

VOL. IV. No. 47.

THE MARINE OBSERVER.

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GENERAL INFORMATION OF TROPICAL REVOLVING STORMS.

In launching THE MARINE OBSERVER in the January, 1924, Number we laid down as one of its functions the provision of information useful to navigation concerning winds, weather, climate, currents, derelicts, and ice.

Towards this, articles giving general information of Hurricanes, Tropical Cyclones, and Typhoons have been published in our pages compiled by Commander J. HENNESSY, R.N.R., and Mr. H. KEETON mainly from the original works of Cyclonologists* the world over, which are mainly too lengthy and detailed for the convenience of seamen.

The preparation of these articles:—

“South Pacific Hurricanes,” page 143, Volume I,

“Typhoons of the North Pacific and China Seas,” page 124, Volume II,

* The term used by Commander M.F. MAURY, U.S.N., for those Meteorologists specially engaged in the study of Cyclones.

“Cyclones of the Bay of Bengal,” page 115, Volume III,

“Tropical Cyclones of the Eastern North Pacific,” page 160, Volume III,

“Hurricanes of the West Indies and North Atlantic,” page 174, Volume IV,

and in this Number “Cyclones of the South Indian Ocean, and Cyclones of the Arabian Sea,” page 216, Volume IV, being essential general information for navigation regarding Tropical Revolving storms in all parts of the world in a concise form suitable to seamen from the enormous volume of meteorological literature has been an arduous task and they deserve full credit for it.

In these articles carefully sifted and concise information is given of the intensity and extent, season and frequency of occurrence, region of origin and tracks, rate of progression, precursory signs and behaviour of these great whirlwinds.

Thus an endeavour has been made to remove the long expressed want of seamen for complete but terse information of Tropical Revolving Storms at sea.

These articles do not generally deal with the practical application of the "Laws of Storms"; that is attempted in the chapters headed "Wireless and Weather an Aid to Navigation," nor do they generally provide information of particular storms, this is given year by year usually twelve months after occurrence.

With the general information now at the disposal of seamen in the first four volumes of this Journal together with the Charts showing the tracks of Tropical Revolving storms published in the first three volumes, it is hoped that with the aid of Wireless Communication, Cyclone Navigation may be improved. With this improvement, interest being stimulated in observation, we may be able to add something to the great fund of knowledge of Tropical Revolving storms which has been so clearly summarized in the articles referred to.

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.

CURRENTS ON THE WEST INDIES AND PANAMA ROUTES.

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

Captain E. Daniels, S.S. "Athenic."

"In passages to and from Colon during the last two years, little or no current has been experienced before reaching the Azores, when the set has been South-Westerly to Longitude 63° W., and then North-Westerly to Mona Passage.

"In the Caribbean Sea the current has always set to the west with a counter-current about 100 miles off Manzanilla, except in November, 1926, and last month (February) when the westerly set was continuous."

Captain J. J. Cameron, S.S. "Remuera."

"During recent years our route has comprised two great circles, i.e., from Start Point to San Miguel (Azores) and thence to the Sombbrero Passage, or alternatively, to the Mona Passage.

"Our homeward route has been from Panama to Curacao, D.W.I., thence to Sombbrero Passage and from there a great circle to the English Channel.

"On these routes we have not felt the influence of the Gulf Stream, being to the southward of its conventional limits, and no other current of appreciable strength has been felt outside the Caribbean Sea. For the purposes of navigation I regard our routes across the open Atlantic as being without current.

"In the Caribbean Sea we find the current flowing to the west at from 10 to 15 miles per day throughout the year, except when traversing between Colon and a point about 100 miles E.N.E. of it, where we have usually experienced a counter-current flowing in an E.N.E. direction, sometimes as much as 1½ knots, at other times less marked, and always strongest near Colon."

REVERSE SET IN GULF STREAM.

THE following is an extract from the Meteorological Report of S.S. *Clan Macwhirter*, Captain J. WATERHOUSE, Norfolk Va., to Dunkirk:—

Current Observations.

Year 1926. Month.	From.		To.		Position.				Set. Direction true.	Drift. Nautical Miles.	Wind.	
	Day.	Time.	Day.	Time.	From.		To.				Direc- tion.	Force.
					Lat.	Long.	Lat.	Long.				
Nov.	27	Noon	28	Noon	37°45' N.	71°50' W.	38°28' N.	67°20' W.	N55° E.	12	NNW-N	8-7
"	28	"	29	"	38°28' N.	67°20' W.	39°11' N.	63°38' W.	W.	36	NNW-S	6-2
"	29	"	30	"	39°11' N.	63°38' W.	40°29' N.	59°05' W.	S83° E.	8	SSW	2
"	30	"	1	"	40°29' N.	59°05' W.	40°32' N.	53°45' W.	N87° E.	70	ESE	3

"I note from MARINE OBSERVER Volume II, No. 16, that S.S. *Manchester Mariner* reported Gulf Stream setting N. 72° W. 9½ miles when 80 miles south of north charted limits of Gulf Stream. In this case we had 36 miles due west; steamer's position was verified by three simultaneous observations of Sun and Moon. We had steamed from a position 80 miles south of northern limit of charted position of Stream to a position 100 miles from north and south limits of Stream as charted in Chart 2060 B (midway between limits). This adverse current was followed by a slight easterly set next day and the day following by a strong easterly set, which drifted ship 3 miles per hour against a very high head swell in which steamer plunged heavily.

"The S.S. *Magellan*, Captain HARVEY, passed 8 miles south of our noon position on 28th November, also bound for the Channel, steaming about 1½ knots in excess of our speed. I communicated with him by W/T on the 29th November, giving position, temperature, air and sea and current. He reported for 28th to 29th November, current experienced, S. 85° W. 37, as compared with our log, west 36. His position at noon was Latitude 39° 12' N., Longitude 63° 04' W. Comparisons by W/T on 30th November at noon, *Magellan* position, Latitude 40° 23' N., Longitude 57° 04' W., run 285 miles, temperature, sea 73°, air 62°, current N. 60° E. 36 miles. Being east he had got the easterly set before me. After my experience of the Stream being so far north-westerly approaching Hatteras, I hauled more northerly between 29th and 30th November and was in a higher latitude in comparison with *Magellan's* latitude, for our longitude, with a current S. 83° E. 8 miles. I decided to keep an east course allowing for an E.N.E. set, and at noon, on the 1st December, we had made N. 88° E. 70 miles from favourable current to a position Latitude 40° 32' N., Longitude 53° 45' W. *Magellan* had steered a more northerly course to a position Latitude 41° 09' N., Longitude 51° 39' W. on 1st December. Run 250 miles, current S. 71° E 12 miles. Barometer 30.06, air 68, sea 67°, wind east force 4, rough sea.

"We continued east, and to position at 5.18 p.m., on 1st December by stellar observations, were making 2½ knots favourable to eastward ahead of our D.R.; between 5.18 p.m. and a.m. stellar observations we lost favourable current and experienced N. 58° W. 11½ miles. Ship was then put on Great Circle Course for Bishop Rock keeping away before strong southerly wind, rising sea, falling barometer, all ready to keep away more easterly when wind shifted to Northwestward."

SUBMARINE EARTHQUAKE SHOCKS.

Off West Coast Central America.

THE following report has been received from S.S. *Magician*, Captain P. O. NICHOLAS:—

"5th November, 1926, at 2.18 ship's time (0758 G.M.T.), when in Latitude 10° 25' N., Longitude 88° 10' W., a very severe submarine disturbance was experienced. Two distinct shocks, lasting about 10 or 15 seconds, with an interval of about 1½ minutes, were felt.

"The vessel shook violently, a rumbling, grating sensation was experienced. Masts, funnel and superstructure vibrated and rattled alarmingly, giving the impression that the ship was running aground on to hard bottom and buckling fore and aft. She was steaming 11 knots, the weather clear and fine with a light easterly wind blowing, although seven hours before, very heavy rain, accompanied by vivid lightning and heavy thunder had occurred.

"The chart shows 1,800 to 1,900 fathoms water in the vicinity.

"The American steamship *Eagle*, then some 15 miles N.W. of our position, was later communicated with by wireless and her master replied that the shocks had been felt on board his vessel with such severity that the engines were stopped in the belief that the ship was running over something."

PHOSPHORESCENT BEAMS.

Gulf of Siam.

THE following report has been received from S.S. *Chak Sang*, Captain G. E. VAUGHAN, Observer, Mr. L. J. STEVENSON, 2nd Officer:—

"November 1st, 1926, 2.05 to 2.09 a.m. (A.T.S.) in Latitude 10° 16' N., Longitude 102° 21' E. (approximate), barometer 29.84 in. Temperature 80°, sea smooth, wind N.E. force 2, sky 3/10ths clouded, St-Nb, clear overhead. Beams of light, similar to searchlight rays about five feet wide and twelve to sixteen feet apart, passing through the water from north to south in long straight lines.

"They passed the ship at about 85 a minute. Ship making N. 37° W.(T) 323° course at eleven knots.

"At the same time, small circular patches of phosphorescence, resembling clusters of bright stars, two or three feet in diameter, made each beam extremely vivid, lighting up ship and decks like bright moonlight, but these small clusters of phosphorescence were only visible as each beam of light passed through them, not in the water between.

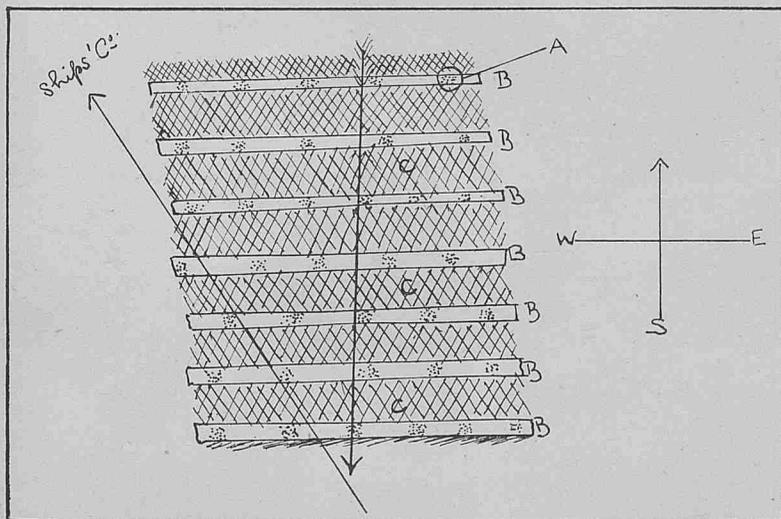
"Each small cluster of phosphorescence was about 12 feet apart, and remained stationary in water as beams of light passed through them. Area affected about two square miles, duration about 3½ minutes.

"No phosphorescence in the water was seen previous to this, or afterwards.

"The bow wave was only phosphorescent as each beam of light passed through it but not between beams.

"This area was not visible till we were almost into it.

"Soundings by Chart, 36 fathoms, mud.



"Passing through water from North to South.

- A = Small clusters of phosphorescent lights in lines.
- B = Beams of light travelling at fair speed through the water.
- C = Water between beams quite dark and lifeless.

(A = Small clusters of light stationary in water whilst beams pass through them.)"

PHOSPHORESCENCE.

North Indian Ocean.

THE following is an extract from the Meteorological Log of S.S. *Orsova*, Commander E. P. CAMERON, R.D., R.N.R., Colombo to Suez, Observer, Mr. J. F. CASTLE BARTLEY, 5th Officer:—

"5th November, 1926, midnight to 0400 a.m. A.T.S., Latitude 7° 30' N., Longitude 76° 50' E., D.R., course 280°, speed 16 knots. The sea appeared to be exceptionally phosphorescent, forming fairly large patches of light. Commencing with a small dot, then quickly spreading outwards until there was a disc of light about 30 to 40 feet across then fading again. These patches appeared to be about 75 to 100 yards apart. It was raining throughout the watch."

STORM IN THE RED SEA.

THE following is an extract from the Meteorological Log of S.S. *Clan Mackinnon*, Captain A. B. MCCOMISH, Aden to Suez, Observer Mr. W. F. ISAAC:—

"2nd November, 1926, Latitude 20° 40' N., Longitude 38° 21' E., experienced remarkable weather shortly after noon. Wind had been S.E., force 3, and sky gradually clouding over from sunrise. Barometer steady. About 10 a.m. very slight swell from S.Eastward. At about 11 a.m. lightning with thunder and distant rain to eastward and southward. Sky heavily cloudy with Nb., in that quarter. At 11.50 a.m. began to rain. Wind backed E., force 3. Rain approaching from southward. Noon, wind backed E.N.E. sharply and freshened. Rain became torrential reducing visibility to 0, fierce lightning with thunder right overhead. Reduced speed. 0.10 p.m., wind veered sharply to S.E. and freshened to force 10. Temperature fell rapidly (18° in 12 mins.). Barometer showing tendency to rise. Forecastle head awning ripped. At 0.25 p.m. rain and wind eased and visibility increased to 7. Sky clearing from southward and westward. Storm passing to N.W. and N.E., wind backed E.N.E., force 5 and came in hot gusts. 1.00, rain ended. Wind veered E., force 3 and continued veering easily to S.E. where it freshened to 4.

Time.	Barometer.	Wind.	Force.	Dry.	Wet.
8 a.m.	1011.7	S.E.	2	87°	79°
Noon.	1011.1	E.N.E.-S.E.	4-10	88°	76°
0.30 p.m.	1012.5	E.N.E.	5	70°	70°·5
1.00 p.m.	1011.4	East	3	72°	70°·5
1.30 p.m.	1010.6	S.E.	3	74°	71°·5
2.00 p.m.	1009.9	S.E.	4	81°	75°·5
4.00 p.m.	1010.0	S.E.	4	83°	77°

"Wireless operator reports very heavy atmospheric all morning. During remainder of day conditions were disturbed and during middle watch a fierce electrical storm took place. Lightning continuous."

NOTE.—The squall accompanied by thunder and lightning experienced by S.S. *Clan Mackinnon* is of similar character to the squalls reported by the P. & O. S.S. *Dongola*, S.S. *Benalder* and other ships between November 18th and 25th, 1921. These squalls were described in an article which appeared on the back of the "Monthly Meteorological Chart of the East Indian Seas" for March, 1923. These reports mainly referred to positions between Latitudes 19° and 22° N. It was then shown that the average percentage frequency of Cumulus cloud in the Red Sea for the years 1880-1888 was greatest at about Latitude 20° N., with a corresponding tendency to convection and the formation of thunderstorms. The report of S.S. *Clan Mackinnon* is an interesting confirmation of the fact that squalls and thunderstorms occur in the central latitudes of the Red Sea during November.

A CALM STREAK IN THE WIND.

Great Australian Bight.

THE following is an extract from the Meteorological Log of S.S. *Orvieto*, Captain C. G. MATHESON, D.S.O., R.D., R.N.R., Adelaide to Fremantle, Observer Mr. J. L. SKILLING, 5th Officer:—

“ November 6th, 1926, 3.26 p.m. in Latitude $35^{\circ} 23'$ S., Longitude $125^{\circ} 41'$ E. Wind N.E., force 6, Cu and St.-Cu, o.q. Sea N.E. disturbance 5-6 with slight swell. Barometer 1007.1 mb. Dry bulb 66° , wet bulb 61° , sea temperature 59° , passed across a belt of calm, glassy sea about a quarter of a mile wide, stretching W.N.W.-E.S.E. and again assumed all previous conditions. At about 3.23 the wind began to fall in velocity and in the belt there was positively no wind, yet immediately the belt had been crossed, it struck with its previous velocity.

“ At 5 p.m. the wind backed to S. by E.4. Barometer rising, temperature falling, confused sea.”

METEOR.

Off South Africa.

THE following is an extract from the Meteorological Report of S.S. *Dundrum Castle*, Captain H. E. WELLER, Philadelphia to Cape Town, Observer Mr. J. F. OAKLEY, 2nd Officer:—

“ On November 15th, 1926, at 1.50 a.m., G.M.T., Latitude $31^{\circ} 13'$ S., Longitude $14^{\circ} 46'$ E., observed strange meteor consisting of two parts, one immediately behind the other, about 20° above the horizon moving parallel to it in a south-easterly direction, the apparent speed being quite slow. It was visible over an arc of the horizon of 45° and gave the appearance of an aeroplane in flight.”

