9.27 to 24.9.27	27.9.27
					Form 911 4.9.27 to 24.9.27	27.9.27
Bampton Castle	Hutchings, A. H.	J. F. H. Coombes	No. A.	Union Castle	„ 18.6.27 to 20.7.27	15.8.27
Banbury Castle	Swiney, W. A.	C. G. Cuthbertson	„ A.	„	„ 21.4.27 to 9.5.27	9.6.27
Banffshire	Wynne, R. H.	W. F. Lockhead	„ A.	Turnbull Martin	„ 3.8.27 to 23.8.27	26.9.27
Baradine	Rollo, W.	S. Gibson, C. Bowden, J. Alleyne, D. Buckley.	M.L.	P. & O. Branch	Met. Log. 17.3.27 to 22.6.27	26.7.27
Barpeta	Strachan, J.	B. R. Faithfull	No. M.	British India	Form 911 24.8.27 to 23.9.27	10.10.27
Barrabool	Rhodes, H. R.	F. S. Bowman	„ M.	P. & O. Branch	„ 19.4.27 to 27.5.27	10.6.27
Baychimo	Cornwall, S. A.	W. H. Deans	„ A	Hudson's Bay Co.	„ 7.7.27 to 14.9.27	13.10.27
59 *Belgenland*	Morehouse, W. A.	C. J. Murray, F. Good	W.T.	Red Star	W.T. Reg. 12.9.27 to 1.10.27	4.10.27
					Form 911 11.9.27 to 1.10.27	5.10.27
Beltana	Allin, C. H. C.	F. Ardern	No. M.	P. & O. Branch	„ 23.6.27 to 19.7.27	9.8.27
Benalder	Cole, J. H., D.S.C.	A. J. Leckie	„ A.	Ben Line	„ 11.8.27 to 18.9.27	5.10.27
Bendigo	Nicholl, R. N. C.	...	„ M.	P. & O. Branch	„ 29.4.27 to 5.9.27	20.9.27
Benefactor	Jones, C. W.	A. Watson	„ M.	Harrison	„ 3.9.27 to 19.9.27	10.10.27
Bengloe	...	...	No.	Ben Line	...	...
31 *Berengaria*	Rostron, A. H., Sir, 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. 11.9.27 to 27.9.27	30.9.27
Berrima	Short, C. E.	T. Ferguson	No. M.	P. & O. Branch	Form 911 4.8.26 to 5.12.26	7.12.26
Berwyn	McCombie, G.	D. Dunn	„ A.	Canadian Pacific	„ 23.1.27 to 19.3.27	24.3.27
Bintang	Morzer Bruyns, M. F.	M. C. Altins	„ M.	Nederland	„ 26.2.27 to 25.3.27	29.3.27
Bogota	Pape, E. R.	S. E. Ayland	„ M.	R.M.S.P. Co.	„ 24.7.27 to 1.8.27	19.8.27
Bolingbroke	Murray, M. F.	J. B. Hewson, F. G. Webster, N. Scallon, R. Davidson.	M.L.	Canadian Pacific	Met. Log. 16.9.26 to 23.3.27	25.5.27
Borda	Holland, R.	...	No M.	P. & O. Branch	Form 911 18.2.27 to 28.6.27	7.7.27
Bothwell	Rothwell, A. J.	— Biggs	„ A.	Canadian Pacific	„ 6 3.27 to 14.4.27	20.4.27
Brecon	Rothwell, A.	E. H. Coleman	„ A.	„ „	„ 5.5.27 to 6.6.27	14.6.27
Brenda	Lamont, A.	N. Ross	„ A.	Scottish Fishery Board.	„ 1.9.27 to 23.9.27	6.10.27
Brighton	Hill, A.	Mr. Munton	C.C.	Southern Railway	Telegraphic Report 2.10.27	2.10.27
British Engineer	Joures, F. W.	W. Evans	No. M.	British Tankers	Form 911 11.2.27 to 26.2.27	25.5.27
British Enterprise	Putt, R. O.	T. Seaman	„ M.	„ „	„ 30.4.27 to 18.7.27	5.8.27
British Soldier	Putt, R. O.	H. J. Crangle	„ A.	„ „	„ 17.11.26 to 10.12.26	3.1.27
Bronte	Crapper, J. S.	C. E. Legg	„ A.	Lamport & Holt	„ 10.8.27 to 5.9.27	26.9.27
Cambria C.S.	Sherwood, C. A., D.S.C.	A J. English, B. C. Farrow, C. F. St. John.	No.	Eastern Tel. Co.	Met. Log. 9.9.26 to 25.1.27	23.2.27
Cambria	Telfer, J. E., O.B.E	V. S. Phillips	C.C.	L.M. & S. Rly	Telegraphic Report 8.10.27	8.10.27
Cameronia	Gemmell, W.	W. Black, R. Blake, L. McPhail.	No. A.	Anchor	Form 911 18.8.27 to 4.9.27	9.9.27
Camito	Forrester, W. T., O.B.E.	H. H. Dunning, J. McIntyre, C. M. Schofield.	M.L.	Elders & Fyffes	Met. Log. 28.3.27 to 24.7.27	29.7.27
Canadian Importer	Forson, A.	G. R. Randall	No. A.	Canadian Gov. Mercantile Marine.	Form 911 21.6.27 to 24.7.27	11.8.27
Canadian Inventor	Boulton, F. W.	O. Dalcorn	„ A.	„ „ „	„ 5.7.27 to 8.8.27	3.10.27
Canadian Scottish	Wallace, C.	...	„ A.	„ „ „	„ 26.5.27 to 11.7.27	19.8.27
Canadian Skirmisher.	Millar, W. H.	...	„ A.	„ „ „	„ 19.11.26 to 5.1.27	11.1.27
Canadian Winner	Hocking, N. P.	R. J. Watson	„ M.	„ „ „	„ 19.7.27 to 22.8.27	12.9.27
Canonesa	Brodie, W. H.	F. W. Kent	„ M.	Furness Houlder	„ 13.9.27 to 2.10.27	8.10.27
35 *Carmania*	Brown, F. G., R.D., Capt., R.N.R.	W. M. Stewart, P.L. Williams, D. E. Sibson.	W.T.	Cunard	W.T. Reg. 4.9.27 to 23.9.27	27.9.27
					Form 911 7.8.27 to 26.8.27	30.8.27
Carnarvon Castle	Hague, J.W., Commr., R.N.R. / Strong, H., R.D., Commr., R.N.R.	B. Simpson, H. A. Causton, G. Gorringe, H. A. Deller.	M.L.	Union Castle	Met. Log. 29.4.27 to 21.8.27	27.8.27
34 *Caronia*	Hossack, W. H., R.D., Capt., R.N.R.	P. F. Collins, H. G. Hayward.	W.T.	Cunard	W.T. Reg. 29.8.27 to 14.9.27	23.9.27
					Form 911 29.8.27 to 15.9.27	22.9.27
Casanare	Steidelmann, H.	R. O. Jones	No. A.	Elders & Fyffes	„ 25.6.27 to 11.9.27	16.9.27
Cavina	Riseley, A. D.	W. J. Dodd	„ A.	„ „	„ 1.8.27 to 2.9.27	6.9.27
52 *Cedric*	Smith, R. G.	S. S. Fieldwood, D. W. Chamberlain, F. Patchett.	W.T.	White Star	W.T. Reg. 12.9.27 to 2.10.27	5.10.27
					Form 911 11.9.27 to 2.10.27	5.10.27
53 *Celtic*	Berry, G.	J. Peters, T. Pratt, A. Thompson.	„	„ „	W.T. Reg. 28.8.27 to 16.9.27	21.9.27
					Form 911 28.8.27 to 17.9.27	21.9.27
Centaur	Rose, A. F.	L. Johnstone	No. M.	A. Holt & Co.	„ 22.12.26 to 2.2.27	14.3.27
Ceramic	Roberts, J., C.B.E., D.S.O., R.D., Capt., R.N.R.	H. J. Yates	„ A.	White Star	„ 14.4.27 to 20.5.27	21.5.27
Changte	Gambrill, F. C.	D. D. Tyer, A. Johnston	M.L.	Yuill & Co.	Met. Log. 15.4.27 to 9.8.27	5.10.27
Changuinola	Thorburn, R. A., R.D., Commr., R.N,R.	W. G. Chanter. M. H. Thomson.	No. A.	Elders & Fyffes	Form 911 5.9.27 to 7.10.27	14.10.27
China	Sudell, F., R.D., Commr., R.N.R.	L. Porter	„ M.	P. & O.	„ 25.7.27 to 11.8.27	8.10.27
Chindwara	Brooks, E. G.	J. J. Smith	„ M.	British India	„ 20.11.26 to 28.11.26	29.12.26
Chindwin	Esslemont, C.	W. D. Tulloch	„ A.	Henderson	„ 22.1.27 to 8.4.27	13.4.27
Chirripo	McColm, F.	...	No.	Elders & Fyffes	...	...