REFRACTION.

Approaching Calcutta.

THE following is an extract from the Meteorological Report of S.S. *Lahore*, Captain E. N. DAWSON, Bombay to Calcutta, Observer Mr. W. G. STEVENSON:—

“ November 17th, 1926. On making *Pilot Ridge Light Vessel* (Latitude $20^{\circ} 52'$ N., Longitude $87^{\circ} 53'$ E.) a phenomenal refraction was experienced, the light having an altitude of from 5° to 10° when observed and could be seen gradually sinking to the horizon as approached. The distance off the light was 8 miles, the whole occurrence occupying but 20 minutes. A slight bank of haze was apparent in the direction of the Light Vessel but completely disappeared when the light assumed its normal position. The Hoogly River Pilot on being told of our experience stated the *Pilot Ridge Light Vessel* was the only light in which this occurred and similar experiences with regard to this light had been met with by other ships.”

WATERSPOUT.

North Atlantic.

THE following is an extract from the Meteorological Report of S.S. *Regina*, Captain R. G. SMITH, Liverpool to Montreal, Observer Mr. R. H. SHAW, 4th Officer:—

“ November 16th, 11.33 a.m. A.T.S., in Latitude $56^{\circ} 50'$ N., Longitude $28^{\circ} 18'$ W. Weather conditions—wind W. by S., force 5, barometer 1003, falling. Frequent rain and hail squalls. Air temperature 38° , sea temperature 45° .

“ Following a heavy hail squall (wind force 6) of four minutes duration, a disturbance on the sea surface was observed half a mile distant from the ship, about a mile in rear of squall. This disturbance which had an anti-clockwise movement, seemed to draw the water up like a small fountain, which increased as it drew nearer



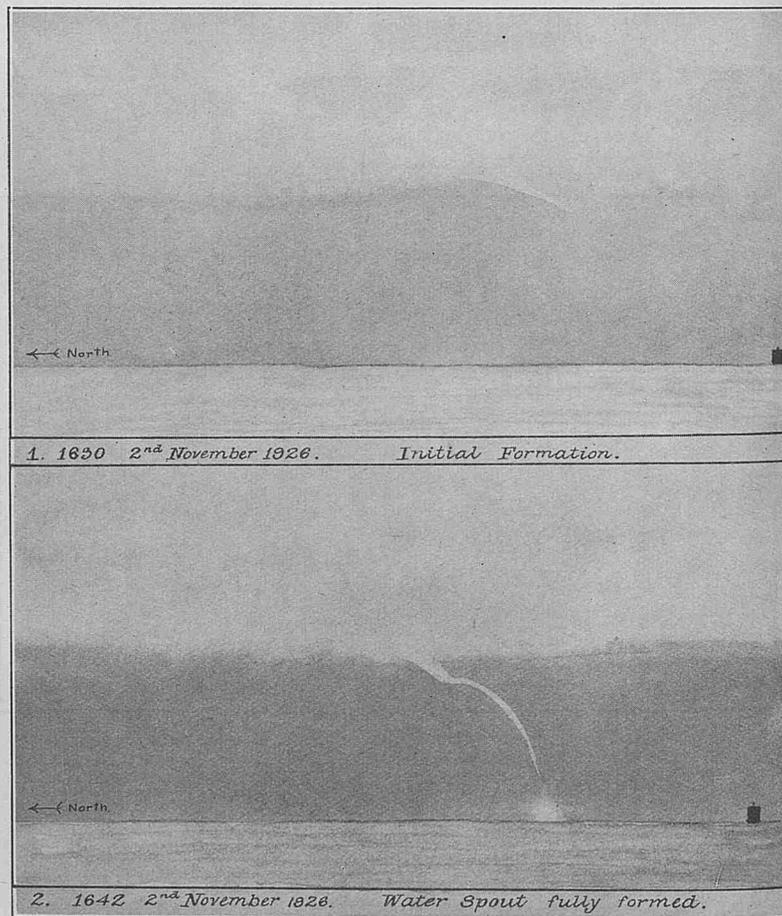
the squall. When apparently under the heavy Cu-Nb cloud, an elongated portion of the cloud (as per sketch) was observed to move about two-thirds of the way towards the sea disturbance, keeping this formation for a period of five minutes, then gradually receding to its original state. During this time, hail (apparently) was falling in the vicinity of the disturbance.”

English Channel.

THE following is an extract from the Meteorological Log of H.M.S. *Flinders*, Lieutenant-Commander E. F. B. LAW, R.N., surveying Home Waters, Observer, Lieut. D. W. DEANE, R.N.:—

“ At about 16.30, 2nd November, 1926, a waterspout was observed from H.M.S. *Flinders* at a distance of about five miles and passing in a northerly direction between the Nab Tower and Chichester Harbour.

“ The waterspout was very clearly defined against a dark background of thick Nimbus clouds, and surmounted by a lighter coloured mass from the base of which the formation commenced.

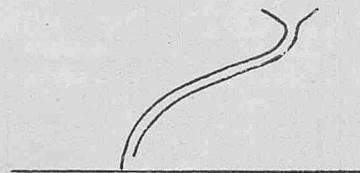


"The upper part appeared to be moving rapidly as the initial formation assumed an oblique shape almost at once. It continued to a form as shown in SKETCH 2, and dissolution commenced about fifteen minutes after the formation began. It parted at about two-thirds of its height from the base, and the phenomena had disappeared within twenty minutes.

"The sea surface appeared to become agitated about two minutes after the initial formation as shown in SKETCH 1 and continued so until about two minutes after the complete disappearance of the waterspout.

"Barometer 1004 mbs. Wind south, force 2. Weather cloudy, visibility moderate."

approximately 50 feet in diameter and the column was thin and greatly curved but gradually straightened out until it was perpendicular. The spray at the base was thrown about 100 feet in the air.



It lasted 9 minutes and after disappearing the sky cleared entirely. At 1.35 p.m. on the same day, vessel passing Ischia on the way to Naples, a second waterspout was observed. Wind south, force 4, sky heavily overcast with Nimbus clouds, barometer 29.68, temperature of the air, dry bulb 70°, wet bulb 68°, sea 71°.

"No connection or contact was first seen although it passed only three-quarters of a mile away. The sea was whirled about 50 feet high within a diameter of 40 to 50 feet. The water broke out and fell like a fountain but later a very thin tail formed downwards from the clouds until the connection was made and the spray rushed up in spiral form in a very thin coiled column.

"The spout moved from south to north and became more and more drawn out. It skirted the Island, passing quite close to the land, and gradually died away. Torrential rain followed."

WATERSPOUTS.

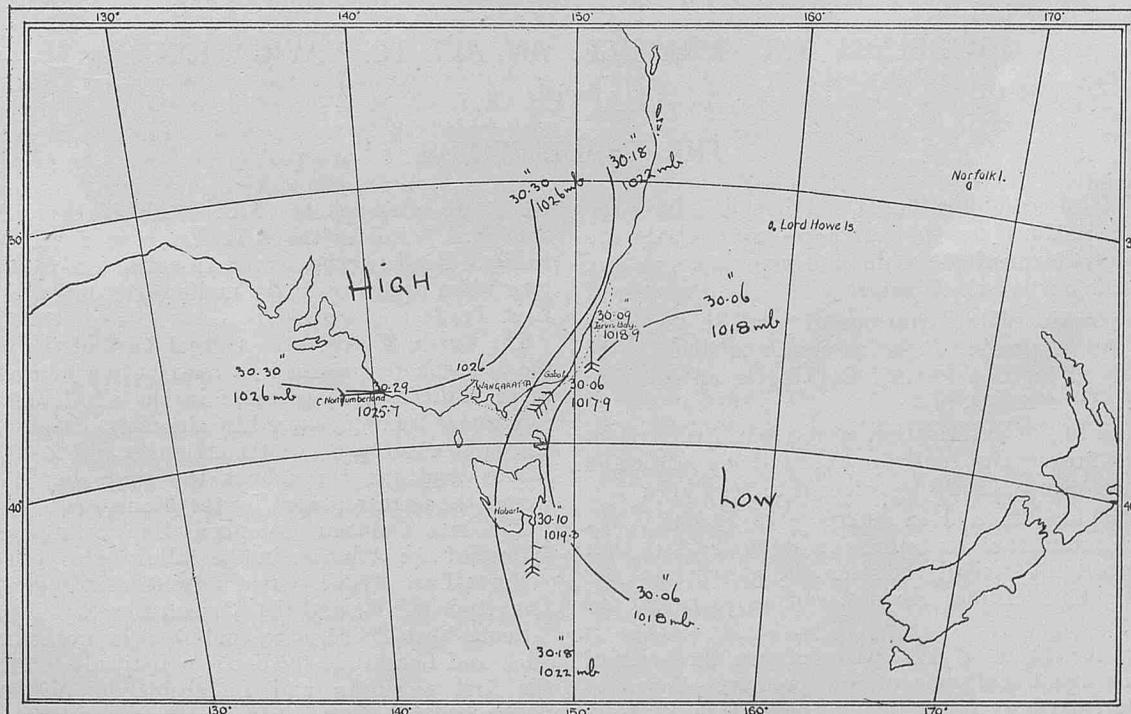
Mediterranean Sea.

THE following is an extract from the Meteorological Report of S.S. *Osterley*, Commander I. J. HAYES, R.D., R.N.R., London to Australia via Suez, Observer, Mr. S. BURNNAND, 4th Officer:—

"7th November, 1926, in Latitude 41° 17' N., Longitude 12° 47' E., observed a waterspout 2 miles distant on the port bow. The sky was heavily clouded at the time, Cu-Nb moving from S.E.-N.W., wind S.E., force 3, sea slight, temperature of sea 66°. The base was

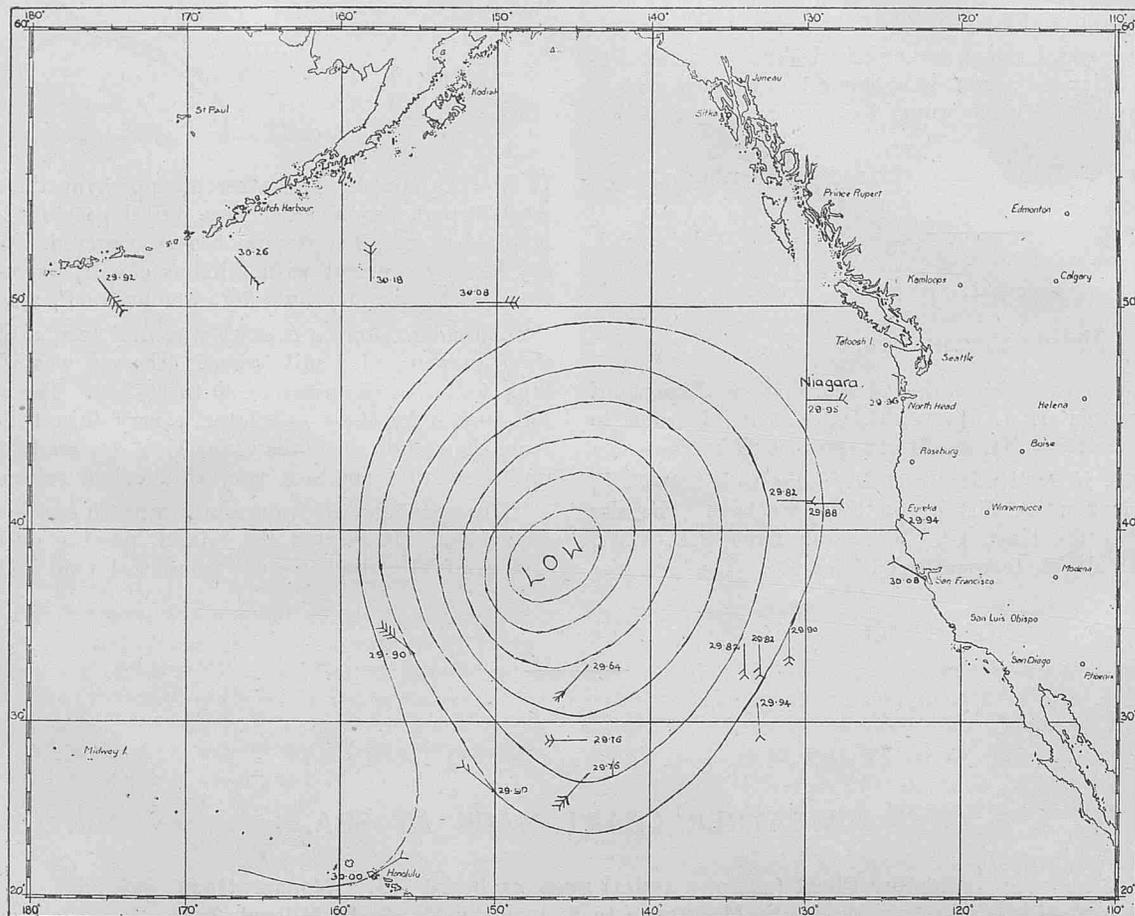
WEATHER CHART MADE AT SEA.

Weather Chart (one of a series) made on board S.S. "Wangaratta," Captain W. Scutt, Melbourne to Sydney, by Mr. S. R. Millard, 2nd Officer. Saturday, 6th November, 1926, 9 a.m. Victorian Standard Time (2200 G.M.T.).



"Forecast for Wangaratta (Melbourne to Sydney): Light South to S.W. winds with tendency to veer later and increase to moderate. Barometer will remain almost steady—fine passage to be expected."

Weather Chart, Eastern North Pacific, for the morning of November 19th, 1926, accompanying the Meteorological Log of S.S. "Niagara," Captain A. C. Showman, from Victoria, Vancouver, to Honolulu.



WIRELESS AND WEATHER, AN AID TO NAVIGATION.

CHAPTER X.

THE TRADE WINDS.

Of all the climates of the Oceans, the Trade Wind regions have the most stable weather conditions; so that averages or normals are more likely to represent the weather a ship will experience in any season than in any other part of the Oceans.

There are, however, considerable variations of wind in the same season, and, if these can be predicted, the navigator is likely to be the gainer, particularly if his is a steamer working to an exacting time-table to fulfil a mail contract.

In this Chapter, much of our information is derived directly from charts of normals and frequencies, and for the methods advocated it is desirable that these charts should be referred to regularly.

Looking back to Chapter VI. and in reference to Charts XXV. and XXVI., it will be found that we laid stress upon the fact that the high pressure zones lying roughly between the parallels of 20° and 40° North and South Latitudes are not continuous round the globe.

Generally speaking, the Trade Winds exist between the belts of high pressure and the equatorial zone of low pressure; they also occupy the gaps of less pressure occurring in these High Pressure belts.

The Trade Winds proper being to the eastward and southward and eastward and northward, according to hemisphere, of the centres of the anti-cyclones, continue round the south-west and north-west sides of the anti-cyclones, always inclining out from the centre.

Hence we often get the S.E. Trade in the vicinity of Martin Vaz as a N.E. wind or the N.E. Trade as a S.E. wind, near the West Indies. Readers who served in sailing ships will remember the old joke when squaring in the main yard, outward bound in the South-East Trade.

The Trade Winds form a great part of the general circulation of the atmosphere governed by distribution of pressure. They are due to the difference of pressure in the great anti-cyclones and in the equatorial "Low," caused by the distribution of the sun's heat over the earth's surface. In the Atlantic and Pacific Oceans, the Trade Winds continue throughout the year, but in the North Indian Ocean they are replaced by the Monsoons.

The late Captain Campbell Hepworth investigated the Trade Winds of the Atlantic in the following areas:—

North-East Trade, area between Latitude 10° and 30° N. and Longitude 30° W. and the African Coast.

South-East Trade, area contained between the meridian of Greenwich and Longitude 10° E. from Latitude 10° to 30° S., and between the first meridian and Longitude 10° W. from the Equator to Latitude 20° S.

In these areas, which represent the hearts of the Trades of the Atlantic, he found that the N.E. Trades were strongest from January to May, while the S.E. Trade increased in the months of April, June, August and November, decreasing in the intervening months.

The Meteorological Charts of the Indian Ocean show that generally the S.E. trades do not vary much in strength from month to month, but are rather stronger during the prevalence of the S.W. monsoon in the Arabian Sea (June to September) than during the N.E. monsoon. This is due to low pressure being developed over Asia in the northern Summer and the South Indian Ocean anti-cyclone being intensified.

The South-East Trade continuing across the Equator and turned by the rotation of the earth gradually becomes a S.W. wind. In the Atlantic during July, August and September, the S.E. Trade is turned gradually to the right, becoming a S.W. wind north of the Equator known as the S.W. monsoon; at this time low pressure has developed over Northern Africa.

The limits of the Trade Winds, as is well known, move north and south after the sun; they are given on the Meteorological Ocean Charts each month.

During the southern Summer the South-East Trade extends considerably to the southward; at the Cape it is known as the "South-Easter"; at this time low pressure is developed over the Kalahari Desert, causing a steepening of the barometric gradient near the coast and to seaward. In the Indian Ocean when the southern limit of the S.E. trade passes south of Cape Leeuwin in the southern Summer, low pressure has developed over the great sandy desert of Western Australia; at this time south-westerly winds prevail in the Timor Sea, due to the cyclonic circulation of air northward of this depression.

Referring again to Chapter VI. and "Australian Weather Types," it will be seen that travelling anti-cyclones pass over Australia and that the Antarctic "Lows" to the southward extend as "A's" to the northward between the anti-cyclones; also tropical "Lows" extend southward.

Mr. C. STEWART, of the South African Union Weather Service, considers that weather is largely due to anti-cyclones passing eastward with their associated A depressions and secondaries at the Cape, and the behaviour of ships' barometers, and wind and weather experienced along the South Pacific trade route seem to indicate that anti-cyclones are constantly passing eastward in these Latitudes.

According to Mr. HUNT, the Mean Latitude along which the centres of anti-cyclones pass is about 40° S. in summer and 30° S. in winter.

The variations of force and direction of the "South-Easter" at the Cape in summer and the South-East Trade in all oceans and in all seasons near its southern limit may be accounted for by the passage of these moving pressure systems. Further north their effect is diminished and the pressure distribution remains more settled. The prediction of the strength of the S.E. Trade in its heart would be useful to the outward Cape or Australian bound steamer, but if the force and direction of the wind at the southern extension could be predicted it would possibly be still more valuable, for here it is that we are more uncertain, the variations from the normal being more frequent and usually greater.

It is at the southern extension that it is proved what Captain S. T. LECKY termed "steamanship" has been used with good judgment for the passage.

South-East Trade in the Indian Ocean and Economy of Coal.

The following are notes taken from my journal when in *Omrah*. This was a lucky voyage and we had a remarkably small coal bill. Unfortunately we did not keep a Meteorological Log, the only voyage during the whole of my time in the Australian Mail Service that we did not do so:—

Colombo to Fremantle.

September 6th, 1913.—10.46 passed Breakwater, set speed 66 revolutions. Light to moderate S.W. breeze and fine clear weather.

September 7th.—Noon, Latitude 4° 10' N., Longitude 81° 30' E. Fresh W.S.W. wind, rather rough sea. Current since 3.8 a.m. Pt. de Galle, S. 34° E., 4 miles.

September 8th.—Noon, Latitude 0° 29' S., Longitude 85° 47' E. Rain in middle and morning watches. Current S. 74° E., 32 miles. P. & O. *Macedonia*, Captain BENNETT, homeward, reported by W/T strong S.E. Trades from Latitude 26° S. to Latitude 6° S.

September 9th.—Noon. Latitude 5° 02' S., Longitude 89° 39' E. Gentle to moderate S.E. trade throughout. Distance to Rottnest 2,181 miles, reduced to 65 revs.

September 10th.—Noon, Latitude 9° 19' S., Longitude 93° 31' E., current S. 68° W., 5 miles. Strong to fresh S.E. Trade.

September 11th.—Noon, Latitude 13° 26' S., Longitude 96° 57' E., current S. 40° W., 10 miles. Fresh to moderate S.E. Trade. Distance to Rottnest 1,513 miles, reduced to 61 revs.

September 12th.—Noon, Latitude 17° 32' S., Longitude 100° 56' E., current S. 46° E., 15 miles. Gentle S.E. trade until 4 p.m., then gentle S.W. breeze and fine. *Orsova*, Captain HEALY, homeward, reports by W/T moderate to light variable winds from Fremantle. Reduced to 60 revs.

September 13th.—Noon, Latitude 21° 28' S., Longitude 104° 59' E., current N. 80° E., 16 miles. Strong S.W. and southerly wind, rough sea; fine and clear.

September 14th.—Noon, Latitude 25° 30' S., Longitude 108° 50' E., current N. 73° E., 14 miles. Fresh to gentle southerly wind.

September 15th.—Noon, Latitude 29° 26' S., Longitude 112° 45' E., Light and variable airs to moderate W. by S. wind. Distance to Rottnest, 211 miles.

September 16th.—4.17 a.m. came to an anchor in Gage Roads. 6.17, received signal to proceed into harbour and Health Officer would board inside Breakwater.

Averages for passage.—Actual steaming time, 9 days, 3 hours, 9 minutes. Distance 3,128 miles. Speed, 14.27 knots. Revs. per minute, 62.34. Apparent slip per cent., 6.2.

Notes from proposed programme worked out in the Mediterranean in consultation with Chief Engineer: Leave Colombo, September 6th midnight. Distance to Fremantle, 3,131 miles; arrive Gage Roads (September 16th) for 6 a.m. medical inspection. Speed required, 14.3 knots, allowing for 9 per cent. slip. Revolutions required, 64.5 (go 15 knots until S.E. Trade).

NOTE.—*Omrah's* normal slip under conditions of loading for 15 knots was 7 per cent.

From this it will be seen that we commenced at nearly four revolutions more than was required for the passage in view of former averages in September, and that for the time of year we had less head wind than usual, with currents as a whole a little favourable.

The weather information received from *Macedonia* near the Equator indicated that from just within the month's average Southern limit, for some days before, the S.E. Trade had been strong. With this information of *past weather* I judged it expedient next day when we had got the S.E. Trade not to make a material reduction of speed, hence the revolutions were only reduced by one.

On September 11th it was found, in the heart of the Trades, that they were not strong and revolutions were reduced to only one above speed required.

Next day on receipt of information of *past weather* from *Orsova* which indicated that the S.E. Trade had been considerably north of the month's average southern limit, the weather by our own observation at the time appearing to be settled, we reduced another revolution and maintained that speed, arriving with nearly two hours in hand. Had it been possible to forecast only a fresh Trade and the absence of head winds at the end of the passage, rather less coal might have been burned.

In those days our wireless only had a range of up to about 200 miles, whereas now, in numbers of ships of the same class, the range is measured by as many thousands of miles; the utility of the barometer for exact comparison of atmospheric pressure at different places was almost unknown to many of us, the scientific use of charted climatic normals was only popular with few, and making a weather chart at sea was almost unheard of.

Let us see with recent synchronous observations of *present weather*, what it may be possible to do in the future with tested instruments and long range wireless telegraphy, and, though we have not got details of engine speed, or notes of what was at the back of the Commander's mind, in the following examples we will suppose in accord with our practice in these chapters, that all ships shown on the weather charts numbered LXI to LXVI broadcasted and received the reports.

In drawing these charts with so few and widely spaced observations, the normal charts give us an idea of the probable shape of the isobars, and in order that these may be more readily compared with the normals, they are drawn for every two millibars. *Ormonde* wishes to know if the Trade Wind will be strong or moderate, and later if she may expect a head wind approaching Fremantle.

Chart No. LXI, Morning, November 7th, 1923.

Ormonde picked up the S.E. Trade at midnight, 5th November, in Latitude 2° S., Longitude 88° E., or about 5° north of the average limit for the month, since when it remained fairly steady.

Pricking off *Ormonde's* position on the monthly chart we find that the normal pressure is 1010 (29.83) there. Her barometer corrected for index error, temperature, height and gravity is 1013 (29.92); according to the table for correcting for diurnal range in the tropics, given in Chapter IV, at this time of the year we must subtract 1 mb. = 1012; thus, at *Ormonde's* position, pressure is about 2 mb. above the normal.

Further, comparing this chart with the normal chart we find that over the S.E. portion of the South Indian Ocean pressure is generally about 2 mb. above the average for the month. *Ormonde*, north of the heart of the Trade, has the wind S.E. 4 and *Ormuz*, well within the average southern limit for the month, has the Trade Wind S.E., force 5. *Ormuz* bears S. 43° 56' E., 1,565 miles from *Omonde*, and their barometers differ 5 mb. This tells us little directly, and we must depend upon the isobars as drawn to obtain an idea of the gradient. The distance between the 1014 and 1018 isobars measured approximately at right angles to them, and midway between these ships, is about 540 miles or 9 degrees on the latitude scale.

5 mb. ÷ 9 = .55 mb. gradient, which according to the following table should produce a wind force of rather less than 4 on the Beaufort scale.

Table of Calculated Gradient and Wind Force.
For Straight Isobars over the Ocean.
Pressure 1,000 mb. Temperature 45 F.

Beaufort Wind Force.	Velocity.	Difference in Pressure in 60 n. miles.				
		Lat. 52°.	Lat. 45°.	Lat. 30°.	Lat. 20°.	Lat. 15°.
	knots.	mb.	mb.	mb.	mb.	mb.
2	4-6	0.5-0.8	0.3-0.7	0.3-0.5	0.2-0.4	0.2-0.3
3	7-10	0.8-1.3	0.7-1.2	0.5-0.8	0.4-0.6	0.3-0.4
4	11-16	1.3-1.9	1.2-1.7	0.8-1.2	0.6-0.8	0.4-0.6
5	17-21	1.9-2.6	1.7-2.3	1.2-1.7	0.8-1.1	0.6-0.8
6	22-27	2.6-3.4	2.3-2.9	1.7-2.1	1.1-1.4	0.8-1.0
7	28-33	3.4-4.2	2.9-3.6	2.1-2.6	1.4-1.8	1.0-1.3
8	34-40	4.2-5.0	3.6-4.4	2.6-3.1	1.8-2.1	1.3-1.6
9	41-47	5.0-5.8	4.4-5.2	3.1-3.7	2.1-2.5	1.6-1.9
10	48-55	5.8-6.8	5.2-6.1	3.7-4.3	2.5-2.9	1.9-2.2
11	56-65	6.8-8.0	6.1-7.2	4.3-5.0	2.9-3.5	2.2-2.6
12	Over 65	Over 8.0	Over 7.2	Over 5.0	Over 3.5	Over 2.6

Later, when these ships passed each other, it was proved how well their barometers compared, but we have only been able to place the isobars by the values reported at the positions indicated, approximately, and though on this occasion the gradient agreed with the general force of the wind at the two ships, with so few reports, it cannot be relied upon, as an examination of the daily charts which follow will prove. However, the gradient so obtained gives an indication of the force of the Trade between observation points and so it is useful.

It must be clearly understood that the Table of Calculated Gradients is for straight isobars; in a cyclone the velocity of the wind is affected considerably by the curvature of the isobars.

During the next 24 hours *Ormonde* may expect the Trade to remain steady in direction and force.

We should like to know what the barometer is doing at Carnarvon, for if a tropical "Low" is moving south or developing over Western Australia, the wind is likely to veer to the S.W. and freshen with the steepening gradient which would result off the West Coast of Australia.

Ormonde had wind S.E., force 4, throughout the 24 hours, according to her log.

Chart LXII. Morning, November 8th, 1923.

Pressure is still about 2 mb. above normal and the gradient has steepened a little in the heart of the S.E. Trade. A depression has developed over Western Australia, where the winds are cyclonic. Comparison of the temperatures reported with those of yesterday are interesting in that they show how the air is becoming heated in its passage to the Doldrums, where much of the moisture taken up will be precipitated.

According to an investigation made in the Marine Division in 1924 an abridged account of which was published in Vol. II, No. 14 of THE MARINE OBSERVER if the air temperature in the Doldrums is above normal the trade wind will probably be light, but if the temperature is below normal in the Doldrums the trade wind will probably be strong. Confirmation of this is required, and careful observation of temperature by use of the portable screen when making routine wireless weather reports is therefore the more necessary.

In using the barometer tendencies it must be remembered that in the Tropics the barometer is rising at this time of day.

Ormonde may expect the Trade to increase to about force 5.

If the tropical "Low" over Western Australia continues to develop, strong South-West winds will occur off the N. West Coast of Australia. The barometer tendency at Carnarvon and Perth, if reported, would now be especially valuable.

According to the log the S.E. Trade increased to force 5 on this day and remained at that force and from the same direction.

Chart LXIII. Morning, November 9th, 1923.

The tropical "Low" has moved South and is now centred east of the Leeuwin. Pressure is still over one millibar above normal in the South-East Trade. As the depression moves south the anti-cyclone may be expected to move east or spread east, in which case *Ormonde* may expect the South-East Trade wind to back a point or two, but with ships so close together within the Trade Wind, we have little to go upon as to force which may be expected; there seems, however, nothing to indicate a material change in force. The wind off the North-West Coast of Australia will probably become more southerly. *Ormonde* will experience a westerly set. According to the log, the wind was S.E., force 5, throughout.

Chart LXIV. Morning, November 10th, 1923.

The positions of the ships again enable us to obtain an idea of the gradient in the S.E. Trade, but astern of them both, and from it we should expect about force 5. The chart indicates that *Ormonde* will experience the continuance of the South-East Trade nearly as far south as its average southern limit for the month, which her route cuts near the 30th parallel of south Latitude.

Chart LXV. Morning, November 11th, 1923, Sunday.

The absence of observations at Australian stations is now felt, for the eastward passage of Antarctic "Lows" may soon commence to affect the weather considerably. The pressure distribution has probably changed little since yesterday, and probably gentle southerly winds will be experienced as *Ormonde* proceeds through the eastern side of the anti-cyclone.

Chart LXVI. Morning, November 12th, 1923.

The Λ of an Antarctic "Low" has now appeared, centred S.W. of Cape Leeuwin; as it passes eastward, the wind in the vicinity of the Leeuwin and Rottneest Island will back through west to the south-west and moderate, and the gradient at the S.E. side of the anti-cyclone will become less steep. *Ormonde*, therefore, predicts with confidence moderate to light south-westerly winds to Fremantle. According to the log, this forecast was correct.

Though not conclusive, these examples are sufficient to show the possibilities of the method, and if steamers fitted with long range wireless sets regularly using the three routes, Cape Guardafui to Cape Leeuwin, Colombo to Fremantle and Fremantle to Durban, would broadcast reports of observations once daily, made at the times suggested in Chapter III, probably material results would be obtained after the practice and experience of the method, which is so essential. The procedure outlined is equally applicable to the Trade Wind regions of the Atlantic and Pacific, though the weather conditions differ owing to distribution of land and sea. It is a far easier matter to work out what should have happened long after the event. But the following example of another experience the writer had in

the *Orontes*, with Captain J. F. RUTHVEN, in January, 1907, will illustrate the use of normals; and then we will give experiences in which the value of wireless weather reports in the South-East Trade region of the Indian Ocean cannot be questioned.

"Orontes" dodges Hurricane Winds of a Cyclone in South-East Trade Region.