City of Baroda	McMillan, J.	A. Beaton, E. H. Routledge, H. C. Snow.	M.L.	Ellerman	Met. Log. 3.2.27 to 17.5.27	27.6.27
City of Benares	Anderson, W. W.	F. Forsyth	No. A.	„	Form 911 4.8.27 to 3.9.27	26.9.27
City of Brisbane	Seaborne, F. O., D.S.C.	D. W. F. Reilly	„ A.	„	„ 19.7.27 to 19.8.27	12.9.27
City of Canterbury	Bremner, D. M.	R. H. Hodgson	„ A.	„	„ 17.8.27 to 9.9.27	3.10.27
City of Carlisle	Mordue, J. A.	...	„ A.	„	„ 1.5.27 to 22.5.27	9.6.27
City of Chester	Letton, F. W.	H. Asher, W. Speakman, H. A. Hazell.	M.L.	„	Met. Log. 21.9.26 to 5.2.27	23.2.27
City of Edinburgh	Wyper, J.	G. Hummell	No. M.	„	Form 911 24.7.27 to 21.8.27	20.9.27
City of Hong Kong	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	S. J. Nash	„ A.	„	„ 26.6.27 to 30.8.27	1.9.27
City of London	Parker, F. W., R.D., Commr., R.N.R.	J. McHattie	„ A.	„	„ 26.2.27 to 8.5.27	28.5.27
City of Rangoon	Jones, P.	E. R. Wildermoth, R. H. Stewart, G. T. Willet.	M.L.	„	Met. Log. 22.1.27 to 4.6.27	29.6.27
City of Venice	Lee, A.	...	No. A.	„	Form 911 2.3.27 to 17.3.27	4.5.27
City of Yokohama	McDonald, W. D.	W. N. M. Faichney	„ A.	„	„ 14.5.27 to 28.6.27	16.7.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment,	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Clan Alpine	Lyall, A. B.	H. J. Winchester	No. A.	Clan	Form 911 17.6.27 to 6.7.27	10.8.27
Clan Lamont	Urquhart, P., D.S.C.	P. de Gruchy	„ A.	„	„ 10.7.27 to 24.7.27	22.8.27
ClanLindsay	Giles, H. J., R.D., Commr., R.N.R.	E. P. Smith	„ A.	Clan	„ 24.7.27 to 16.8.27	20.9.27
Clan Macbeth	Young, A. H., R.D., Lieut. - Commdr R.N.R.	J. M. Lorimer	„ A.	„	„ 23.8.27 to 19.9.27	5.10.27
Clan Macfadyen	Stenson, F. J. R.D., Capt. R.N.R.	H. M. Wavell	„ A.	„	„ 25.3.27 to 23.4.27	27.4.27
Clan Macgillivray	West, W. F.	R. W. Roberts	„ A.	„	„ 27.4.27 to 24.5.27	20.6.27
Clan Macindoe	West, W. F.	D. McAllister	„ A.	„	„ 3.8.27 to 27.8.27	30.8.27
Clan Mackellar	Smith, W. P.	G. A. A. Grant	„ A.	„	„ 30.7.27 to 12.8.27	5.9.27
Clan Macphee	Gourlay, J. B.	D. S. Rae, A. F. Martin, W. A. Shewan.	M.L.	„	Met. Log. 14.5.26 to 2.5.27	9.6.27
Clan Macnaughton	Simpson, A. W.	D. D. Ingram	No. A.	„	Form 911 14.8.27 to 11.9.27	3.10.27
Clan Mactaggart	Mee. F. T.	E. A. Hewson	„ A.	„	„ 5.7.27 to 18.8.27	8.10.27
Clan Macwhirter	Waterhouse, J.	W. A. Robbie, E. A. Brown, D. Timms.	M.L.	„	Met. Log. 11.2.27 to 15.8.27	23.8.27
Clan Macwilliam	Thompson, W.	T. B. Cranwill	No. A.	„	Form 911 7.12.26 to 20.6.27	11.7.27
Clan Malcolm	Neill, G. A.	D. A. Stark, H. V. Whitman, A. R. Macdonald.	M.L.	„	Met. Log. 7.4.27 to 23.7.27	27.8.27
Clan Morrison	Porterfield, W. M.	L. C. Higgins	No. A.	„	Form 911 5.7.27 to 2.8.27	3.8.27
Clan Murdoch	Miller, W.	H. F. M. Preston	„ A.	„	„ 13.7.27 to 18.8.27	12.9.27
Clan Ranald	Laird, C.	...	„ A.	„	„ 18.7.27 to 10.8.27	15.9.27
Clan Ross	Openshaw, L. G.	H. T. Booth	„ A.	„	„ 1.8.27 to 26.8.27	19.9.27
Clan Sinclair	George, L. S.	N. Macleod	„ A.	„	„ 8.6.27 to 30.7.27	9.8.27
Clan Urquhart	Baker, E. W.	F. E. Woodall	„ A.	„	„ 14.9.27 to 28.9.27	6.10.27
Colonia, C.S.	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
Colonian	Gittins, R. P.	W. J. Wright	No. A.	Leyland	Form 911 28.8.27 to 21.9.27	26.9.27
Comorin	Miller, E. C., R,D., Commr., R.N.R.	E. C. White	„ M.	P. & O.	„ 11.8.27 to 22.9.27	26.9.27
Concordia	Telfer, J. H.	T. Philip, W. Law, L. H. Hobson.	M.L.	Anchor Donaldson	Met. Log. 5.2.27 to 11.7.27	14.7.27
Corinthic	Hart, F.	E. Burt, M. Bennett, S. A. Macnaughton.	„	White Star	„ 24.4.27 to 6.8.27	10.8.27
Cornwall	Haines, F. P.	H. S. White	No. A.	Federal	Form 911 26.1.27 to 28.2.27	12.4.27
Craftsman	Gibbings, W.	J. Williams	„ A.	Harrison	„ 20.7.27 to 9.8.27	30.8.27
Crawford Castle	Morgan, A. O., R.D., Commr., R.N.R.	J. A. Wilson	„ A.	Union Castle	„ 22.7.27 to 4.9.27	3.10.27
Culebra	Mackay, A. S., R.D., Commr., R.N.R.	P. Cooper, R. W. Hurst, G. Ferguson.	M.L.	R.M.S.P. Co.	Met. Log. 15.5.27 to 15.7.27	27.7.27
Cumberland	Macmillan, D.	J. D. Marks	No. A.	Federal	Form 911 13.7.27 to 20.8.27	26.8.27
Cuthbert	Barlow, F. P.	...	„ A.	Booth	„ 25.8.27 to 18.9.27	22.9.27
Cyclops	Cosker, W.	J. R. C. Evans	„ A.	A. Holt	„ 26.7.27 to 17.9.27	22.9.27
Dardanus	Williams, D. T.	A. S. Holland	„ A.	„	„ 27.8.27 to 6.9.27	16.9.27
Darian	Masters, W.	A. S. Holland	„ A.	Leyland	„ 17.9.27 to 29.9.27	3.10.27
Darro	Matthews, G. P.	W. Halder-Campe	„ M.	R.M.S.P. Co.	„ 6.8.27 to 30.9.27	3.10.27
Demerara	Shillitoe, B., R.D., Commr., R.N.R.	J. R. Baty	„ M.	„	„ 26.7.27 to 15.9.27	21.9.27
Demosthenes	Ogilvy, A.	J. Cruickshank	„ M.	Aberdeen	„ 27.6.27 to 11.7.27	3.8.27
Deseado	Purvis, A.	...	„ M.	R.M.S.P. Co.	„ 11.6.27 to 6.8.27	16.8.27
Desna	Green, J.	A. F. Walker	„ M.	„	„ 3.12.26 to 19.1.27	31.1.27
Deucalion	Melling, C. F.	R. Wilson	„ A.	A. Holt	„ 15.7.27 to 20.9.27	11.10.27
Dieppe	Marmery, S.	Mr. Parsons	C.C.	Southern Railway	Telegraphic Report 13.10.27	13.10.27
Dimboola	Roy, C. M.	...	No. A.	Melbourne S.S. Co.	Form 911 7.8.27 to 1.9.27	3.10.27
Discoverer	Ling, J. T.	H. W. Gostage	„ M.	Harrison	„ 8.4.27 to 9.7.27	12.7.27
Domala, M.V.	Kitson, A. G.	J. G. Wallace	„ M.	British India	„ 8.7.27 to 18.9.27	10.10.27
Dominia, C.S.	Campos, V., O.B.E., Lt.-Commr., R.NR.	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
Dominic	Harris, F. C. P.	C. C. Beal	No. A.	Booth	Form 911 22.7.27 to 5.8.27	5.9.27
61 *Doric*	Summers, F. F., R.D., Commr., R.N.R.	H. R. Wilkinson	W.T.	White Star	„ 3.9.27 to 24.9.27	26.9.27
Doric Star	Thomas, R. T.	L. McDermott	No. A.	Blue Star	„ 22.11.26 to 20.12.26	10.1.27
Dorington Court	Clarke, E. J.	P. Jones	„ A.	Haldin & Co.	„ 19.6.27 to 29.9.27	11.10.27
Dromore Castle	MacMahon, J.	D. H. McDougall	„ A.	Union Castle	„ 14.4.27 to 26.8.27	9.9.27
Dryden	Major, T. W.	...	„ M.	Lamport & Holt	„ 5.6.27 to 5.9.27	19.9.27
Duendes	Pape, E. R.	S. E. Ayland	„ M.	P.S.N. Co.	„ 9.7.27 to 23.7.27	5.8.27
Dunaff Head	Butt, H. L., R.D., Commr., R.N.R.	S. Duff	„ A.	Ulster S.S. Co.	„ 16.5.27 to 13.9.27	16.9.27
Dundrum Castle	Weller, H. E.	H. H. F. Trew	„ A.	Union Castle	„ 17.6.27 to 15.7.27	28.7.27
Dunrobin	Ramsay, J. D.	C. H. Kendall	„ A.	Glen & Co.	„ 16.8.27 to 14.9.27	3.10.27
Duquesa	Ellis, F., D.S.C.	E. W. Denman	„ A.	Furness Withy	„ 12.6.27 to 10.8.27	18.8.27
Durenda	Beeching, P. H.	...	„ A.	British India	...	...