On this voyage we left Colombo at 11 p.m. on January 21st, 1907, and had the N.E. monsoon until 8 p.m. on January 22nd, in Latitude $1^{\circ} 13' S.$, Longitude $86^{\circ} 34' E.$; thence Doldrums until 9 p.m. on January 23rd, in Latitude $6^{\circ} 06' S.$, Longitude $91^{\circ} 23' E.$, when we picked up the S.E. Trade, commencing with a light shower of rain. The Trade wind was gentle to moderate and light at times, first from S.E. and later from south and S.S.W., with barometer conforming to diurnal range and normal pressure until noon on January 25th, in Latitude $12^{\circ} 19' S.$, Longitude $98^{\circ} 22' E.$ At 4 p.m. that day the barometer, corrected, was 29.758 inches or 1007.7 millibars. Correction for diurnal range + 1.3 = 1009, or 1 millibar below the normal isobar on the month's chart. The wind continued from S.S.W. and south, force 3 and 4, until 8 a.m. on January 26th, when the barometer was 4.4 millibars below the normal, allowing for diurnal range; it was now evident that a cyclone might be encountered.

At noon, in Latitude $16^{\circ} 21' S.$, Longitude $101^{\circ} 53' E.$, the wind freshened to force 5 and S.S.W., and from then onwards it increased and veered gradually, being W.S.W., force 8, at 8 p.m., when Captain RUTHVEN altered course to the eastward and we passed in rear of the ring of hurricane winds and centre, making a fair wind of the N.W. and northerly gale, which did not exceed force 10. The wind rapidly moderated and veered to the S.E. again as the storm passed away to the S.W. and the ship receded from it on a south-easterly course. We had very heavy rain in the first watch, when the ship was nearest to the centre.

When the South-East Trade blows into a Cyclone.

In the South Indian Ocean it is not difficult to avoid the intense part of the storm field of a cyclone approached from the north-west, for there is not the same temptation as there is to a ship bound to the northward or westward, because by passing in rear a ship bound to the south-eastward will benefit by a fair wind.

In this ocean, cyclones often form near the northern limit of the South-East Trade, which, during the months December to April, is also the southern limit of the N.W. or Middle Monsoon. Now, it is proved by observation that, before cyclones form, there is a reduction of barometric pressure and it is also proved by observation that cyclones in this ocean are not detached whirls of air beyond which light airs prevail, but the winds extend north and south from the centre for hundreds of miles. For this knowledge we are indebted to the great work of Dr. MELDRUM at Mauritius, where, in consultation with Captain WALES, Captain of the Port, he also drew up the rules which were outlined in Chapter IV. A cyclone having formed, it draws its supply of air from the N.W. monsoon to the northward and the S.E. trade to the southward, and it is difficult to tell when the increasing S.E. Trade forms part of a cyclone. Dr. MELDRUM also found that in the South Indian Ocean cyclones, north-easterly and easterly winds often, if not always, blow towards the centre.

Upon Chart LXVII the track of R.M.S. *Orontes*, Captain J. F. RUTHVEN, is plotted with wind and barometer from the Meteorological Log kept by Mr. J. AVERN, 3rd Officer, who later became Marine Superintendent of the Commonwealth of Australia Line, also the track of a homeward bound steamer, who did not realise that the South-East Trade was blowing into a cyclone and passed through the centre, in which were seen great flocks of birds.

This chart also serves to show the great distance covered by the winds to the N.W. and S.E. of the centre, though it should be remembered that the observations covered several days. The advantages of routine reports reciprocated by these two vessels are obvious, but it was not until six years later that wireless was fitted in steamers in the Australian Mail Service, R.M.S. *Otranto* being the first to be so fitted, and it is interesting to note that her first operator is now the General Manager of a great Wireless Service in Australia.

Looking through the logs of vessels which have encountered cyclones in the South Indian Ocean in recent years we have not found a

single case of a ship bound to the south-eastward; but we find records in March, 1923, where, of three steamers homeward bound in the South-East Trade, two, *Surrey* and *Port Albany*, ran into the hurricane winds of a cyclone, and from the following it would appear that the third, *Tennessee*, did not avoid them; we have no other report regarding *Tennessee*. As reported in the "Marine Observer's Log," March, 1924, number, of THE MARINE OBSERVER, page 37, S.S. *Port Lincoln*, Captain C. N. JONES, Port Pirie to Port Said, reported:—

"After having the barometer somewhat high for a considerable period, about March 9th it began to fall—from 29.87 to 29.62 (uncorrected) between 8 p.m., March 8th, and 8 p.m., March 10th—and sky changed from blue and Cirrus clouds to overcast, with passing rain, which we assumed to be a great change in weather, or that we were in the vicinity of some disturbance; but it came to be the outskirts of a cyclone. We were in communication by wireless daily with S.S. *Port Albany*, *Surrey* and *Tennessee*, who by their reports appeared to be making heavy weather of it, judging from their positions and day's run, which were all we received."

Port Lincoln's barometer was an aneroid, and comparison made on arrival in London showed that it read .35 inches too low (i.e., index error and correction for height combined + .35 inches).

On 8th March, at 8 a.m., *Port Lincoln* was in the position indicated on Chart LXVIII and her barometer, corrected and allowing for diurnal range, was .29 in., 9.8 mb. above normal. Examination of the readings of this aneroid barometer, logged, show that they cannot be relied upon for obtaining the departure from the normal, as its error is probably not constant.

On the outskirts of a tropical revolving storm in formation the barometer is frequently unusually high and steady.

In this vicinity two days later, on 10th March at 8 a.m., *Surrey* and *Port Albany*, both with tested mercurial barometers, recorded pressure 5 millibars, .15 in. below normal by the month's chart.

The tracks of S.S. *Port Albany*, Captain C. A. ROBINSON, Fremantle to Suez, and S.S. *Surrey*, Captain C. R. KETTLEWELL, Adelaide to Suez, are plotted on Chart LXVIII with barometer and wind observed every four hours.

Both ships had the South-East Trade from 6th March off the S.W. Coast of Australia, which backed to the northward of East at 4 a.m. on 10th March. Up to midnight on 9th March blue sky and Cumulus cloud was logged in both ships; at that time *Surrey* recorded Cirrus radiating from N.N.W., the sky became overcast later. Both ships encountered a confused swell at 4 p.m. on 9th March, which increased from E., E.N.E., and N.E. as the path of the centre and the ships' courses converged.

The Cirrus, barometer below normal, and confused swell with wind backing to the eastward, all gave warning.

At 8 a.m. on 11th March, had routine reports been broadcast, not only would these ships have been confirmed in their anticipation that they were approaching the path of a cyclone, but all others within range would have had early and distant information.

If the bearings of the centre are laid off from the ships' positions at midnight on 11th March in accordance with the average rule given in Chapter IV it will be seen that they do not fit, the indraft of the easterly winds being much greater at quite a small distance from the centre.

Port Albany's wireless aerials were carried away, which accounts for the absence of weather reports between these ships.

There can be no doubt that in the absence of several reports of synchronous observations on different sides of a cyclone in the South Indian Ocean when the S.E. Trade increases materially or backs, or the barometer is 3 or more millibars below normal within the Tropics, that it is best to heave to, until, by the veering or backing of the wind the passage of the centre with respect to the ship can be inferred. Even if such reports are received, once the wind circulation of a cyclone has been entered from the S.E. with an easterly or S.E. wind it is best to heave to, unless very near the line of progression.

Distant reports and careful observation and comparison with normals are the best means of obtaining information for shaping course or regulating speed to avoid the storm field of a cyclone in the Trade Wind regions within which heavy seas may cause damage or straining to decks and hull, or worse.

(To be continued.)

CYCLONES OF THE SOUTHERN INDIAN OCEAN AND ARABIAN SEA.

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

Southern Indian Ocean.

Investigation into the nature of the tropical revolving storms frequenting the South Indian Ocean dates back to 1801 when CAPPER in his book "Observations on the Winds and Monsoons" speaks of them as whirlwinds. PIDDINGTON, author of the "Sailors' Horn Book," gave to them the name of Cyclones from the Greek word "Kuklos" meaning Circle, and Dr. THOM of Mauritius, who, in 1845, published a work dealing solely with the storms of the South Indian Ocean, did much to advance the knowledge of their behaviour.

It is, however, due to the labours of the late Dr. C. MELDRUM, when Director of the Royal Alfred Observatory, Mauritius, that seamen owe the greatest debt of gratitude for their present knowledge of the "Law of Storms."

In the latter half of the nineteenth century numerous sailing ships bound home round the Cape made Mauritius a port of refuge after encountering a cyclonic storm. Meldrum obtained copies of their logs and interviewed their commanders and so made a detailed study into the nature of the storms which at that time caused so great a loss of life and damage to shipping.

The approach of a cyclone being indicated, 41 vessels put to sea from the roadsteads of Reunion on or before the 25th February, 1860. Of these 41 ships, 3 disappeared, 3 were wrecked on the coast of Madagascar, 6 were condemned after survey, and of the remaining 29 vessels only 10 escaped with minor damage. This great loss of life and property was attributed to the ignorance or neglect of the Commanders to act in conformity with the "Law of Storms" until MELDRUM showed that the principles of the "Law of Storms" as they then were, were at fault, and that the losses in this storm were occasioned by the Commanders acting in conformity with them; and further showed that had this storm, which was progressing very slowly, been travelling at a normal rate the list of casualties would probably have been greater.

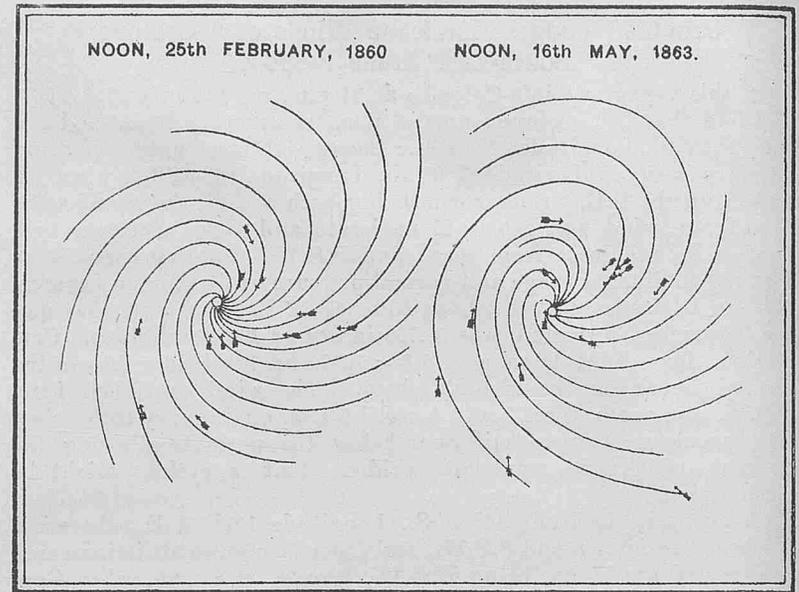
At that time the "Law of Storms" were based on the theory that the wind described a regular circle about a calm centre, and the ships on putting to sea finding the wind at S.E. placed the centre bearing eight points to the left, namely, N.E., and so steered N.W. in order to get into the navigable semi-circle, instead of which they steered direct into the storm centre which was bearing N.W. with the S.E. wind blowing straight towards it. From 5 p.m. on the 14th to 3.30 a.m. on the 16th of May, 1863, the ship *Earl Dalhousie* scudded three times around the centre of a cyclone which at that time was practically stationary, experiencing the wind veering regularly from N.E. to East, S.E., South, S.W. West, North and back to N.E. as she completed each circle. At 3.30 a.m. on the 16th the ship entered the storm centre. On leaving the storm centre she again commenced to run before the wind, but the cyclone was then progressing at the rate of 15 miles an hour. The ship continued to scud to the S.W. at 10 knots and finding little change in the weather hove to at 6 p.m.

From the investigation of these and other storms MELDRUM proved that the winds in a cyclone did not rotate in a true circle, but had a spiral movement inwards towards the centre, also, that in the South Indian Ocean the N.E. and S.E. winds often, if not always, blow towards the centre, and in conjunction with Captain WALES the harbour master at Mauritius, drew up the "Rules for handling Ships in Cyclonic Storms" as we know them to-day and which serve seamen in such good stead.

The following figures show the flow lines according to MELDRUM of the cyclones referred to above for noon on the 25th February, 1860, and for noon on the 16th May, 1863. A similarity will be seen between the two storms, also that the N.E. and S.E. winds blow towards the centre.

Intensity and Extent of Storms.

The cyclones of the South Indian Ocean are generally fully developed, containing winds of hurricane force, with a well defined calm centre.



Flow lines according to Meldrum—South Indian Ocean Cyclone.

The storm field may be divided into three areas:—

- (1) The outer storm area containing winds up to gale force in which the barometer falls slowly and in which the diurnal range is still marked.
- (2) The inner storm area in which winds of storm and hurricane force prevail, where the barometer falls rapidly masking the diurnal range.
- (3) The eye of the storm, which is an area of absolute or relative calm rarely exceeding 20 miles in diameter.

The intensity of a cyclone is shown by the amount the barometer at the centre falls, taking as the standard reference the normal height of the barometer for the time of year. In severe storms of the South Indian Ocean the decrease of pressure as the centre is approached amounts to 3.4 mb (.10 inches) or more for every 10 miles of approach. Within the centre of the storm the barometer always falls below 948 (28.00 inches).

The extent of the storm field varies greatly in different storms, but often attains a diameter of between 500 and 600 miles.

Region of Origin.

From September to March, the S.E. Trades of the Indian Ocean recede from and approach the Equator following the motion of the sun in declination, but with a considerable lag in this motion. During this time the N.E. monsoon on crossing the Equator backs to a point from between north and west becoming what is known as the middle or N.W. monsoon. Between these two wind systems is a belt of light variables and calms which during the southern summer extend in a N.E.—S.W. direction from Sumatra to Northern Madagascar, and it is within this belt of Doldrums that most of the storms investigated by both THOM and MELDRUM were found to have originated.

Season and Frequency.

The cyclone season of the South Indian Ocean can be considered to extend from October to May. The following table compiled from records of the Mauritius Observatory shows the seasonal distribution of storms for the years 1886-1917.

Month.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Total.
No. of Storms	2	8	25	42	54	39	18	6	194
Percentage of Frequency	1	4	13	22	28	20	9	3	—

During this period 83 per cent. of the storms recorded occurred in the months December to March. February being the month of maximum frequency, while no storms were recorded during the months June to September. The annual frequency of storms varies considerably. During the above period the average frequency was seven or eight storms per annum.

Both MELDRUM and CLAXTON showed that the sunspot cycle has an appreciable effect on the frequency of cyclones in the South Indian Ocean, there being a decided increase in the number of storms about the time of maximum sunspots which occurs every 11 years.

Rate of Progression and Track of Cyclones.

The rate of progression of storms in this ocean varies greatly for different storms also for the same storm at different stages of its path. Storms may progress as little as 50 or as much as 500 miles daily; but 200 miles is the average daily rate of travel on the first and second branch of their paths, decreasing to about 170 miles during the recurve. It is not exceptional to find that the rate of progression at the beginning of the path is less than at any other stage of its travel even when recurving, this being peculiar to the cyclones of this Ocean alone.

While the majority of storms originate between the parallels of 10° and 15° South and between the meridians of 50° and 70° E., they sometimes originate within 5° of the Equator and as far East as the 100th meridian.

They follow a parabolic track, the first branch being in a S.W'ly. direction which inclines more to the southward as the point of recurve is reached. After recurvature they may move in any direction between south and east and during mid-summer frequently continue into the temperate regions where they continue eastward as extra tropical cyclones. Generally the southerly extent of their tracks decreases with the sun's movement northward. The average point of recurvature throughout the season is in about 21° South, but varies greatly and may take place anywhere between the 8th and 32nd parallel. KOPPEN investigated the tracks of 89 cyclones, and found the average position of recurvature for each month as shown in the following table, from which it will be seen that the point of recurvature is situated more to the southward and westward during the middle of the season, than during the beginning and end.

Month.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.
Number of storms	4	12	28	20	13	8	4
Mean Latitude of Recurve.	17° 00'	17° 00'	22° 12'	22° 12'	20° 48'	15° 00'	14° 00'
Mean Longitude of Recurve.	76° 00'	67° 18'	60° 00'	63° 00'	63° 30'	74° 30'	75° 00'

The average tracks of storms recorded in the different months of the cyclone season are as follows:—

October.

In October, 1862, the Seychelles were visited by a cyclone which, up to that time, was thought to lie outside the tropical storm belt. For the 32 years ending 1917, only two storms are recorded in this month. The first was reported by the S.S. *Calcutta*, who experienced a violent storm in 1892 in Latitude 15° S., Longitude 88° E. The second storm was reported east of Rodrigues in 1917.

November.

Most of the storms of this month originate south of the 5th parallel and west of the 70th meridian, recurving in about Latitude 17° N. They pass close to, or over Mauritius and Rodrigues. A few instances are recorded of storms originating off the west coast of Sumatra moving in a direction west of the Cocos Islands.

December.

The storms of this month are three times as frequent as those of November, and originate anywhere on a line running from the north coast of Madagascar to Latitude 5° N. 90° E. Recurving in about Latitude 17° S., many traverse the Mozambique Channel and generally continue into south temperate regions.

January and February.

The tracks of storms are similar in these two months, which are the months of maximum frequency. Originating south of the 5th parallel and west of the 90th meridian they first move in a S.W'ly. direction, recurving in about Latitude 22° S. They continue in a south-easterly direction, many continuing into temperate regions. Occasionally storms pass down the Mozambique Channel.

March.

The storms of this month are a little less frequent than during the two preceding months. They originate south of the 10th parallel between the north-east coast of Madagascar and Longitude 70° E. The mean point of recurve is in about 21° S., and few storms continue beyond Latitude 30° S.

April.

The storm frequency in this month is less than half that of March. They may originate anywhere between the north-east coast of Madagascar and the south-west coast of Sumatra, but the majority have their tracks well east of the 60th meridian and recurving in about Latitude 15° S., rarely continue beyond the 25th parallel.

May.

Storms are not frequent in this month, only six being recorded in the 32 years ending 1917. Originating south of the 5th parallel their tracks lie east of the 60th meridian and rarely continue south of the 22nd parallel.

Precursory signs of Cyclones.

Other than the usual signs of an approaching cyclone given by Cirrus clouds, swell, or a departure from the normal pressure, MELDRUM found that a vessel approaching a cyclone on its southern side almost always encounters a strong reinforced Trade Wind freshening to a gale. This makes it difficult to tell when the Trade forms part of the storm area, consequently the bearing of the centre can seldom in this position be inferred from the direction of the wind, but it should be borne in mind that the S.E. winds in a cyclone mostly blow directly towards the centre, which would therefore bear sixteen points.

Most of the storms of the South Indian Ocean are unaccompanied by lightning on their southern side. Thunder and lightning when reported, has always been on the northern side of the storm-field, and in the old days the Commanders of Dutch ships, when navigating this ocean, had orders to shorten sail if lightning was observed in the north-west. The advent of a storm is frequently indicated by the oppressive heat and by the red colour of the sky and clouds, together with the pink and crimson tints which give an unnatural appearance to all it covers, especially at sunrise and sunset. In the neighbourhood of Mauritius and Reunion from December to May, should a Λ -shaped depression form between two anti-cyclones, tropical storms generally occur, three to five storms forming in quick succession.

Now that more and more selected ships are regularly making Wireless Weather Messages to "All ships" of observations taken at the same time as those of the nearest land stations, navigators are in a better position than hitherto, for, by the making of a simple weather chart from the observations, broadcast from shore, and by ships, the existence of any disturbance may be at once seen, its track followed and rate of progression obtained, thereby enabling the navigator to take early precautions to avoid the dangerous areas of the storm field.

Particulars of weather messages and storm warnings broadcast from stations on the east coast of Africa and adjacent islands, will be found in this Number.

Arabian Sea.

Published information regarding the development of the cyclones of the Arabian Sea is up to the present time not so detailed as it is for the storms of the Bay of Bengal or other parts of the ocean frequented by Tropical revolving storms.

In 1891, W. H. DALLAS, Assistant Meteorological Reporter to the Government of India, published the result of his enquiry into the nature and course of these storms from the limited information then available, and in 1926 C. W. B. NORMAND, M.A., D.Sc., of the Indian Meteorological Department compiled an Atlas illustrating

the tracks of all definitely known storms. It is from these two publications that the following particulars have been obtained.

Intensity and Extent of Storms.

The Indian Meteorological Office limit the use of the word storm to those cyclonic circulations which contain winds of force 8 and above. When the wind reaches force 10 and above the disturbance is termed a severe storm. In order to differentiate between them they are known as storms and cyclones respectively.

Like the cyclones of the Bay of Bengal the storms of the Arabian Sea are of gradual growth commencing as feeble circulations and are therefore of varying intensity and magnitude which differ greatly in different storms. The intensity of storms is to a great extent independent of their magnitude, it being possible to have a storm of great extent but of feeble intensity, also to have a storm of small extent but of violent intensity. The extent of storms varies greatly and in severe cyclones may influence the weather over an area up to 800 miles from centre when in the open sea; but with the storm's centre close to land, instances are recorded of ships being within 100 miles of the centre of a severe cyclone without receiving any indication of its existence from the appearance of the weather.

Cyclone Season and Frequency.

The following table has been compiled from NORMAND'S Atlas illustrating the tracks of all definitely known storms which have occurred in the Arabian Sea for the 84 years, 1842-1925.

Month.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Number of Storms	2	—	—	4	10	12	3	—	1	12	13	4	61
Percentage of Frequency	3	—	—	7	16	20	5	—	1	20	21	7	—

This table shows that there are two maximum periods of cyclonic activity during the year and that they occur during May and June and October and November respectively, months that are characterized by the change of the monsoons; also that in February, March and August the Arabian Sea is entirely free from cyclonic storms.

Region of Origin.

The cyclones that frequent the Arabian Sea are of two classes, those that cross the Peninsula from the Bay of Bengal and those that are generated within the sea itself. The storms of the latter class are generated between the southern limit of the N.E. monsoon and the northern limit of the S.W. monsoon, consequently their place of origin vacillates with the seasonal advance and retreat of the S.W. monsoon over the sea.

During the period that the S.W. or N.E. monsoon is fully established over the Arabian Sea, storms rarely form and in the few cases recorded have not been of a severe nature.

Rate of Progression.

The average rate of advance of Arabian Sea cyclones changes during the different days of their existence and in the different seasons of the year.

The following are the average rates of progression according to DALLAS.

In storms of the pre-monsoon period the rate of advance on the first three days of their existence is about 7 miles per hour, decreasing on the sixth day to 4 miles per hour. In storms of the post-monsoon period the rate of advance on the first day is about 9 miles per hour decreasing on the second day to 7 miles per hour and on the third day to 5 miles per hour. On the fourth day the rate increases to 8 miles per hour and on the fifth day to 10 miles per hour.

During both seasons there is a decrease in the rate of advance when storms are recurring.

Tracks of Storms.

Arabian Sea cyclones may follow a curved, straight, or irregular path. In those storms that follow a curved path the recurve is in the majority of cases to the N.W. during the pre-monsoon period,

while during the post-monsoon period the recurve is generally to the N.E., but in either season it is not exceptional for the opposite to be the case.

The place of origin and average tracks of storms recorded in the different months are as follows.

January.

No storms originate in the Arabian Sea during this month. Of the two storms recorded, one entered the Arabian Sea from the coast of Malabar and progressed westward to the 73rd meridian while the other entered the sea from the west coast of Ceylon and moved in a W.S.W. direction to the 73rd meridian. Both storms were of moderate intensity.

February and March.

No storms are recorded in the Arabian Sea during these months.

April.

The four storms recorded in this month all occurred after the 13th of the month, and were all severe cyclones. Three of the storms originated in the vicinity of the Maldives while the fourth generated in about Latitude 17° North, Longitude 61° East. Their tracks show that any part of the Sea east of the 58th meridian may be visited by a storm during this month, and that the recurve may take place either to the N.W. or N.E.

May.

There is a noted increase in the number of storms recorded this month and all were of a severe nature with the exception of one which was a storm of moderate intensity, originating off the Bombay coast and following a curved path to the N.N.W. and N.N.E. between the 16th and 20th parallels.

All other recorded storms originated south of the 14th parallel between the meridian of Socotra and the Indian Peninsula. Their tracks are such as to cover all parts of the Arabian Sea. The majority follow a curved path the concavity of which may face either N.E. or S.W. and their direction of movement may be anything between West and N.E.

June.

This is the month of maximum frequency for storms of the pre-monsoon period which are usually of a severe nature. Their zone of origin lies east of the 68th meridian between the 12th and 21st parallels. At first moving in a N.N.W. direction the larger number recurve to west and cross the northern part of the sea but a few recurve in a N.Easterly direction and move to the Bombay coast. One recorded storm originated in about Latitude 11° 45' N. Longitude 59° 30' E., and moved in a N. by W. direction across Eastern Arabia into the Gulf of Oman.

July.

The three storms recorded this month were of moderate intensity, and were confined to the N.E. of the Sea. One storm entered the sea from the Kutch Coast and moved in a W. by N. direction, the other two storms originated north of the 20th parallel off the Kathiawar coast. One storm moving N.E. passed inland while the other moving N. by W. crossed Kathiawar and the Gulf of Kutch.

August.

No storms are recorded in the Arabian Sea during this month.

September.

The one storm recorded this month was of moderate intensity and entered the sea from the S.W. coast of Kathiawar, thence moving in a N.Westerly direction to the head of the sea.

October.

Storms are frequent during this month and are mostly of a severe nature. Those storms which enter the sea from the Bay of Bengal do so south of Latitude 16° N. and progress in a W. by N. direction to about the 58th meridian. Storms may originate in the Arabian Sea south of the 18th parallel between the meridians of Socotra and the west coast of India. The storms which travel in a N.N.W. direction later recurving to the N.E. are confined to the eastern side of the sea, while the storms that cross the sea in a west to N.W. direction keep below the 18th parallel. One storm originated in about Latitude 17° N. Longitude 67° E. and moved in a S.W. direction to the 13th parallel.

November.

This is the month of maximum frequency for storms of the post-monsoon period which are of great intensity. Storms may generate in the Arabian Sea between the 16th and 8th parallel, eastward of the 62nd meridian. They first travel in a N.Westerly direction later recurving to the N.E.

Those storms which enter the sea from the Bay of Bengal cross the coast south of the 16th parallel, and move in a West to N.W. direction; some recurve to the N.E. and travel to the head of the sea or cross the Kathiawar and Bombay coasts.

December.

Of the four storms recorded in this month, three generated in the Bay of Bengal and entered the Arabian Sea south of the 10th parallel, their general direction of advance being to the N.W. Two of these storms were of a severe nature.

The fourth storm generated in about Latitude $9^{\circ} 30'$ North, Longitude 63° East and at first travelled E.N.E., recurving to the north and later to the N.N.E. entered the Gulf of Cambay. This storm was of moderate intensity.

DRIFTS OF DERELICT SHIPS IN THE NORTH ATLANTIC OCEAN.

PREPARED IN THE MARINE DIVISION BY F. C. LEVIN, CLERICAL ASSISTANT.

There are numerous instances on record of interesting drifts of derelict ships in the North Atlantic Ocean, and some of these dangers to navigation have not infrequently drifted across the Ocean for considerable distances and during long intervals of time.

During the years 1885 and 1888 two particularly long drifts of derelict schooners occurred. The schooner *Twenty-one Friends*, which was abandoned during 1885 when 160 miles east of Chesapeake Bay, drifted approximately 3,500 miles in eight months. She was last sighted some 130 miles N.E. of Cape Finisterre. In March, 1888, the schooner *W. L. White* was abandoned by her crew during a blizzard when about 80 miles from New York, eventually driving ashore at Haskeir Island, off the coast of North Uist, Hebrides. This derelict had drifted some 5,000 miles and was reported by at least 50 ships during the time of her long drift.

A singular drift occurred in June, 1892, as the result of a collision between the steamer *Trave* and the British sailing ship *Fred. B. Taylor*. The latter was cut in two, amidships, in approximately, Latitude $39^{\circ} 19' N.$, Longitude $68^{\circ} 33' W.$, just inside the northern limit of the Gulf Stream.

The after part of the *Fred B. Taylor* drifted almost directly north to a position in approximately Latitude $43^{\circ} 30' N.$, Longitude $68^{\circ} 30' W.$ From thence it drifted to the S.W., and some time later, after having been reported by no less than twenty ships, went ashore at Well's Beach, north of Portsmouth, New Hampshire, U.S.A. The bow portion of the vessel drifted westward for a few days until in about Latitude $39^{\circ} N.$, Longitude $70^{\circ} W.$ Thence it drifted to the south-westward and was last reported on the 22nd September, 1892, in approximately Latitude $38^{\circ} N.$, Longitude $75^{\circ} W.$ More than thirty ships had passed and reported this danger during its drift of ninety-three days.

FIGURE 1 shows the tracks of three rather remarkable derelict drifts which occurred during 1909-10, two American, wooden fore and aft schooners, *Nettie Champion* and *Anna R. Bishop*, and the Norwegian, timber-laden barque *Crown*.

The *Nettie Champion* was abandoned towards the end of December, 1909, off Chesapeake Bay, U.S.A. She was sighted on several occasions, being last reported on May 16th, 1910, in about Latitude $47^{\circ} N.$, Longitude $32^{\circ} W.$, having drifted in an E.N.E. direction about 13 miles per day, probably under the influence of the Gulf Stream and its extensions.

The *Anna R. Bishop* was abandoned on February 28th, 1910, in approximately Latitude $38^{\circ} N.$, Longitude $62^{\circ} W.$ She was sighted on May 25th, 1910, in about Latitude $48^{\circ} 15' N.$, Longitude $42^{\circ} 10' W.$ with her masts gone and decks just awash, and again during July and August of that year, and was becoming covered with shells and weed. The last report of this derelict was August 27th, 1910, in approximately Latitude $49^{\circ} N.$, Longitude $16^{\circ} W.$, on the Trans-North Atlantic Steamer tracks. The drift of this vessel averaged about 12 miles per day.

The barque *Crown*, abandoned towards the close of December, 1909, in mid-Atlantic, followed a track first to the W.S.W. and then to the N.W. The position of her abandonment is given as approximately Latitude $29^{\circ} 30' N.$, Longitude $44^{\circ} 30' W.$, on December 26th, 1909. On May 12th, 1910, she was passed in Latitude $24^{\circ} 26' N.$, Longitude $63^{\circ} 44' W.$, with all her masts and yards (with the exception of the fore lower-topsail yard) standing, port

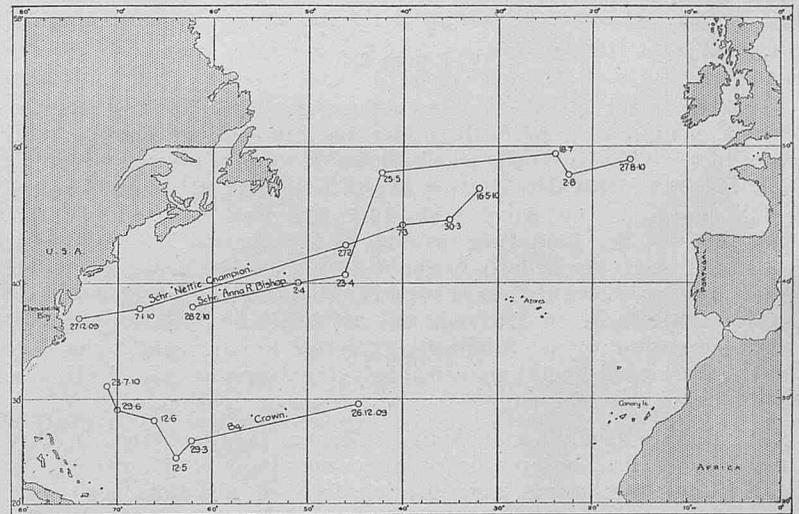


Figure 1.

bulwarks gone and decks awash. Up to this time *Crown* had drifted to the W.S.W. at the rate of approximately 7 miles per day. She then appears to have come within the influence of the Bahamas current and was drifting N.W., being sighted on June 12th, 1910, in approximately Latitude $28^{\circ} N.$, Longitude $66^{\circ} W.$, when her sails were hanging in ribbons from the yards. On June 21st, 1910, she was reported as having been set on fire by a boat's crew from the steamship *Grenada*. She was again sighted, however, on July 23rd, 1910, in approximately Latitude $31^{\circ} N.$, Longitude $71^{\circ} W.$, this being the last report of this derelict. At the time she was in a sinking condition. Her drift to the N.W. since May 12th, 1910, was at the rate of from 6 to 7 miles per day.