Edinburgh Castle	Owen, S.	T. N. McAllen	No. A.	Union Castle	„ 5.8.27 to 25.9.27	3.10.27
Egori	Sola, P., D.S.O.	...	No.	Elder Dempster	...	...
Egyptian Prince	Ord, T.	...	„ A.	Prince	„ 13.1.27 to 7.3.27	31.3.27
El Paraguayo	St. Pierre, P.	S. B. Wright	„ M.	Houlder Bros.	„ 22.5.27 to 13.7.27	9.8.27
Elpenor	Gordon, A. L.	M. Robertson, C. Kavanagh	M.L.	A. Holt	Met. Log. 27.3.27 to 30.7.27	18.8.27
Elysia	Duncan, A. R.	A. Laidlaw, H. C. Fry, J. Herbert.	„	Anchor	„ 4.5.27 to 7.7.27	13.7.27
Empress of Asia	Douglas, L. D. R.D., Lt.-Commr., R.N.R.	P. Sinclair, L. G. Goddard, R. Hickey.	„	Canadian Pacific	„ 6.2.27 to 27.5.27	2.7.27
Empress of Canada	Robinson, S., C.B.E., R.D., Commr., R.N.R. / Hailey, A. J.	...	„	„ „	„ 26.2.27 to 18.6.27	14.7.27
Empress of France	Griffiths, E.	E. Roberts, W. Ewens, W. Pickersgill.	„	„ „	„ 29.1.27 to 15.4.27	1.5.27
Empress of Russia	Hosken, A. J.	F. A. R. Dobbin	„	„ „	„ 25.12.26 to 8.5.27	13.6.27
Empress of Scotland	Latta, R. G.	P. Powys Smith, T. Sargent, E. Aikman.	„	„ „	„ 14.11.26 to 22.4.27	3.5.27
Endeavour	Commr. S. A. Geary-Hill, D.S.O., R.N.	C. S. E. Lansdown	M.L.	His Majesty's Ship	„ 14.3.27 to 11.7.27	19.7.27
Essequibo	Kite, E.	J. E. Williams	No. M.	R.M.S.P. Co.	Form 911 11.8.27 to 27.9.27	8.10.27
Eumaeus	Read, J. W.	...	„ A.	A. Holt	„ 15.6.27 to 26.8.27	5.9.27
Euripides	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

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Euryades	Stewart, J. R.	...	No. A.	A. Holt	Form 911 20.8.27 to 13.9.27	8.10.27
Explorer	Ling, J. T.	...	„ M.	Harrison	...	...
Explorer	Allan, J.	...	„ A.	Scottish Fishery Board.	Form 911 3.9.27 to 30.9.27	5.10.27
Ferndale	Daniel, F.	D. Jones, R. T. Hartrick	„ M.	Commonwealth Govt.	„ 4.7.27 to 7.8.27	12.8.27
Flandria	Maars, L.	T. Doornbosch	„ M.	Holland Lloyd	„ 15.4.27 to 2.6.27	9.6.27
Francisco	Scales, H.	J. C. Nettleship	„ A.	Ellerman Wilson	„ 29.7.27 to 31.8.27	7.9.27
Freya	Angus, W.	W. Pirrie	„ A.	Scottish Fishery Board.	„ 1.9.27 to 30.9.27	5.10.27
Gaika	Jackson, C. R.	L. G. May	„ A.	Union Castle	„ 5.8.27 to 30.8.27	20.9.27
Galtymore	Yeoman, J. T.	R. B. Gurner	„ M.	Furness Withy	„ 27.5.27 to 5.6.27	27.6.27
Garoet	Visser, C. W.	C. J. Vandenboom	„ M.	Rotterdam Lloyd	„ 26.6.27 to 15.7.27	25.7.27
Garth Castle	Jackson, C. R.	W. S. J. Aldous	„ A.	Union Castle	„ 28.5.27 to 18.6.27	22.6.27
Gelria	Veldkamp, C. J.	T. van der Mast	„ M.	Holland Lloyd	„ 24.6.27 to 14.7.27	16.7.27
Geranium	Bennett, H. T., D.S.O., Commr. R.A.N.	...	„ M.	His Majesty's Australian Ship.	...	...
Glamorganshire	Spriddell, F. G., R.D., Commr., R.N.R.	T. G. S. Cairns	„ M.	R.M.S.P. Co.	Form 911 2.7.27 to 2.8.27	5.9.27
Glenamoy, M.V.	Homan, C. E.	R. H. Bishop	„ A.	Glen Line	„ 27.6.27 to 11.8.27	14.9.27
Glengarry	Angier, J.	C. S. Brewer	„ M.	„	„ 31.7.27 to 4.9.27	3.10.27
Glenluce	Kennett, W. H.	H. B. Porter	„ A.	„	„ 21.8.27 to 7.9.27	13.10.27
Glenshane	Beer, E.	...	„ A.	„	„ 21.5.27 to 21.8.27	15.9.27
Gloucestershire	Robin, E.	H. R. Mackay	„ A.	Bibby	„ 3.7.27 to 11.9.27	15.9.27
Gorgon	Hughes, J. W.	A. E. Bowlt, E. W. Powell, J. M. T. Edward.	M.L.	A. Holt & Co.	Met. Log. 29.10.27 to 7.4.27	9.5.27
Grantully Castle	Whitfield, G. T.	R. Wren	No. A.	Union Castle	Form 911 3.6.27 to 14.8.27	17.8.27
Greenbrier	McColm, F.	J B. Wookey	„ A.	Elders & Fyffes	„ 24.7.27 to 28.8.27	5.9.27
Halesius	Samuels, C.	L. W. Cook	„ A.	R. P. Houston	„ 3.6.27 to 21.7.27	25.7.27
Haliartius	Marsh, L. V.	...	„ A.	„ „	„ 25.6.27 to 19.7.27	15.8.27
Harmonides	Hughes, W. F.	S. S. Davidson	„ A.	„ „	„ 10.4.27 to 2.5.27	16.5.27
Hatarana	Graham, H. A.	...	M.L.	British India	...	...
Hatimura	Lane, S. R., R.D., Capt., R.N.R.	R. W. Scotchman	No. M.	„ „	Form 911 27.7.27 to 11.8.27	26.9.27
Hauraki, M.V.	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
Henry Holmes, C.S.	Bicker Caarten, A.	M. A. Green	No. M	W. I. & Panama Telegraph Co.	Form 911 28.7.27 to 5.9.27	5.10.27
Herald	Silk, H. V., Lieut.-Commr., R.N.; Haselfoot, F.E.B., Capt., R.N.	D. G. V. Williams	M.L.	His Majesty's Ship	Met. Log. 1.3.27 to 20.6.27	3.8.27
Herefordshire	Mann, R. P.	...	No. A.	Bibby	Form 911 14.7.26 to 28.8.27	1.9.27
Herminius	Roberts, T. V.	O. C. Hayles	„ A.	Shaw, Savill & Albion	„ 24.2.27 to 10.4.27	15.8.27
Herschel	Watson, W. W.	J. F. Maurey	„ A.	Lamport & Holt	„ 13.4.27 to 3.7.27	25.7.27
Hertford	Urquhart, D.	A. Robertson	„ A.	Federal	„ 22.5.27 to 13.6.27	25.7.27
Hibernia	Tanner, E. B., O.B.E.	R. Woodall	C.C.	L.M. & S. Railway	Telegraphic Report 1.10.27	1.10.27
Highland Laddie	Jones, T. J.	N. F. Seaton	No. A.	Nelson	Form 911 1.8.27 to 17.9.27	26.9.27
„ *Piper*	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
„ *Pride*	Robinson, R. H.	F. B. Quelch	No. A.	„	Form 911 1.7.27 to 27.8.27	30.8.27
„ *Prince*	Davies, J.	S. A. Wheaton	„ A.	Prince	„ 13.8.27 to 4.9.27	27.9.27
„ *Rover*	Ashby Graves, F.	C. C. Legg	„ A.	Nelson	„ 17.7.27 to 3.9.27	22.9.27
Hildebrand	Maddrell, J.	...	„ A.	Booth	„ 18.5.27 to 30.6.27	12.7.27
Hobson's Bay	Kydd, O. J.	R. Pearce, R. Bodman, G. Newton, H. Hendy.	M.L.	Commonwealth Govt.	Met. Log. 31.5.27 to 10.9.27	17.9.27
Holbein	Gough, W. A.	H. L. Rudd	No. A.	Lamport & Holt	Form 911 2.4.27 to 9.6.27	20.6.27
54 *Homeric*	Holme, A.	H. G. Morgan, H. Gilligan, W. T. Poustie.	W.T.	White Star	W.T. Reg. 1.9.27 to 15.9.27 „ 22.9.27 to 7.10.27	19.9.27 10.10.27
Hororata	Holland, E.	B. Evans, F. Malcouronne	No. A.	New Zealand S.S. Co.	Form 911 22.1.27 to 17.5.27	21.5.27
Hubert	Evans, L.	S. G. Edwards	„ A.	Booth	„ 14.6.27 to 2.8.27	12.8.27
Huntingdon	Ashworth, W.	...	„ A.	Federal	„ 29.7.27 to 3.9.27	5.9.27
Huntsman	Russell, H.	...	„ M.	Harrison	„ 5.7.27 to 18.7.27	15.8.27
Hurunui	Burton Davies, J.	J. Oxnard, F. Longheed, L. Cann, K. Goldsworthy.	M.L.	New Zealand S.S. Co.	Met. Log. 2.1.27 to 23.6.27	28.6.27
Ingoma	Barrow, R. K.	D. G. Russell	No. M.	Harrison	Form 911 19.8.27 to 2.10.27	5.10.27
Inkum	Meetham, J. T.	H. Johnson	„ A.	J. H. Welsford	„ 2.8.27 to 21.8.27	9.9.27
Iris, C.S.	Hughes, H. R.	W. Oliver, D. Bruce, D. MacDonald, T. Vickers.	M.L.	Pacific Cable Board	Met. Log. 17.11.26 to 24.3.27	11.10.27
Iroquois	Jackson, A. L. Commr., R.N.	H. L. Jenkins	„	His Majesty's Ship	„ 4.4.27 to 1.8.27	13.9.27
Ixion	Reed, G. C.	M. H. Vincent	No. A.	A. Holt	Form 911 20.8.27 to 12.9.27	10.10.27
Javanese Prince	Naylor, E.	W. Venn	„ A.	Prince	„ 11.7.27 to 23.8.27	26.9.27
Jervis Bay	Chaplin, W. R.	R. W. Laycock	„ M.	Commonwealth Govt.	„ 30.3.27 to 18.4.27	9.5.27
Kaisar-i-Hind	Morton, A. J.	R. H. Hand	„ M.	P. & O.	„ 10.7.27 to 31.8.27	5.9.27
Kalyan	Cornewall Jones, B.	S. Gerranson	„ M.	P. & O.	„ 13.8.27 to 15.9.27	19.9.27
Kamo Maru	Enya, S.	...	„ A.	Nippon Yusen Kaisha	Form 911 5.7.27 to 20.7.27	19.9.27
Kangaroo	Norris, H. C.; Turner, J. E.	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
Karapara	Miller, A. C.	J. W. Knight	No. M.	British India	Form 911 24.11.26 to 7.1.27	24.1.27
Kashmir	Mallalue, R., R.D., Lt.-Commr., R.N.R.	A. J. McHattie	„ M.	P. & O.	„ 26.8.27 to 14.9.27	10.10.27
Kenilworth Castle	Chave, Sir B., K.B.E.	...	M.L.	Union Castle	Met. Log. 8.8.26 to 30.1.27	5.4.27
Khiva	Cooper, C. P., O.B.E., R.D., Capt., R.N.R.	G. W. Wood, D. Meakle, E. Allen, V. A. Nicolls.	M.L.	P. & O.	„ 8.6.27 to 14.8.27	19.8.27
Khyber	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
Kia Ora	McIntosh, A.	E. A. Hickling	„	Shaw Savill & Albion	„ 30.1.27 to 15.6.27	20.6.27
Knight Companion	Cox, B. T.	A. Lamb, D. W. Williams	No. M.	A. Holt	Form 911 16.3.27 to 31.7.27	3.8.27
Koolinda, M.V.	Norris, H.	J. S. Airey	„ M.	State Service, Australia.	„ 28.7.27 to 22.8.27	26.9.27
Kovno	Dossor, W. A.	A. Snowdon, S. N. Stokes, N. W Glendenning.	M.L.	Ellerman Wilson	Met. Log. 30.10.26 to 13.6.27	18.7.27
37 *Laconia*	Britten, E. T., R.D., Commr., R.N.R.	J. Ashcroft, E. W. Connell, G. Noonan.	W.T.	Cunard	W.T. Reg. 19.9.27 to 9.10.27 Form 911 19.9.27 to 8.10.27	11.10.27 13.10.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Laguna	Kirkwood, J. H.	R. H. A. Clark	No. A.	Pacific S.N. Co.	Form 911 9.8.27 to 15.9.27	12.10.27
Lahore	Dawson, E. N.	W. G. Stevenson	„ M.	P. & O.	„ 27.11.26 to 31.12.26	5.1.27
Lalande	Hamill, H.	A. E. Warburton	„ A.	Lamport & Holt	„ 25.3.27 to 26.6.27	11.7.27
Lancashire	Griffiths, C. A.	R. Allen	„ A.	Bibby	„ 31.7.27 to 7.10.27	12.10.27
36 *Lancastria*	Oram, B. B., R.D., Capt., R.N.R.	R. P. Cambell, L. R. Sharp, F. G. Russell.	W.T.	Cunard	W.T. Reg. 11.9.27 to 1.10.27 Form 911 10.9.27 to 1.10.27	6.10.27 6.10.27
Laomedon	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	H. A. Standfield	No. A.	A. Holt	„ 8.8.27 to 19.8.27	24.8.27
La Paz, M.V.	Benson, C. W.	D. Beamer	„ M.	Pacific S.N. Co.	„ 13.5.27 to 30.7.27	3.8.27
Laplace	Hickman, V. G.	A. L. Murray, R. D. Cottam	„ A.	Lamport & Holt	„ 15.4.26 to 28.6.27	30.8.27
55 *Lapland*	Harvey, H.	E. Cornellie, J. C. Flett	W.T.	Red Star	W.T. Reg. 4.9.27 to 24.9.27 Form 911 4.9.27 to 25.9.27	27.9.27 26.9.27
Lautaro, M.V.	Dunn, R. E., O.B.E.	E. Sandon	No. M.	Pacific S.N. Co.	„ 29.6.27 to 25.7.27	8.9.27
Leicestershire	Lyon, H.	J. Cullen, P. Hawkins, J. K. Gemmell, H. S. Vickers.	M.L.	Bibby	Met. Log. 21.5.27 to 1.8.27	30.8.27
Leighton, M.V.	Lindesay, J. M.	J. T. A. Thomson	No. A.	Lamport & Holt	Form 911 22.7.27 to 10.8.27	22.8.27
Leitrim	Kemp, E. R.	C. R. Brown	„ A.	Dowie, J., & Co.	„ 24.6.27 to 15.7.27	22.8.27
Llandaff Castle	Morton Betts, W.	R. Bayen	„ A.	Union Castle	„ 19.5.27 to 9.6.27	5.7.27
Llandovery Castle	Owens, G.	C. H. Williams, G. Moon, M. J. Castle.	M.L.	„ „	Met. Log. 5.5.27 to 14.7.27	15.7.27
Loch Katrine	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
London Commerce	Young, H. J., D.S.C.	W. Edmonds	„ A.	Furness Withy	„ 19.8.27 to 19.9.27	26.9.27
London Importer	Fowler, W. H.	J. S. Williams, J. H. Metcalfe, J. G. Freeman.	M.L.	„ „	Met. Log. 19.5.27 to 5.8.27	19.8.27
Lord Antrim	Jarvis, F E.	L. G. Kirwan	No. A.	Ulster S.S. Co.	Form 911 27.4.27 to 10.5.27	23.5.27
Loriga, M.V.	Clapham, E. C.	R. W. Gill	„ A.	Pacific S.N. Co.	„ 19.5.27 to 1.9.27	5.9.27
Losada, M.V.	Ross, J.	J. T. Denley	„ M.	„ „	„ 29.6.27 to 1.10.27	13.10.27
Macedonia	Potter, H. W., R.D., Commr., R.N.R.	E. Lee	„ M.	P. & O.	„ 28.6.27 to 25.8.27	1.9.27
Macharda	Tyers, W. O.	W. Cowie	„ M.	Brocklebank	„ 4.9 27 to 13.9.27	22.9.27
Maharani	Elliott, G. F.	M. Haslett	„ M.	Asiatic S.N. Co.	Form 911 16.5.27 to 5.6.27	7.7.27
Maihar	Charlton, W. L.	C. Shaw, C. Cadwallader, S. S. Slade.	M L.	Brocklebank	Met. Log. 9.6.27 to 31.8.27	29.9.27
Maimyo	Smith, G. C.	H. M. Drummond	No. A.	„	Form 911 16.7.27 to 8.10.27	11.10.27
Maiwara	Brown, T. M.	...	M.L.	Burns Philp	...	...