The drifts of three vessels, viz., the schooner *William Thomas Moore* (two tracks), the Russian barque *Ekonom* and the barque *Diana* are shown in FIGURE 2.

The pecked track is that of the *William Thomas Moore* after her first abandonment on April 4th, 1915. She became waterlogged during very heavy weather which was general along the Atlantic seaboard of U.S.A., during the first fortnight of April, and her crew were taken off their vessel when in approximately Latitude $36^{\circ} N.$, Longitude $74^{\circ} W.$ She was subsequently sighted in derelict condition by a number of ships and was eventually picked up by U.S.S. *Seneca*, then engaged on Ice Patrol duty, in about Latitude $41^{\circ} N.$, Longitude $50^{\circ} W.$, on May 14th, 1915. *Seneca* took her in tow and reached Halifax, Nova Scotia, on May 21st, 1915, where she was moored. From the time that the *William Thomas Moore* was abandoned until taken in tow by the *Seneca*, she had drifted roughly 1,100 miles in an E. by N. direction.

The *William Thomas Moore* was fated to become once more a danger to navigation for she was again abandoned by her crew on November 13th, 1916, in Latitude $40^{\circ} 05' N.$, Longitude $37^{\circ} 56' W.$ The firm line shows her subsequent drift on this occasion. When sighted on February 3rd, 1917, she was in a waterlogged condition with her stern smashed and one of her masts over the side. On

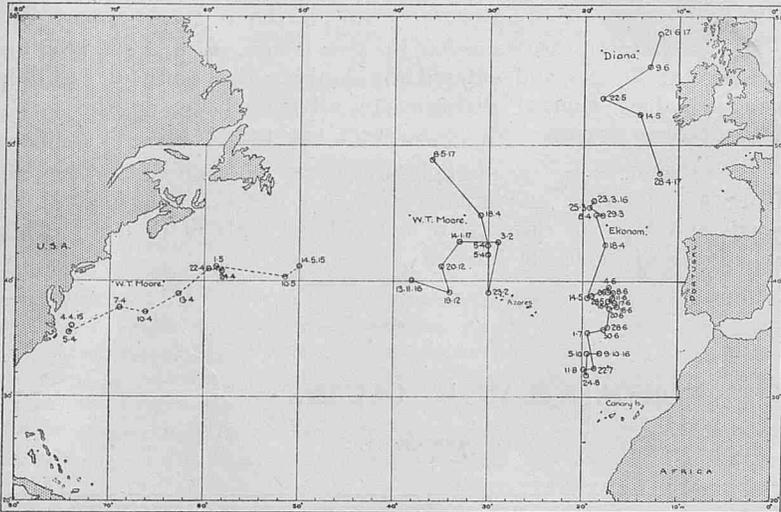


Figure 2.

the 23rd of that month she was sighted about 60 miles W. of the Azores, having been probably under the influence of that part of the North Atlantic Drift which flows to the southward in this locality. After this date she appears to have drifted almost directly north again, for on April 18th, 1917, she was reported in Latitude $44^{\circ} 52' N.$, Longitude $30^{\circ} 43' W.$, dismantled, her bulwarks gone and stern opened up. She was also sighted previously on April 5th as shown in the FIGURE. The last report of her was on May 8th, 1917, in Latitude $48^{\circ} 38' N.$, Longitude $35^{\circ} 50' W.$, when according to an Admiralty "Notice to Mariners," she was in a waterlogged condition, with only the bowsprit and deckhouse visible and still constituted a danger to navigation.

The drift of the Russian barque *Ekonom* is interesting, in that it was confined to an area between the meridians of 16° and $20^{\circ} W.$ and to the southward from her position of abandonment. She was abandoned on March 23rd, 1916, in about Latitude $46^{\circ} N.$, Longitude $19^{\circ} W.$, in a waterlogged condition, her crew being rescued by the steamer *Westerdijk*. She was sighted on subsequent occasions by no less than 22 passing vessels as indicated in FIGURE 2, the last report being that of October 9th, 1916. Her approximate drift to the southward was about 720 miles in 200 days or roughly $3\frac{1}{2}$ miles per day, and it seems probable that during part of this time she came within the influence of the Canary Current.

The barque *Diana* was abandoned in approximately Latitude $48^{\circ} N.$, Longitude $12^{\circ} W.$, on April 28th, 1917. She was last sighted on June 21st, 1917, in about Latitude $57^{\circ} N.$, Longitude $12^{\circ} W.$ Her track indicates that she had drifted almost directly northward, covering some 500 miles in this direction in 54 days.

FIGURE 3 shows the remarkable drifts of two derelict schooners, the *B. B. Hardwick* and the *Governor Parr*.

The *B. B. Hardwick* (the track of which is indicated by a pecked line) was a vessel of about 150 tons, gross. She was abandoned by her crew on October 7th, 1919, in Latitude $41^{\circ} 10' N.$, Longitude $47^{\circ} 29' W.$, when on a voyage from Bridgewater (N.S.) to Madeira. She had experienced heavy weather and at the time of her abandonment (her crew were taken off by a passing steamer), she was very deep, and it appeared impossible for her to hold together more than a few hours. However, she did not disappear as was expected, but drifted in an easterly direction, reaching a point nearly half-way between the Azores and the Portuguese coast. Thence she drifted southward or S.S.W'ward. On May 10th, 1920, she was reported by the steamer *Panaghi Vagliano* in Latitude $34^{\circ} 43' N.$, Longitude $21^{\circ} 47' W.$, "Dismasted and deckhouse broken." The last report of her was that of the Spanish steamer *Principe de Viana*, who sighted her on October 20th, 1920, in about Latitude $27^{\circ} N.$, Longitude $36^{\circ} W.$, "Very low in the water and still a grave danger to passing vessels." This was more than 12 months after she had been abandoned and she was aptly called, in the press, the "Vagrant of the Atlantic." No further reports of her were received, though it will be seen she was in less frequented waters, and appears to have drifted into the eastern portion of the Sargasso Sea.

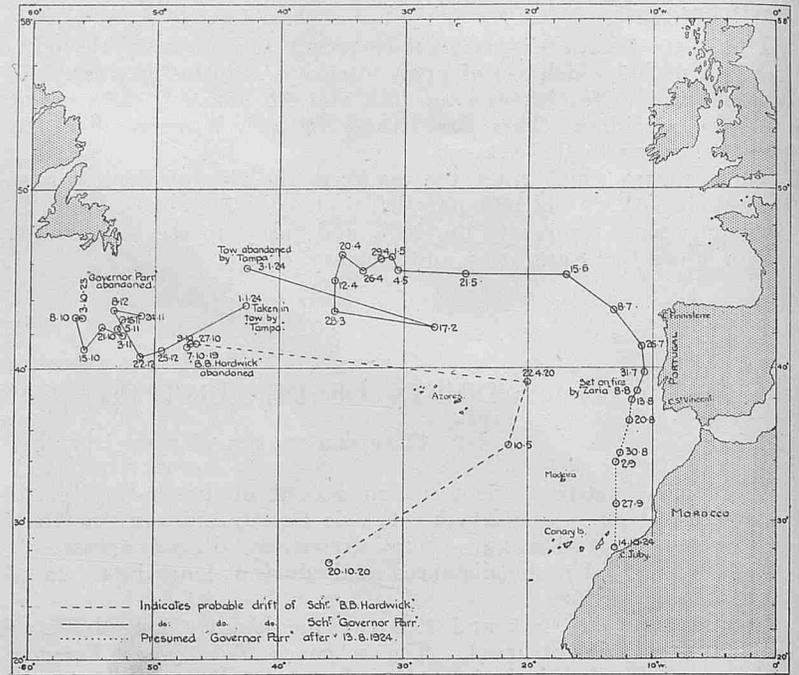


Figure 3.

The drift of the derelict *Governor Parr* is one of the most notable on record in the North Atlantic Ocean. It is indicated in the FIGURE by a firm line.

The *Governor Parr* was a four-masted schooner, 200 feet long and 972 tons, gross. She was British, hailing from Bridgetown, Barbados, and left Ingramport (N.S.) on September 25th, 1923, with a cargo of lumber, for Buenos Ayres.

Soon after sailing she ran into heavy weather, in all probability caused by the hurricane which originated in the West Indies towards the close of September, 1923, and traversed the eastern seaboard of the U.S.A., during early October. *Governor Parr* lost her mizzen and jigger-masts and sustained other damage, and on October 3rd, 1923, her crew were taken off by the American steamer *Schodack*, and she was left abandoned in Latitude $42^{\circ} 49' N.$, Longitude $55^{\circ} 56' W.$

The vessel became waterlogged, and continued to drift in the neighbourhood of one of the main trans-North Atlantic steamer lanes, numerous reports being received.

On October 4th she was boarded by a boat's crew from the Cunard liner *Saxonia*, in Latitude $42^{\circ} 57' N.$, Longitude $56^{\circ} 04' W.$, and was found to be waterlogged, but in good condition, with two of her masts still standing. She was subsequently sighted and reported by name on numerous occasions during the remainder of the year. Steps were taken by the U.S. authorities to locate and destroy her, the U.S. Coastguard Cutter *Tampa*, sailing from New York on December 21st, 1923, with this end in view.

Tampa, cruising in the vicinity of the meridian of $43^{\circ} W.$, found the derelict in Latitude $43^{\circ} 50' N.$, Longitude $42^{\circ} 30' W.$, on January 1st, 1924, and took her in tow, heading for Halifax, a heavy southerly gale prevailing at the time. Slow progress was made and owing to the gale, high seas, and shortage of fuel combined with the heaviness of the tow, *Tampa* was obliged to abandon the task on January 3rd, in Latitude $45^{\circ} 47' N.$, Longitude $42^{\circ} 48' W.$ *Tampa* after re-fueling, &c., at Halifax, again set out to search for the *Governor Parr* and also to look out for another schooner which was reported abandoned, on fire, at that time. She was unsuccessful however in her attempt to locate the *Governor Parr*.

The next report of this derelict was on February 17th, when the American freighter, *Emergency Aid*, passed her in Latitude $42^{\circ} 10' N.$, Longitude $27^{\circ} 25' W.$, far to the eastward of her previously reported position.

She was subsequently reported by the Italian steamer *Campania* on March 28th, in Latitude $43^{\circ} 23' N.$, Longitude $35^{\circ} 34' W.$, and the White Star Liner *Majestic* which had previously seen her on October 8th, 1923, during the dark hours, not long after her abandonment, again passed her on April 12th in Latitude $45^{\circ} 00' N.$, Longitude $35^{\circ} 38' W.$, this time in broad daylight. It will be seen by

FIGURE 3 that after February 17th, the derelict appears to have doubled on her tracks in a remarkable manner.

Numerous reports of sighting the derelict during April were received and on the 29th of the month, the Cunard liner *Aquitania* sighted her in Latitude 46° 08' N., Longitude 32° 00' W., "Dismasted and showing about 5 feet of freeboard, very dangerous to navigation."

On May 1st, the American steamer *West Wauna*, reported her in Latitude 46° 18' N., Longitude 31° 02' W., as being, "About 5 feet out of the water and drifting 30 miles per day due east." Her drift during the remainder of the month appears to have been in an easterly direction, for she was passed by the S.S. *San Lamberto* on May 21st, in Latitude 44° 56' N., Longitude 25° 20' W.

Continuing, approximately in an easterly direction she was next seen by the steamer *Olen* on June 15th, in Latitude 45° 20' N., Longitude 17° 00' W. The master of the *Olen* reported that she had her starboard bulwarks and stern partly smashed, her bowsprit, anchors and deckhouses apparently intact, and that she was floating on an even keel, with about 6 feet of freeboard.

After being sighted on July 8th by the British steamship *Hubert*, the derelict appears to have continued in a S.Easterly direction until close to the coast of Portugal, when her drift became more southerly. She was now right in the track of shipping off that coast, extremely dangerous and completely waterlogged, and it is reported that a Lisbon tug, tempted by the prospect of salvage, put out to search for her, on "No cure, no pay" terms. The weather was unfavourable, however, and the tug had to return without sighting the derelict.

A further determined attempt to rid the seas of this menace was made by a boarding party from the British S.S. *Zaria*, homeward bound from West African ports, on August 8th. A derelict was sighted in Latitude 38° 24' N., Longitude 11° 11' W., which proved to be the *Governor Parr*. She was waterlogged, and awash amidships, while her cargo of timber was swollen so much as almost to force her decks apart. Two fires were started by the boarding party, one in the foc's'le and the other aft of amidships, and after making sure that the derelict was well ablaze, *Zaria* resumed her voyage.

Five days later, however, the Spanish steamer *Iberia* sighted a sailing vessel, awash, in Latitude 38° 06' N., Longitude 11° 44' W., and there is little doubt that this was the *Governor Parr*.

The subsequent movements of the *Governor Parr* are somewhat uncertain. A number of ships reported passing the wreck or hull of a derelict schooner adrift, on various dates, in September, between Madeira and the coast of Morocco.

On October 14th, 1924, according to "Lloyd's List," a dangerous derelict was reported in Latitude 28° 05' N., Longitude 13° 07' W., a position N.W. of Cape Juby. It seems probable that this derelict was the remains of the *Governor Parr*, which had drifted since July 26th with the current, which flows generally in a southerly or S.S.W'ly direction near the coasts of Portugal and N.W. Africa. In this connection it is interesting to note that the schooner *Republique*, after being abandoned and set on fire in Latitude 32° 13' N., Longitude 13° 55' W. (approximately midway between Madeira and the African coast on February 12th, 1924, finally went ashore between Agadir and Cape Juby, about the end of March. No further reports concerning the *Governor Parr* have been received.

The drifts of the derelicts *B. B. Hardwick* and *Governor Parr* charted in FIGURE 3 both appear to have come within the influence of the current circulation around the area of permanent high pressure over the central part of the Ocean. The two schooners, for the best part of their time adrift were stripped of all top-hammer and showed very little freeboard, so that it can be assumed that there was little leeway, the currents having practically full effect upon the deep hulls.

In each of the three figures above, straight lines connect each report, the drift between reports may have been variable in direction.

At the time of writing, another derelict schooner, the *Annabel Cameron*, which has been drifting about the North Atlantic Ocean since January of this year, has again been sighted; the latest position being, Latitude 40° 31' N., Longitude 32° 34' W., on June 12th, 1927.

Drifts of Bottle Papers.

The drifts of bottles cannot be traced so well as those of derelicts for the simple reason that they cannot be identified and fixed by reports during their drift.

The following table gives a summary of bottles recovered, released in the North and South Atlantic Oceans, since 1920, with the bearing and distance of the place of recovery, from the position of release where land does not intervene, and the minimum average daily drift which the bottle must have made.

Table of Bottle Papers Released in the North and South Atlantic Oceans, returned to the Marine Division.—1920-1927.

Released from S.S.:—	Date.	Position Released.		Date Recovered.	Position Recovered.		Bearing and Distance of Place of Recovery from position of Release.	Average drift in miles per day by shortest sea route.
		Latitude.	Longitude.		Latitude.	Longitude.		
<i>Olympic</i>	1.10.20	50° 02' N.	21° 22' W.	1.3.21	West Smölen, Norway. 63° 40' N.	7° 45' E.	—	8.2
<i>Darro</i>	12.6.23	30° 20' N.	15° 05' W.	2.7.23	Gomera Island, Canary Islands. 28° 10' N.	17° 15' W.	S. 39° W. 170 miles	8.5
"	2.12.23	5° 33' S.	32° 50' W.	30.12.23	Amarracao, North Brazil. 2° 53' S.	41° 39' W.	—	20.0
"	20.4.24	8° 05' S.	33° 19' W.	17.10.24	Savannah la Mar, Jamaica. 18° 12' N.	78° 09' W.	—	17.3
<i>St George</i> (Yacht)	16.5.24	17° 06' N.	40° 57' W.	29.11.24	Clarence Town, Bahamas. 23° 06' N.	74° 56' W.	N. 79° W. 1,949 miles	9.9
"	18.5.24	13° 52' N.	44° 30' W.	26.8.24	East Coast Antigua, West Indies. 17° 05' N.	61° 40' W.	N. 79° W. 1,008 miles	10.1
<i>Kenilworth Castle</i>	24.5.24	7° 39' N.	14° 55' W.	21.6.24	Kent Village, Sierra Leone. 8° 10' N.	13° 10' W.	N. 73° E. 109 miles	3.9
<i>Olen</i>	4.6.25	39° 58' N.	49° 36' W.	13.3.26	Taing, Burra Island, Shetland Isles. 60° 05' N.	1° 20' W.	N. 56½° E. 2,187 miles	7.8
<i>Manchester Importer</i>	23.7.25	55° 32' N.	32° 26' W.	15.2.26	South Coast of Iceland. 63° 48' N.	20° 57' W.	N. 35° E. 605 miles	2.9
<i>Balfour</i>	15.2.26	49° 00' N.	23° 36' W.	10.10.26	Bigton, Shetland Isles. 59° 59' N.	1° 21' W.	—	4.3
<i>Metagama</i>	22.2.26	52° 21' N.	23° 33' W.	3.1.27	Nolsö, Faroe Island. 62° 00' N.	6° 40' W.	—	2.6
<i>Celtic</i>	1.3.26	50° 31' N.	17° 34' W.	8.8.26	Rathlee Head, Sligo, Ireland. 54° 17' N.	9° 04' W.	—	2.5
<i>Vigilant</i> (Fishery Cruiser)... ..	16.3.26	55° 36' N.	5° 56' W.	3.4.26	Crosspoll Tiree, Hebrides. 56° 34' N.	6° 40' W.	—	4.1
<i>El Paraguayo</i>	9.7.26	50° 35' N.	6° 16' W.	29.7.26	Trevone Bay, Cornwall. 50° 33' N.	4° 58' W.	S. 88° E. 50 miles	2.5
<i>Bothwell</i>	18.7.26	53° 34' N.	37° 52' W.	24.1.27	Lochmaddy N. Uist, Hebrides. 57° 35' N.	7° 07' W.	—	5.8

Table of Bottle Papers Released in the North and South Atlantic Oceans, returned to the Marine Division.—1920-1927—continued.

Released from S.S.:—	Date.	Position Released.		Date Re-covered.	Position Recovered.		Bearing and Distance of Place of Recovery from position of Release.	Average drift in miles per day by shortest sea route.
		Latitude.	Longitude.		Latitude.	Longitude.		
<i>Bothwell</i>	8.8.26	50° 32' N.	30° 57' W.	5.3.27	Rhosneigr, Anglesea. 53° 17' N. 4° 41' W.	—	5.0	
<i>Demerara</i>	20.9.26	0° 17' N.	30° 16' W.	7.6.27	E. Point Lt.-Ho., E. Coast, Barbados. 13° 09' N. 59° 26' W.	N. 66° W. 1,898 miles	7.3	
<i>Celtic</i>	12.11.26	43° 53' N.	47° 57' W.	24.6.27	Rosbeg, Co. Donegal, Ireland. 54° 48' N. 8° 26' W.	N. 67° E. 1,976 miles	8.8	
<i>El Paraguayo</i>	14.1.27	8° 07' S.	34° 15' W.	22.1.27	Piedade, Recife, Brazil. 8° 12' S. 34° 56' W.	S. 83° W. 41 miles	5.1	
<i>Bengloe</i>	7.3.27	48° 35' N.	15° 05' W.	19.8.27	Soulac/Mer, France. Gwithian Beach, Nr. Godfrey Lt. Ho.	—	—	
<i>Celtic</i>	26.6.27	50° 44' N.	13° 45' W.	25.8.27	50° 14' N. 5° 24' W. Nr. Cape Vidio, Spain.	S. 85° E. 324 miles	5.4	
<i>Almanzora</i>	26.6.27	43° 48' N.	8° 49' W.	12.8.27	43° 36' N. 6° 15' W.	—	2.4	
„	27.6.27	46° 31' N.	6° 51' W.	10.8.27	Plage de Pornichet, France. 47° 18' N. 2° 33' W.	N. 75° E. 182 miles	4.1	
<i>Celtic</i>	24.7.27	50° 50' N.	12° 30' W.	12.8.27	Clogher Strand, Co. Kerry, Ireland. 52° 09' N. 10° 27' W.	N. 44° E. 111 miles	5.8	
„	24.7.27	Off Stag Rocks, Ireland. 51° 28' N.	9° 14' W.	26.7.27	Seige Cove, Nr. Glandore, Ireland. 51° 34' N. 9° 07' W.	N. 36° E. 7 miles	3.5	

THE SEA AS A SOURCE OF SALT.

By W. E. GIBBS, D.Sc.

Ever since life began on this planet in the form of minute cells or sacs, filled with sea-water, salt has been an essential constituent of the body fluids of living organisms. The saline constituents of our blood are probably a token of our primitive marine ancestry.

It is probable that the sea has always been salt. Long before water vapour first condensed upon the surface of the cooling earth, salt vapours would have condensed upon it, and this deposited salt would dissolve in the first water as it formed. Subsequently, the sea would receive continually further additions of salt, dissolved by rain from the rocks, and, later, from the soil, and carried by the rivers to the sea.

The removal of water from the surface of the sea by evaporation, to an extent which would approximately balance the rainfall, would tend to keep the volume of sea-water constant, so that the salinity should gradually increase. This gradual increase in salinity is checked to some extent by the removal by growing marine plants and animals of some of the dissolved salts from the sea-water in which they live. Actually, the rate at which the salinity of the sea-water is increasing is imperceptibly small.

It has been estimated that, if all the salt in the sea has been conveyed to it by rivers at the same rate as at present, it will have taken rather less than 100,000,000 years to produce the present degree of salinity. Probably, in the morning of the world's history, when evaporation was very much more rapid and the rainfall was correspondingly more heavy, while salt would be more accessible, the salinity would increase much more rapidly than it does now.

Table I.

The Salinity of Sea-Water.

Locality.	Salinity, per cent.
Atlantic Ocean	3.63
Baltic Sea	0.72
White Sea	2.6-3.0
Mid-Mediterranean Sea	3.88
East Mediterranean Sea	3.83-4.11
Red Sea	5.08-6.85
Black Sea	1.82-2.22

It will be seen from Table I that ocean water all over the world normally contains about 3.5 per cent. of dissolved salts. In certain localities such as the Red Sea, where more water is removed by

evaporation than is received from rain and rivers, it contains more dissolved salts. On the other hand, in seas like the Baltic, where rainfall and drainage are much in excess of evaporation, the water contains less than 1 per cent. of salt. Some inland seas—the Dead Sea, for example—have become concentrated by evaporation to such an extent that they are saturated with salt, and large deposits of various salts have been formed on their beds.

Although the actual salinity of sea-water varies in different localities, the chemical composition of the dissolved saline matter is remarkably uniform. The proportions in which the different salts are always present in sea-water are shown in Table II.

Table II.

Name of Salt.	Parts per 100 Parts of Total Solids.	Per cent. of Sea-water containing 3.5 per cent. Dissolved Solids.
Sodium chloride	77.8	2.72
Magnesium chloride	10.9	0.38
Magnesium sulphate	4.7	0.16
Calcium sulphate	3.6	0.13
Potassium sulphate	2.5	0.09
Magnesium bromide	0.2	0.007
Calcium carbonate	0.3	0.01

There are also present, amongst other compounds, traces of iron, silicates, phosphates, iodine, barium, aluminium, copper, zinc, gold, silver, radium, lead, cobalt and nickel.

It was almost certainly by the evaporation of isolated bays or lagoons of the sea that the large salt deposits of the world were formed in Permian and Triassic times. The best known of these deposits are those in Cheshire and Worcestershire in this country, at Stassfurt in Germany, and at Wieliczka in Poland. Other extensive deposits occur in America, China and India.

The manner in which such a deposit of rock salt is thought to have been formed is described in the following diagrams. Sea-water is partially confined in a bay or lagoon, formed by the erection of a sand bar (FIG. 1). By exposure to wind and sun, it slowly evaporates and becomes increasingly salt. Organic life (fish and seaweed) gradually becomes impossible in it. The chalk and iron oxide that are present in the sea-water become insoluble and settle to the bottom. Vegetation still flourishes on the surrounding land.

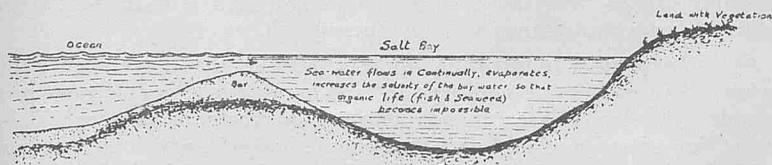


Figure 1.

When the density of the sea-water has reached 1.129, the water has become saturated with gypsum, and, as evaporation continues further, more and more gypsum becomes insoluble and settles to the bottom, to form a well defined "Bed" (FIG. 2). The land vegetation begins to wither.

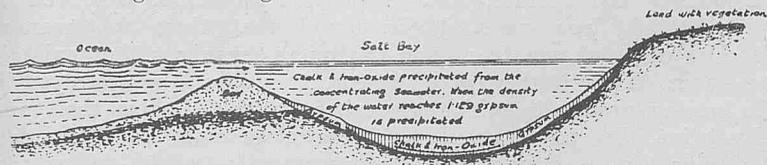


Figure 2.

When the density of the sea-water has reached 1.218, the sea-water has become saturated with salt (sodium chloride), so that further evaporation leads to the gradual deposition of salt and gypsum (calcium sulphate) from the "Mother liquor" (FIG. 3). By this time, the surrounding land has become barren.

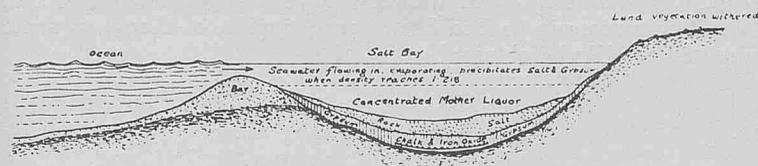


Figure 3.

Further evaporation leads to the continued simultaneous precipitation of salt and gypsum, reinforced by soil particles blown into the lagoon by the land winds. The mother liquor, containing the salts of calcium, magnesium and potassium, drains away over the bar as fresh sea-water flows in (FIG. 4). This gives the English type of rock salt deposit, in which the rock salt is associated with gypsum, but is practically free from salts of magnesia and potash.

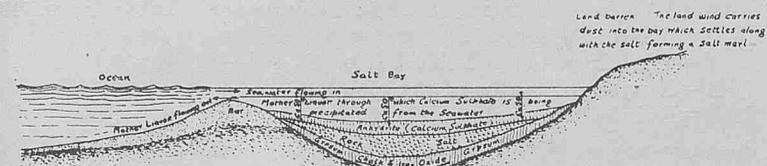


Figure 4.

If the bar rises, so that the contents of the salt bay become shut off from the sea, the mother liquor is imprisoned, and gradually deposits beds of potash and magnesia salts, producing the Stassfurt type of deposit, in which beds of rock salt are associated with beds of carnallite, kainite, kieserite, &c. (FIG. 5).

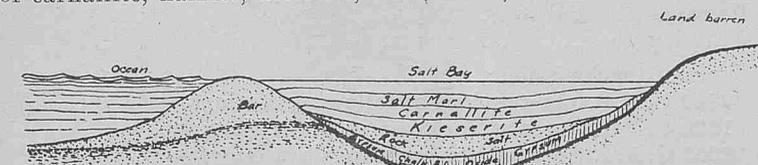


Figure 5.

This process has been repeated by man in those maritime countries such as the shores of the Mediterranean and the Red Sea, where, for a considerable part of the year, insolation is intense and the rainfall is small. The salt made from salt-water, by exposing it in large, shallow ponds to the heat of the sun, is generally known as solar salt. The production of solar salt in modern times is an industry of considerable magnitude. In the year 1920, the world's

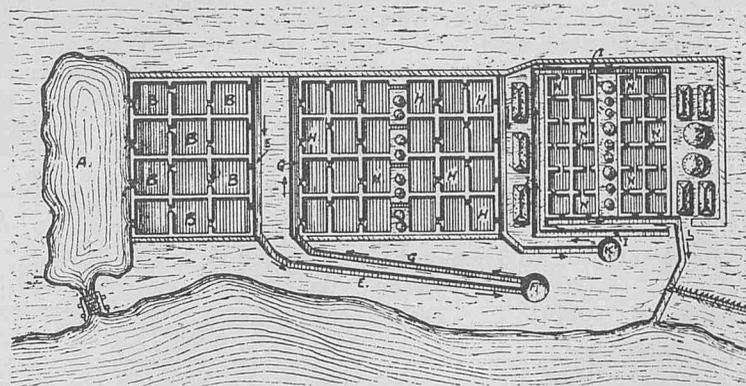


Figure 6.

total production of salt was 21,100,000 tons, of which approximately 9,000,000 tons were solar salt.

The general arrangement of a solar-salt works is shown in FIG. 6.

It consists essentially of a large reservoir A, into which sea-water flows at high tide, connected by channels with a series of increasingly shallow evaporating and crystallising ponds. In A, any suspended matter, such as sand, shells, sea-weed, is deposited, and the clear sea-water (specific gravity, 1.028) is then conveyed through canals into a number of smaller reservoirs B, B. These reservoirs or ponds are lined with clay and separated by low banks, which serve to distribute the flow of the brine. In these ponds, owing to the large surface exposed to the sun, the sea-water concentrates rapidly and deposits iron oxide and calcium carbonate. It then passes along the channel E to the sump F, from which it is pumped via the channel G to a number of smaller ponds H, H, arranged on each side of a wide bank or platform. In these ponds, further concentration occurs, so that gypsum is precipitated. From time to time, the gypsum is raked out and heaped up upon the central platform.

The concentrating sea-water remains in these gypsum ponds until its specific gravity becomes 1.19. It then flows into the sump K, from which it is pumped into the distributing canal I, whence it passes to the shallow crystallising ponds N, N. The sea-water brine reaches these crystallisers at from 1.19 to 1.23 specific gravity. It fills them to a depth of from 25 to 35 cms. As the evaporation proceeds in these crystallising ponds, the salt begins to separate from the brine and is deposited upon the bottom of the pond. Crystals of salt gradually grow, to form large coarse crystals which are very hard.

In some cases, the brine is allowed to dry up completely, and the deposit of salt, which may be as much as 6 ins. thick, is harvested. At other works, the level of the brine is kept constant by the addition of more brine to replace the water that is lost by evaporation, and the salt is raked out of the brine from time to time. Evaporation is allowed to continue until the specific gravity of the brine reaches 1.28. It is then run off into the sea. The salt is heaped up on the bank and allowed to drain.

In the South of France, between June and September, approximately one millimetre of salt is deposited per day and, after forty days' continuous deposition, the salt is harvested. The harvesting of the salt normally occupies from four to five weeks; approximately 19 kilogrammes of salt are produced per square metre of crystallising surface.

Since sea-water contains, in addition to sodium chloride, a considerable quantity of magnesium chloride which also concentrates or, but, being much more soluble than sodium chloride, is not deposited, it follows that the mother liquor that is left at the end of the process is very rich in this compound. Consequently, the salt that is gathered from the crystallising ponds is heavily contaminated with magnesium chloride. The greater proportion of this contaminating mother liquor drains away from the salt during storage, and, where a supply of clean, fresh water is available, this impurity can be almost entirely removed by washing the heaps of salt with a limited amount of fresh water. In a few instances, attempts have been made to extract salts of potash and magnesia from this residual brine or bitter. These processes, however, are seldom able to compete on economic grounds with the mined products from the Stassfurt deposits.