58 *Majestic*	Metcalfe, G. R.	W. W. Pearson, L. Thompson	W.T.	White Star	W.T. Reg. 15.9.27 to 29.9.27	3.10.27
Makambo	Brown, T. M.	F. C. Vogelmann, R. W. Holmes, T. MacRae.	M.L.	Burns Philp	Met. Log. 15.3.27 to 15.8.27	11.10.27
Makura	Mawson, J.	D. M. Todd, W. J. Weber, L. P. Bourke, L. Thomas, A. Gell.	„	Canadian-Australasian	„ 26.1.27 to 11.6.27 Form 911 15.7.27 to 1.9.27	1.9.27 15.9.27
Malabar	Hillman, E. J.	R. Morris.	„	Burns, Philp & Co.	Met. Log. 6.1.27 to 9.5.27	11.10.27
Malakuta	Adamson, F. L.	...	No. M.	Brocklebank	Form 911 27.6.27 to 10.9.27	22.9.27
Malancha	Whitham, F.	R. Humble	„ M.	„	„ 14.8.27 to 24.8.27	1.9.27
Malda	Baird, S. K.	D. J. B. Bailing	„ M.	British India	„ 12.4.27 to 8.7.27	12.7.27
Maloja	Manley, G.	A. D. Dennis	„ M.	P. & O.	„ 24.7.27 to 5.10.27	12.10.27
Mamari	Falconer, H.	P. Campbell	„ A.	Shaw, Savill & Albion	„ 19.7.27 to 22.9.27	27.9.27
Manchester Brigade	Stott, C. H.	W. S. Eustance	„ A.	Manchester Liners	„ 13.8.27 to 10.9.27	13.9.27
Manchester Corporation	Makin, T.	H. Swindells	, A.	„ „	„ 2.4.27 to 16.5.27	9.6.27
Manchester Hero	Riley, J. E.	H. Anderton	M.L.	„ „	Met. Log. 16.2.27 to 27.6.27	7.7.27
Manchester Regiment	Foale, J. R.	...	No. A.	„ „	Form 911 20.8.27 to 16.9.27	21.9.27
Manchester Shipper	Raper, E. W.	H. Swindells, C. A. Walker, W. R. Cullen.	M.L.	„ „	Met. Log. 10.12.26 to 16.6.27	20.6.27
Manipur	Cochran, G. N.	R. Penston, C. Perry	No. M.	Brocklebank	Form 911 13.8.27 to 28.8.27	26.9.27
Manora	Hudson, H. T., R.D., Commr., R.N.R.	...	„ M	British India	...	...
Mantua	Randell, G. G.	D. B. Leader, H. Tee	„ M.	P. & O.	Form 911 6.8.27 to 29.9.27	3.10.27
Marella	Mortimer, S.	...	M.L.	Burns Philp	Met. Log. 6.12.26 to 3.5.27	1.9.27
Marengo	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
Maresfield	Jones, T. E.	T. Conolly	No. A.	Woods, Tyler & Brown	...	...
Margha	Milne, R. A., R.D., Commr., R.N.R.	P. Wright, H. E. Evans, R. M. Wyatt, D. G. Woods.	M.L.	British India	Met. Log. 2.7.27 to 1.10.27	13.10.27
Marquesa	Smiles, R. S.	...	No.	Furness Houlder	...	...
Marsina	Rothery, S.	H. C. Tarrington	No. A.	Burns, Philp & Co.	Form 911 15.9.26 to 6.10.26	15.11.26
Masirah	Mallett, R.	A. E. Evans	„ M.	Brocklebank	„ 12.9.26 to 13.10.26	16.11.26
Matakana	Thurston, H. P.	J. Hart, J. Dickson, C. E. Mayer.	M.L.	Shaw, Savill & Albion	Met. Log. 15.4.27 to 1.9.27	5.9.27
Mataram	Voy, W.	V. V. Edmonds	No. A.	Burns, Philp & Co.	Form 911 26.12.26 to 20.1.27	28.2.27
Mataroa	Kershaw, W. A. R.	T. T. Oliver, J. J. Nicoll, G. Lindsay.	M.L.	Shaw, Savill & Albion	Met. Log. 25.3.27 to 10.7.27	12.7.27
Matheran	Ison, W. A.	L. Jeans, H. Simpson, J. Richardson	„	Brocklebank	„ 2.2.27 to 29.4.27	30.5.27
Matiana	Green, F. V.	G. F. Du Santog	No. M.	British India	Form 911 8.8.27 to 31.8.27	3.10.27
Maunganui	Showman, A. C. Davey, A. H.	F. Gibson, V. Knight, H. Kemp.	„ M.	Union S.S. Co. of N.Z	„ 29.4.27 to 22.7.27	5.9.27
32 *Mauretania*	Diggle, E. G., R.D., Capt., R.N.R.	J. A. Quarrie, G. Duguid, C. B. Osborne.	W.T.	Cunard	W.T. Reg. 19.9.27 to 3.10.27	6.10.27
Medic	Jones, W. H.	W. Nicoll	No. A.	White Star	Form 911 10.3.27 to 18.4.27	21.4.27
Megantic	Trant, E. L., R.D., Commr., R.N.R.	...	„ A.	„ „	„ 30.7.27 to 20.8.27	24.8.27
22 *Melita*	Stewart, A.	J. Shearer	W.T.	Canadian Pacific	W.T. Reg. 28.8.27 to 14.9.27	20.9.27
Memnon	Dougall, W. T.	...	No. A.	A. Holt	Form 911 4.9.27 to 17.9.27	22.9.27
21 *Metagama*	Freer, A., Capt., R.N.R.	R. Walker, T. Gillette, G. Mowatt.	W.T.	Canadian Pacific	W.T. Reg. 17.9.27 to 6.10.27	10.10.27
Middlesex	MacRae, A., D.S.C., Lt.-Commr., R.N.R.	C. Roberts	No. M.	Federal	Form 911 21.8.27 to 8.9.27	13.10.27
Minderoo	Richardson, E.	B. J. Bennie, W. J. McPhedran, J. H. Oxton.	„ A.	West Australia Nav. Co.	Met. Log. 2.5.26 to 4.10.26	1.12.26
Minna	Mackenzie, G. G.	A. M. Campbell	„ A.	Scottish Fishery Board.	Form 911 14.8.27 to 14.9.27	19.9.27
23 *Minnedosa*	Griffiths, J. N.	A. Mackie	W.T.	Canadian Pacific	W.T. Reg. 17.9.27 to 6.10.27 Form 911 24.7.27 to 11.8.27	11.10.27 16.8.27
Minnesota	Pollard, W. F., D.S.O., Capt., R.N.R.	A. J. Smith	No. M.	Atlantic Transport	„ 26.6.27 to 13.8.27	17.8.27
Minnetonka	Gates, T. F., C.B.E.	H. E. Macartney	„ M.	„ „	„ 28.8.27 to 17.9.27	20.9.27
Minnewaska	Claret, F. H., C.B.E., Commr., R.N.R.	...	„ M.	„ „	„ 12.9.27 to 1.10.27	5.10.27
Mirror, C.S.	Gibson, L.	A. G. Watts	„ M	Eastern Tel. Co.	„ 8.3.27 to 17.3.27	8.4.27
Mississippi	Wylie, J. T. J.	S. C. Skinner	„ A.	Atlantic Transport	„ 16.5.27 to 26.6.27	8.7.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received
Moldavia	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	W. L. Dobbin	No. M.	P. & O.	Form 911 7.8.27 to 24.8.27	3.10.27
Mongolian Prince	Edwards, W.	V. E. Palmer	„ A.	Prince	„ 19.4.27 to 5.9.27	19.9.27
24 *Montcalm*	Hamilton, G.	H. McFadyen	W.T.	Canadian Pacific	W.T. Reg. 12.9.27 to 29.9.27	4.10.27
25 *Montclare*	Webster, G. S., R.D., Lt.-Commr., R.N.R.	A. Mansey, F. E. Williams, A. Easton, F. E. Bevis.	„	„ „	„ 27.8.27 to 15.9.27	21.9.27
Montferland	Van Noppen, C.D.	...	No. M.	Holland Lloyd	Form 911. 18.8.27 to 9.9.27	3.10.27
27 *Montnairn*	Notley, A. H., R.D., Commr., R.N.R.	N. A. Goater, J. Roche, K. Hutchings.	W.T.	Canadian Pacific	W.T. Reg. 27.8.27 to 15.9.27	20.9.27
Montoro	Donaldson, A.	R. M. Blunt	No. A.	Burns, Philp & Co.	Form 911 18.5.27 to 26.6.27	9.8.27
26 *Montrose*	Landy, E.	A. Watt	W.T.	Canadian Pacific	W.T. Reg. 6.8.27 to 25.8.27	5.9.27
20 *Montroyal*	Sibbons, H.	R. Antrobus	„	„ „	„ 2.9.27 to 15.9.27	20.9.27
Moresby	Edgell, J. A., O.B.E., Capt., R.N.	W. H. Martin	M.L.	His Majesty's Australian Ship.	Met. Log. 4.4.27 to 14.8.27	4.10.27
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.	„	„ 30.6.27 to 5.7.27	21.7.27
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.	H. O. Case	„ M.	P. & O.	„ 11.6.27 to 7.9.27	12.9.27
Naldera	Dayas, C.	W. F. Laughland	M.L.	„	...	...
Nardana	Moth, F. L.	J. N. McMillan, F. G. Sharp	No. M.	British India	Form 911 31.7.27 to 4.9.27	10.10.27
Nellore	Hignett, A. H., R.D., Lt.-Commr., R.N.R.	A. J. Brown	„ M.	P. & O.	„ 8.8.27 to 8.9.27	3.10.27
Nerbudda	Williams, B. N.	J. W. B. Archibald, T. Barnard, J. H Robottom,	„ M.	British India	„ 8.6.27 to 21.7.27	25.7.27
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	Westgarth, W. A., D.S.C.	R. F. Handley, E. Sainty, S. Moore, E. B. Burke.	„	Furness Withy	„ 20.5.27 to 29.9.27	5.10.27
Niagara	Showman, A. C.	T. Haulton, J. M. Hood, D. Rollo, R. N. Turner.	„	Canadian-Australasian	„ 10.2.27 to 19.8.27	10.9.27
Ningchow	Christie, W.	...	No. A.	A. Holt	Form 911 13.10.26 to 30.12.26	10.1.27
Norfolk	Mead, G. F.	J. W. Pring	„ A.	Federal	„ 28.5.27 to 10.7.27	13.7.27
Norna	Wright, J. W.	T. R. Ness	„ A.	Scottish Fishery Board	„ 15.9.27 to 4.10.27	10.10.27
Norseman, C.S.	Barter, H. O., R.D., Commr., R.N.R.	R. W. Greenfield	„ M.	Western Tel. Co.	„ 18.7.27 to 30.8.27	16.9.27
Northumberland	Upton, H. L.	...	M.L.	Federal	...	...
Northwestern Miller	Nuttall, E. L.	...	No. A.	Furness Withy	Form 911 20.11.26 to 23.12.26	29.12.26
Nova Scotia	Furneaux, S.	...	„ A.	„ „	„ 17.8.27 to 12.9.27	16.9.27
Nowshera	Schleicher, J. W.	W. D. L. Reeves	„ M.	British India	„ 10.7.27 to 30.7.27	23.8.27
Nubian	Watmough, T. M.	...	„ A.	Leyland	„ 28.2.27 to 14.3.27	22.3.27
Oaklands Grange	St. Clair, C., D.S.C.	C. F. Foxwell	„ A.	Houlder Bros.	„ 3.9.27 to 1.10.27	3.10.27
57 *Olympic*	Marshall, W., C.B., D.S.O., A.D.C., R.D., Commodore, R.N.R.	A. Fisher, H. J. C. Day, A. E. Weller.	W.T.	White Star	W.T. Reg. 8.9.27 to 22.9.27 Form 911 7.9.27 to 22.9.27	27.9.27 26.9.27
Orama	Shelford, W. S., Lieut. - Commr., R.N.R.	T. Fox Russell, C. K. Blake, H. Tanner.	M.L.	Orient	„ 6.3.27 to 7.6.27	14.6.27
Oranian	Hoskins, W.	W. R. Atkinson	No. A.	Leyland	„ 28.3.27 to 1.6.27	9.6.27
Orbita	Dominy, R. H., C.B.E., Commr., R.N.R.	J. Lloyd Jones	„ M.	R.M.S.P. Co.	„ 10.5.27 to 13.7.27	25.7.27
Orcoma	Pearse, A. W.	T. Naylor, G. Gerety, R. T. Hales.	M.L.	Pacific S.N. Co.	Met.Log. 17.2.27 to 4.5.27	24.8.27
Orduna	Daniel, T.	E. Hicks	No. M.	R.M.S.P. Co.	Form 911 12.7.27 to 18.9.27	26.9.27
Orestes	Flynn, G. A.	F. T. Berry	„ A.	A. Holt	„ 24.9.27 to 4.10.27	13.10.27
Orita	Splatt, W. A.	D. W. Hutchinson, J. L. Jones, A. G. Litherhead, J. W. Milne.	M.L.	Pacific S.N. Co.	Met. Log. 22.12.26 to 30.5.27	10.6.27
Ormonde	Rice, W. V., D.S.O., D.S.C., Commr. R.N.	J. Taylor, H. P. L. Tennent, C. F. Loveless, H. P. Price.	„	His Majesty's Ship	„ 4.3.27 to 1.7.27	3.8.27
Ormonde	James, L. V., D.S.C.	B. W. Gorman	No. M.	Orient	Form 911 22.8.27 to 30.8.27	6.9.27
Oronsay	Owens, A. L., R.D., Commr., R.N.R.	R. K. Rogerson, R. S. Hawker, J. D. Archer.	M.L.	„	Met. Log. 22.5.27 to 30.9.27	6.10.27
Oroya	Ridyard, A.	S. Lewis	No. M.	Pacific S.N. Co.	Form 911 24.5.27 to 1.8.27	10.8.27
Orsova	Cameron, E. P., R.D., Commr., R.N.R.	L. E. Fordham, L. J. Vesty, A. Croft Cohen, H. A. Whittle.	M.L.	Orient	Met. Log. 3.4.27 to 7.7.27	13.7.27
Orvieto	O'Sullevan, F. R.	G. L Carter, T. L. Shurrock, R. C. Warner.	„	„	„ 1.5.27 to 4.8.27	27.8.27
Osterley	Hayes, I. J., R.D., Commr., R.N.R.	S. Burnnand	No. A.	„	Form 911 25.8.26 to 28.9.27	5.10.27
Otaki	McNish, R.	C. R. Brown	„ A.	New Zealand S.S. Co.	„ 24.12.26 to 7.2.27	10.2.27
Otira	Wood, C., D.S.C.	D. N. MacGregor	„ M.	Shaw, Savill & Albion	„ 18.7.27 to 30.9.27	6 10.27
Otranto	Staunton, H. G., C.B.E., R.D., Commr., R.N.R.	...	„ M.	Orient	„ 20.1.27 to 1.4.27	19.4.27
Oxfordshire	Forster, W. L.	M. D. Louttil	„ A.	Bibby Bros.	„ 16.7.27 to 24.9.27	27.9.27
Pacific Shipper, M.V.	Newman, G. W. A.	G. Davis	„ A.	Furness Withy	„ 5.5.27 to 2.6.27	8.7.27
Pacuare	Sapsworth, S. A.	V. R. Watkins	„ A.	Elders & Fyffes	„ 6.8.27 to 10.9.27	19.9 27
Pakeha	W. P. Clifton Mogg	E. T. Baker, R. E. Nicholson, A. J. Tillot.	M.L.	Shaw, Savill & Albion	Met. Log. 21.12.26 to 29.4.27	7.5.27
Pareora	Evans, J. O.	A. J. Ellis	No. A.	Hain S.S. Co.	Form 911 6.7.27 to 2.8.27	15.9.27
Paris	Cook, C. L.	Mr. Biles	C.C.	Southern Rly.	Telegraphic Report. 31.7.27	31.7.27
Patia	Makepeace, S.	J. Kinsley	No. A.	Elders & Fyffes	Form 911 19.6.27 to 23.7.27	3.8.27
Patrician	Pugh, R. H.	H. W. Stanley	„ M.	Harrison	„ 11.6.26 to 28.9.26	23.11.26
Patrol, C.S.	Welsh, T. K.	J. S. Browne	No.	Eastern Extension (A. & C.) Telegraph Co.	Met. Log. 18.10.26 to 15.11.26	9.2.27
Peisander	Slater, H	A. E. Bartlett	No. A.	A. Holt	Form 911 10.7.27 to 7.8.27	9.8.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Peshawur	Wilding, H. G.	J. C. Mellonie. J. K. Crone, R. G. Wood.	M.L.	P. & O.	Met. Log. 27.4.27 to 28.9.27	5.10.27
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	Jackson, T. H.	C. W. Smethurst	No. A.	Booth	Form 911 6.8.27 to 10.9.27	22.9.27
Port Adelaide	Williams, R.	E. N. Rogerson	M.L.	Commonwealth & Dominion.	Met. Log. 13.1.27 to 20.6.27	12.7.27
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.	„	„ „ „	„ 4.3.27 to 31.7.27	10.8.27
„ *Bowen*	Gilling, W.	W. R. Johnston	No. A.	„ „ „	Form 911 8.2.27 to 20.3.27	28.3.27
„ *Caroline*	Hoad, A. C.	...	M.L.	„ „ „	Met. Log. 16.1.27 to 16.6.27	29.6.27
„ *Darwin*	Sawbridge, I. R.	S. Hearn, W. Lynd, E. T. N. Lawrey.	„	„ „ „	„ 28.1.27 to 29.6.27	4.7.27
„ *Denison*	Ferris, J.	P. J. Howe	„	„ „ „	Form 911 25.5.27 to 7.7.27	9.7.27
„ *Dunedin*	Farmar, F.	E. G. Jones, H. M. Post, N. M. Muzzell.	M.L.	„ „ „	Met. Log. 20.5.27 to 25.9.27	28.9.27
„ *Fremantle*	Kearney, F. J.	...	No.	„ „ „	...	...
„ *Gisborne*	Hutchinson, —	...	No. A.	„ „ „	...	...
„ *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. Weldin.	„	„ „ „	„ 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. G. Lewis, G. L. H. Dean, P A. Munday, C. Jolly.	M.L.	„ „ „	Met. Log. 26.2.27 to 24.7.27	11.8.27
„ *Pirie*	Kippins, T.	...	„	„ „ „	„ 26.3.27 to 2.9.27	13.9.27
„ *Sydney*	Higgs, W. G.	H. G. Boys Smith, E. E. Roswell, K. D. Morgan.	„	„ „ „	„ 1.4.27 to 17.8.27	1.9.27
„ *Victor*	Swan, L. H.	L. M. R. Bayly, J. B. Watson, A. Brown.	„	„ „ „	„ 8.12.26 to 8.6.27	13.6.27
„ *Wellington*	Hayter, S. W.	D. F. Morgan	No. A	„ „ „	Form 911 16.7.27 to 20.8.27	26.9.27
President Jackson	Griffith, J.	P. Treanor	„ A.	Pacific Mail S.S. Co.	„ 25.5.27 to 9.6.27	22.7.27
President Jefferson	Nichols, F. R	C. Hansson, C. H. Moen	„ A.	Admiral Oriental Line	„ 6.8.27 to 25.9.27	10.10.27
President Wilson	Nelson, H.	A. M. Quinlan	„ A.	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.	J. Schlee, R. J. Whitley, H. Leftwich, R. Pearson.	M.L.	South African Naval Service.	„ 1.4.27 to 29.7.27	11.10 27
Protesilaus	Nelson, T. B.	...	„	A. Holt	Met. Log. 8.4.27 to 7.9.27	11.10.27
Pyrrhus	Elford, W. J.	R. E. Wilks	No. A.	„	Form 911 19.7.27 to 25.9.27	27.9.27
Ranpura	King, A. M., D.S.C.	H. Morgan	„ M.	P. & O.	„ 3.9.27 to 22.9.27	10.10.27
60 *Regina*	Davies, E.	R. C. Cochrane	W.T.	White Star-Dominion	„ 18.9.27 to 8.10.27	10.10.27
Reindeer	Langdon, C.	...	C.C.	G.W. Railway	Telegraphic Report 1.6.27	1.6.27
Remuera	Cameron, J. J.	D. Hughes, P. L. Shakespear.	No. A.	New Zealand S.S. Co.	Form 911 6.5.27 to 20.8.27	24.8.27
Rhodesian Transport.	Bullock, F. W. H.	H. B. Parkins	„ A.	Houlder Bros.	„ 6.4.27 to 22.5.27	10.6.27
Rimutaka	Hemming, 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	Matthews, E. G.	R. H. Friedlander	No. M.	Asiatic S.N. Co.	Form 911 24.8.27 to 10.9.27	3.10.27
Rotorua	Hunter, J. L. B.	E. Lawrence, R. G. Rees, H. Cockerill.	M.L.	New Zealand S.S. Co.	Met. Log. 9.4.27 to 26.7.27	5.8.27
Royal Fusilier	Dawson, J.	J. Fraser	No. A.	London & Edinburgh S.S. Co.	Form 911 19.5.27 to 7.7.27	11.7.27
Royal Transport	Dove, J.	R. W. Wass	„ A.	Houlder Bros.	„ 7.5.27 to 15.8.27	19.8.27
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.	F. O. Colvin, R. S. Millington, J. Kavanagh.	„	Eastern and Australian.	„ 2.4.27 to 28.6.27	1.9.27
St. Helier	Mulhall, W.	C. Bell	C.C.	G.W. Railway	Telegraphic Report 13.10.27	13.10.27
St. Julien	Langdon, C. H.	C. Joy	„	„ „	„ „ 1.10.27	1.10 27
St. Andrew	Bearpark, E. W.	J. G. Feint	No. A.	Rankin Gilmour	Form 911 2.1.27 to 17.2.27	11.3·27
Salaga	Jones, W.	C. V. Evans	„ A.	Elder Dempster	„ 19.3.27 to 4.6.27	15.6·27
38 *Samaria*	Malin, R. G., Lieut.-Commr., R.N.R.	C. S. Williams, A. B. Fasting, W. B. Tanner.	W.T.	Cunard	„ 4.9.27 to 24.9.27 W.T. Reg. 4.9.27 to 24.9.27	27.9·27 27.9·27
Samarinda	Flack, Z. W.	R. F. Rikhert	No. M.	Rotterdam Lloyd	Form 911 8.5.27 to 3.6.27	9.6·27
Saxon	Gardner, G. F., O.B.E.	G. H. Pickering, R. Rogers	„ A.	Union Castle	„ 16.7.27 to 4.9.27	7.9·27
Scholar	Egerton, J. J.	J. McLellan	„ M.	Harrison	„ 25.5.27 to 8.8.27	10.8·27
Scotia	Prichard, S. D., M.B.E.	O. W. L. Jones	C.C.	L.M. & S. Railway	Telegraphic Report 13.10.27	13.10·27
Scottish Bard	McDonnell, S.	J. W. Lilley	No. A.	Tankers Ltd.	Form 911 22.11.26 to 3.12.26	3.1·27
33 *Scythia*	Prothero, W.	G. Overton, G. H. Morris, P. G. Britten.	W.T.	Cunard	W.T. Reg. 27.8.27 to 16.9.27 Form 911 26.1.27 to 19.2.27	21.9·27 3.3 27
Sheaf Mount	Groves, C. V.	W. Thomson	No. A.	W. A. Souter	„ 5.6.27 to 14.7.27	20.7·27
Sheaf Spear	Whitfield, G. A., O.B.E.	S. J. Dring, T. B. Fishley	M.L.	„	Met. Log. 4.2.27 to 25.7.27	17.9·27
Shropshire, M.V.	Adamson, B. W.	W. L. Whiteside, R. V. Brown, W. H. Brittain, J. E. Goldsworthy.	„	Bibby	„ 4.6.27 to 14.8.27	17.8.27
Socrates	Taylor, F. C.	W. E. Jordan	No. A.	Lamport & Holt	Form 911 2.7.27 to 14.9.27	26.9.27
Somerset	Howell Price, J.	W. Redwood	„ A.	Federal	„ 25.7.27 to 3.9.27	13.10.27
Spero	Montgomery, H.	D. Millward	M.L.	Ellerman Wilson	Met. Log. 24.12.26 to 3.7.27	8.7.27
Stockwell	Thowless, E.	R. A. Kneen	No. A.	Brocklebank	Form 911 8.8.27 to 7.10.27	14.10.27
Surrey	Lamb, C. B.	S. C. Bradley	„ A.	Federal	„ 28.3.27 to 15.8.27	19.8.27
Suwa Maru	Gotoh, M.	...	„ A.	Nippon Yusen Kaisha	„ 26.6.27 to 25.7.27	4.8.27
Sylvafield	Biddick, E.	E. Holmes	„ A.	Hunting & Son	„ 17.8.27 to 26.8.27	30.8.27
Tainui	Elford, H. C.	P. S. Horwood	„ A.	Shaw, Savill & Albion	„ 30.7.27 to 4.9.27	13.10.27
Tahiti	Aldwell, B M.	G. M. Coote	„ A.	Union S.S. Co. of N.Z.	„ 10.8.27 to 29.9.27	13.10.27
Taiping	Frame, A. M. Thomas, R.	F. Stratford, S. Moore, A. C. Kennedy.	M.L.	Yuill & Co.	Met. Log. 15.1.27 to 8.6.27	15.9.27
Talthybius	Hatfield, J.	G. D. Jones	No. A.	A. Holt	Form 911 4.9.27 to 27.9.27	13.10.27
Tamaroa	Hartman, W. H.	F. W. Lutyens	„ M.	Shaw, Savill & Albion	„ 27.8.27 to 2.10.27	6.10.27
Tanda	Pilcher, E. T., Lieut.-Commr., R.N.R.	C. Stratford, H. E. Nuzum, J. Heddle, W. McIntyre.	„ M.	E. & A. S.S. Co.	„ 8.1.27 to 31.5.27	2.8.27
Teiresias	Wilkinson, W. H.	...	„ A.	A. Holt & Co.	„ 9.4.27 to 7.8.27	12.8.27
Tekoa	Barnett. H.	...	„ M.	New Zealand S.S. Co.	„ 16.8.27 to 21.9.27	26.9.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.10.27.	Date Received.
Telamon	Willcox, J. H.... ...	... ...	No. A.	A. Holt	Form 911 4.8.27 to 16.8.27	19.9.27
Tetela	Bostock, R. J.... ...	... ...	„ A.	Elders & Fyffes ...	... ...	...
Teucer	Hodgson, R. N. ...	R. N. Inkster	„ A.	A. Holt	„ 17.7.27 to 20.8.27	22.9.27
Themistocles ...	Jermyn, W. M. ...	H. C. Howe	„ M.	Aberdeen	„ 5.5.27 to 18.6.27	30.6.27
Theseus	Jones, E.	... ...	„ A.	A. Holt	„ 27.8.27 to 6.9.27	16.9.27
Titan	Power, J.	D. MacTavish, G. W. Best, C. F. Bailey.	M.L.	„	Met. Log. 4.4.27 to 10.8.27	5.9.27
Tongariro	Williams, J. M. ...	E. A. Quick	„	New Zealand S.S. Co.	Form 911 7.6.27 to 12.7.27	21.7.27
Transylvania ...	Bone, D. W.	P. Middleton	No. A	Anchor	„ 4.9.27 to 24.9.27	3.10.27
Traveller	Worthington, B. ...	E. L. Stockley	„ M.	T. & J. Harrison ...	„ 3.5.27 to 21.6.27	5.7 27
Trematon	Evans, B.	J. Jenkyn, C. Warren, E. Griffin.	M.L.	Hain S.S. Co.	Met. Log. 20.5.27 to 6.9.27	14.9.27
Turakina	Hamilton, E. S. ...	A. N. Marshall	No. M.	New Zealand S.S. Co.	Form 911 21.3.27 to 12.7.27	3.8.27
11 *Tuscania*	Smart, R. W.	... ...	W.T.	Anchor	„ 20.8.27 to 16.9.27	22.9.27
Tyndareus	Williams, R. J. ...	A. G. Phillips, F. Howe, A. R. McDavid.	M.L.	A. Holt	Met. Log. 16.12.26 to 18.5.27... ...	2.7.27
Ulimaroa	Wylie, W. J.	C. Rasmussen	No. M.	Huddart Parker, Ltd.	Form 911 22.7.27 to 22.8.27	5.10.27
Ulysses	Owen, R. D., O.B.E....	A. Studholme	„ A.	A. Holt	„ 2.3.27 to 10.7.27	13.7.27
Umvolosi	Barnes, E. W.... ...	... ...	„ A.	Bullard King	„ 20.8.27 to 8.9.27	3.10.27
Valacia	Inch, F....	G. Meggitt	„ M.	Cunard	„ 28.7.27 to 26.8.27	1.9.27
Vardulia	Robinson, F. W. ...	... ...	„ A.	„	„ 31.5.27 to 12.6.27	11.7.27
Verbania	Pooley, T. S. M. ...	A. F. Watts	„ A.	„	„ 8.2.27 to 26.3.27	19.4.27
Vigilant	Simpson, E. S. S. ...	J. Hunter	„ A.	Scottish Fishery Board.	„ 8.9.27 to 30.9.27	5.10.27
Waiotapu	Todd, D.	... ...	„ M.	Canadian - Australasian.	„ 13.7.27 to 19.8.27	12.9.27
Wairuna	Ryan, J.	C. C. Waters, G. H. George, L. B. Ehlert.	M.L.	Union S.S. Co. of N.Z.	Met. Log. 1.10.26 to 23.4.27	1.9.27
Walmer Castle ...	Owen, S. H.	A. E. Denn	No. A.	Union Castle	Form 911 27.5.27 to 17.7.27	19.7.27
Wangaratta ...	Scutt, W.	T. W. Wordingham, S. R. Millard, A. G. Brooks, J. K. Rigden.	M.L.	British India	Met. Log. 3.4.27 to 27.8.27	3.9.27
Warfield	Steel, R.	C. M. Quick	No. A.	„ „	Form 911 9.9.27 to 23.9.27	3.10.27
War Nizam ...	Moncrieff, T.	... ...	„ A.	British Tankers ...	„ 3.7.27 to 14.8.27	1.9.27
Welshman	Rollerson, W.... ...	J. Mendus	„ M.	White Star-Dominion	„ 22.10.26 to 14.11.26 ...	26.11.26
Westmoreland ...	Gardner, H. W. ...	... ...	M.L.	Federal...	... ...	...
Windsor Castle ...	Strong, H., R.D., Commr., R.N.R.	F. Wilbraham, C. L. Lovegrove, S. E. Aldham, L. A. J. Keeble.	„	Union Castle	Met. Log. 1.10.26 to 29.5.27	13.6.27
Winifredian ...	Harrocks, W.... ...	... ...	No. M.	Leyland	Form 911 6.8.27 to 5.9.27	12.9.27
Wonganella ...	Suffern, H.	G. F. Phillips	„	W. Crossby & Sons ...	„ 28.7.27 to 3.9.27	13.10.27
Woodarra	Reilley, J. V.	L. D. Graham, H. Goater, B. W. Smith.	M.L.	British India... ...	Met. Log. 23.10.26 to 18.4.27... ...	1.5.27
Yorkshire	Millson, G. E.... ...	W. M. C. Higginson, R. Allen	No. A.	Bibby	Form 911 23.4.27 to 4.7.27	9.7.27
Conway H.M S. ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets	Cadets' M.L.	... ...	Cadets' Met. Log. 8.5.27 to 23.7.27...	27.7.27
Pangbourne Nautical College	Tracy, A. F. G., Commr., R.N.	„ „	„	... ...	Cadets' Met. Log. 1.5.27 to 22.7.27...	27.7.27
Worcester, H.M.S.	Sayer, M.B., C.B.E., R.D., Capt., R.N.R.	„ „	„	... ...	Cadets' Met. Log. 6.5.27 to 27.7.27...	30.7.27
Abaco	... ...	The Keepers	Lighthouse Register.	... ...	Lighthouse Register 1.7.26 to 20.10.26	20.4.27
Cay Lobos	... ...	„	„	... ...	Lighthouse Register 1.1.27 to 11.7.27	29.9.27
Double Headed Shot	... ...	„	„	... ...	Lighthouse Register 1.7.26 to 31.12.26	20.4.27
Inagua	... ...	„	„	... ...	Lighthouse Register 24.1.27 to 3.7.27	29.9.27
Sombrero	... ...	„	„	... ...	Lighthouse Register 1.1.27 to 30.6.27	10.8.27
Watling Island ...	... ...	„	„	... ...	Lighthouse Register 10.9.26 to 30.6.27	29.9.27
Cape Pembroke ... (Falkland Is.).	... ...	„	„	... ...	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 30.9.27.	Date Received.
Casanare	Steidelman, H.	R. O. Jones	Elders & Fyffes	Water Samples	15.9.27
Darro	Matthews, G. P.	W. Halder-Campe	R.M.S.P. Co.	„ „	27.7.27
Deseado	Purvis, J.	J. N. Duncan	„	„ „	3.6.27
Hildebrand...	Maddrell, J.	A. Allan	Booth	„ „	29.8.27
Tetela	Bostock, R. J.	J. S. Bell	Elders & Fyffes	„ „	...

December, M.O., 1927.