It is found that solar salt varies widely in quality, according to the care with which it has been harvested and stored. In some cases, it is contaminated with fragments of shells, particles of soil and sand, and even organic matter. On the other hand, the salt made in an up-to-date saline, in which every care is taken to wash out the soluble mineral impurities, frequently reaches a high degree of purity. Analyses of some samples of solar salt are given in Table III.

Table III.

Representative Analyses of English Boiled Salts and Foreign Solar Salts.

	English.			Solar.					
	Pure Dried Vacuum.	Best Fishery.	Common.	Ceylon. Elephant Pass. (Govt.)	Aden. Kur-kutch.	Indian.		Brazilian. Capo Frio.	Spanish. Iviza.
						Bombay.	Madras.		
Sodium chloride ...	99.80	99.71	99.07	98.30	97.06	94.44	90.16	98.09	94.82
Calcium sulphate ...	trace	0.26	0.72	0.35	0.87	1.58	1.07	0.50	1.43
Calcium chloride ...	nil	0.01	nil	nil	nil	nil	nil	nil	nil
Sodium sulphate ...	0.17	nil	0.12	0.34	0.69	0.78	2.61	0.42	1.44
Magnesium chloride	trace	0.01	0.04	0.67	1.14	1.76	4.79	0.78	1.76
Potassium chloride	nil	nil	nil	0.12	0.15	0.15	0.49	0.02	0.36
Sodium carbonate...	0.02	nil	trace	trace	0.02	nil	0.02	0.03	nil
Sodium bicarbonate	0.01	0.01	0.01	0.02	0.02	0.07	0.01	0.01	0.01
Insoluble matter ...	nil	trace	0.04	0.20	0.05	1.22	0.85	0.15	0.18
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Solar salt is invariably coarse and hard, and is widely used for salting hides and skins, and for curing fish.

It is frequently found that, on fish or hides that have been cured with solar salt, particularly in warm weather, numerous pink patches develop. Research has shown that these patches consist of extensive colonies of certain chromogenic bacteria which can flourish even in the presence of saturated brine. A bacteriological examination of samples of sea-water from different parts of the world has shown that similar micro-organisms occur in every sea. Samples of solar salt almost invariably are found to be infected with them.

In this respect, solar salt differs fundamentally from the boiled salt that is made, for example, in Cheshire or Worcestershire. At these works, the brine from the vast, underground deposits, is pumped to the surface, and evaporated in large, coal-fired or steam-heated, iron pans. It is found that these subterranean deposits of brine are free from the micro-organisms that exist in sea-water. Even if they were present, they would be destroyed by the boiling process by which the salt is extracted from the brine. This brine also contains very much less magnesium salts than does the brine that is obtained by the concentration of sea-water; consequently, boiled salt is invariably purer, both chemically (see Table III), and bacterially, than solar salt.

It is probable that the sea is destined to be the great source of salt in the future, for, extensive as they are, the vast, underground deposits of brine and rock salt, both in this country and elsewhere, will gradually become exhausted. When that day begins to dawn, the great European chemical industries, that depend upon brine as their raw material, will probably have to migrate to the coasts of the Mediterranean or Red Sea, where supplies of cheap, saturated brine will readily be obtainable.

WEATHER SIGNALS.

II.—WIRELESS WEATHER BULLETINS.

SOUTH-WEST AFRICA, UNION OF SOUTH AFRICA, AND PORTUGUESE EAST AFRICA.

Spark and C.W. Issues.

REPORTS of weather conditions at 0630 G.M.T. at South African ports are issued daily by Coast W/T Stations in code, mainly New International, in the form:—

I_n BBBSB. DDF_{fw} VNRRR where

I_n = Indicator letters of observation station (generally the station's W/T call signal).

BBB = Barometer reading, corrected, in mbs. and tenths, initial 9 or 10 omitted. (See Table XIII, p. 21, Vol. IV, No. 37, for conversion to inches.)

S = State of sea and swell. (See Table XXVIII, p. 101, Vol. IV, No. 41.)

B_r = Only used for Capetown, Mossel Bay, East London, Durban, Lourenço Marques,* Beira and Mossoril,† for other stations a dash will be sent. It represents the following:—

At Capetown ... Run, or undertow in docks, Table XLIII.

At Mossel Bay ... Instructions regarding anchorage, Table XLIV.

At East London, Durban, Lourenço Marques, Beira, and Mossoril. } State of bar. Table XLV.

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

F = Wind force by Beaufort scale, Forces 9 and above reported as 9, with the actual force at the end of the particulars for each port concerned, e.g., "Gale ten," "Storm eleven," "Hurricane twelve."

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

V = Visibility. (See Table VI, p. 20, Vol. IV, No. 37.)

N = Number of tenths of sky clouded.

RRR = Rainfall in whole millimetres.

A dash (— — — —) will be sent should any portion of a report not be available. In the absence of a complete report from any station the station's indicator letters followed by the words "not received" will be transmitted.

Details of Reports.

1. Transmitting station... **Walvis Bay** (Latitude 22° 58' S.; Longitude 14° 30' E., approx.).

Call signal ... **VNV.**

Messages directed to ... **CQ.**

Wave length ... **600 m. spk.**

Times of transmission:

0840 G.M.T. (observations at following stations at 0630 G.M.T.).

1230 G.M.T. (forecast for coast in plain language).

2000 G.M.T. (forecast for coast in plain language).

2. Observation stations, 0840 report:

Indicator Letters.	Station.	Position approx.
		Lat. S. Long. E.
VNC	Capetown...	33° 56' 18° 29'
VNJ	Port Nolloth ...	29° 14' 16° 51'
VNV	Walvis Bay ...	22° 58' 14° 30'
CRM	Mossamedes ...	15° 12' 12° 09'
CRL	Loanda ...	8° 49' 13° 13'

* Refers to the bar near Inyack Island.

† Refers to the bar at the Mozambique Port.

1. Transmitting station ... **Capetown** (Latitude 33° 56' S.; Longitude 18° 29' E., approx.).
 Call signal ... **VNC.**
 Messages directed to ... **CQ.**
 Wave length ... 600 m. spk.
 Times of transmission:—
 0830 G.M.T. (observations at following stations at 0630 G.M.T.).
 1220 G.M.T. (forecasts for coasts in plain language).

2. Observation stations, 0830 report:—

Indicator	Station.	Position (approx.).	
Letters.		Lat. S.	Long. E.
VNO	East London ...	33° 02'	27° 55'
VNQ	Port Elizabeth ...	33° 59'	25° 37'
MB	Mossel Bay ...	34° 11'	22° 09'
VNC	Capetown ...	33° 56'	18° 29'
VNJ	Port Nolloth ...	29° 14'	16° 51'
VNV	Walvis Bay ...	22° 58'	14° 30'

1. Transmitting station ... **Port Elizabeth** (Latitude 33° 59' S.; Longitude 25° 37' E. approx.).
 Call signal ... **VNQ.**
 Messages directed to ... **CQ.**
 Wave length ... 600 m. spk.
 Times of transmission:—
 0820 G.M.T. (observations at following stations at 0630 G.M.T.).
 1250 G.M.T. (forecast for coasts in plain language).

2. Observation stations, 0820 report:—

Indicator	Station.	Position (approx.).	
Letters.		Lat. S.	Long. E.
VND	Durban ...	29° 52'	31° 03'
VNO	East London ...	33° 02'	27° 55'
VNQ	Port Elizabeth ...	33° 59'	25° 37'
MB	Mossel Bay ...	34° 11'	22° 09'
VNC	Capetown ...	33° 56'	18° 29'

1. Transmitting station ... **Durban** (Latitude 29° 52' S.; Longitude 31° 03' E. approx.).
 Call signal ... **VND.**
 Messages directed to ... **CQ.**
 Wave length ... 600 m. spk.
 Times of transmission:—
 0810 G.M.T. (observations at following stations at 0630 G.M.T.).
 1205 G.M.T. (forecast for coasts in plain language).

2. Observation stations, 0810 report:—

Indicator	Station.	Position (approx.).	
Letters.		Lat. S.	Long. E.
CRT	Beira ...	19° 50'	34° 51'
CRZZ	Lourenço Marques ...	25° 58'	32° 36'
VND	Durban ...	29° 52'	31° 03'
VNO	East London ...	33° 02'	27° 55'
VNQ	Port Elizabeth ...	33° 59'	25° 37'

1. Transmitting station ... **Lourenço Marques, Polana** (Latitude 25° 58' S.; Longitude 32° 36' E. approx.).
 Call signal ... **CRZZ.**
 Messages directed to ... **CQ.**
 Wave length ... 2,400 m. c.w.
 Time of transmission:—
 0800 G.M.T. (observations at following stations at 0630 G.M.T.).

2. Observation stations, 0800 report:—

Indicator	Station.	Position (approx.).	
Letters.		Lat. S.	Long. E.
VNO	East London ...	33° 02'	27° 55'
VND	Durban ...	29° 52'	31° 03'
CRZZ	Lourenço Marques ...	25° 58'	32° 36'
CRT	Beira ...	19° 50'	34° 51'
CRV	Mozambique ...	15° 02'	40° 45'

1. Transmitting station ... **Mozambique** (Latitude 15° 02' S.; Longitude 40° 45' E. approx.).
 Call signal ... **CRV.**
 Messages directed to ... **CQ.**
 Wave length ... 600 m. spk.
 Time of transmission:—
 0900 G.M.T. (observations at following stations at 0630 G.M.T.).

2. Observation stations 0900 report:—

Indicator	Station.	Position (approx.).	
Letters.		Lat. S.	Long. E.
CRV	Mozambique (Mossoril) ...	14° 57'	40° 40'
CRT	Beira ...	19° 50'	34° 51'
CRZZ	Lourenço Marques ...	25° 58'	32° 36'

MADAGASCAR.

THE following W/T Stations broadcast, *en clair*, the general atmospheric situation in Madagascar and a weather forecast for the day on 600 metres (spark) in each case.

W/T Station.	Call Sign.	Lat.	Long.	Time.
Majunga ...	HYE	15° 43' S.	46° 20' E.	0900 G.M.T.
Diégo Suarez ...	HYD	12° 15' S.	49° 23' E.	0830 "
Tamatave ...	HYL	18° 08' S.	49° 26' E.	0800 "

SPECIAL WEATHER TELEGRAPHY TABLES NOT NEW INTERNATIONAL CODE. (SOUTH AFRICA).

Table XLIII.

Run or Undertow (at Table Bay Docks).

Code figure.	Meaning.
0 ...	No run.
1 ...	Slight run.
2 ...	Moderate run.
3 ...	Heavy run.

NOTE.—“Run” is a local term for the undertow, due to a heavy swell in the Bay, which causes vessels to range so heavily along the quays that it is difficult to hold them.

Table XLIV.

Instructions regarding Anchorage at Mossel Bay.

Code figure.	Meaning.
1 ...	It is recommended that vessels should anchor well up the Bay towards Seal Island in not less than 9 fathoms of water, and veer plenty of cable
5 ...	It is recommended that vessels should take up ordinary anchorage with beacons in line in about 7 fathoms.

Table XLV.

State of bar (at East London, Durban, Lorencó Marques, Beira and Mossoril).

Code figure.	Meaning.
1 ...	Bar smooth.
2 ...	„ breaking slightly.
3 ...	„ rough.
4 ...	„ breaking heavily.
5 ...	„ dangerous.
6 ...	„ impassable.

NOTE.—At East London the use of 1, 2, and 3 also implies that work with lighters is possible, and 4, 5, and 6, that it is impossible.

WIRELESS STORM WARNINGS.

MADAGASCAR.

Spark Issues.

CYCLONE warnings are broadcast when necessary by the following stations on a wave length of 600 metres (spark), in each case:—

Zaudzi (Mayotta I.): Latitude 12° 47' S., Longitude 45° 16' E., Call Sign **HYH.**

Majunga: Latitude 15° 43' S., Longitude 46° 20' E., Call Sign **HYE.**

Diégo Suarez: Latitude 12° 15' S., Longitude 49° 23' E., Call Sign **HYD.**

Tamatave: Latitude 18° 08' S., Longitude 49° 26' E., Call Sign **HYL.**

The warning, originating from the observatory at Antananarivo, will be broadcast at every even hour during the probable passage of the cyclone when within the range of the W/T stations, alternately by Zaudzi and Majunga W/T stations in the case of a cyclone affecting the Mozambique Channel, and alternately by Diégo Suarez and Tamatave W/T stations in the case of a cyclone affecting the area north-east and east of Madagascar.

The warning will be preceded by the Danger Signal **TTT (- - -)** repeated ten times at short intervals on full power. The warning will be broadcast one minute after the Danger Signal, and will be repeated three times at intervals of ten minutes.

If the Danger Signal *only* is broadcast it will indicate, in the absence of precise information, that there is reason to expect the passage of a cyclone.

During the whole period of this service Zaudzi and Tamatave W/T stations will remain permanently on watch.

III. WIRELESS TIME SIGNALS.

UNION OF SOUTH AFRICA.

Spark Issue.

TIME signals controlled from the Cape Observatory are broadcast daily by **Cape Town W/T Station**, call sign **VNC**, Latitude 34° 08' 45" S., Longitude 18° 19' 17" E., on a wave length of 600 metres (spark).

A warning signal is broadcast before the time signal.

The time signal consists of a series of 12 dashes each about $\frac{3}{4}$ sec. duration, extending over half a minute, and divided up into five groups, a dash commencing at each of the following times:—

G.M.T.			G.M.T.			
h.	m.	s.	h.	m.	s.	
20	59	30	20	59	48	
20	59	32				50
		34				
20	59	38	56			
		40				
20	59	44	21	00	00	

NOTE.—Each signal may be used as indicating the exact G.M.T. recorded above; the *beginning* of the last dash of the series is exactly 21h. 00m. 00s. G.M.T.

PORTUGUESE EAST AFRICA.

Spark and C.W. Issues.

DELAGOA BAY.—LOURENÇO MARQUES. W/T time signals are transmitted automatically by means of the pendulum clock at Campos Rodrigues Observatory.

The transmission of the signals is made simultaneously by **Ponta Vermelha W/T station**, Lat., 25° 56' 05" S., Long., 32° 35' 39" E., call sign **CRZ**, wave length 600 metres (spk.) and **Polana W/T station**, Lat., 25° 27' 40" S., Long., 32° 35' 59" E., call sign **CRZZ**, wave length 2,400 metres, C.W., and the new International system of W/T time signals is used.

The transmitting times are:—

G.M.T.					
	h.	m.	s.	h.	m.
From	7	57	00	to	8 00 00
„	18	57	00	„	19 00 00

The procedure as regards each series of signals is as follows:—

G.M.T.			Signal.		
h.	m.	s.	h.	m.	s.
7	57	00	to	7	57 50
18	57	55	„	18	58 00
57	55	„	58	00	{ 55 56 57 58 59 60
58	08	„	58	10	{
58	18	„	58	20	{
58	28	„	58	30	{
58	38	„	58	40	{
58	48	„	58	50	{
58	55	„	59	00	{ 55 56 57 58 59 60
59	06	„	59	10	{
59	16	„	59	20	{
59	26	„	59	30	{
59	36	„	59	40	{
59	46	„	59	50	{
7	59	55	„	8	00 00
18	59	55	„	19	00 00

Note.—The error of the Observatory clock is stated never to exceed a few hundredths of a second.

IV.—VISUAL STORM WARNINGS.

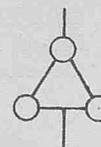
Mozambique.

STORM signals are displayed at Sebastian fort on receipt of information by cable from Mojanda in Madagascar. They consist of warning signals which are hoisted at the northern yard-arm, and are as follows—

By day.



By night.



The lights displayed in the night signal are *white*.

MADAGASCAR.

SIGNALS indicating the localities threatened by a cyclone are exhibited at the following ports: Tamatave, Andovoranto, Vatmandri, Mahanoro Manajari, Farafangana, Fort Dauphin, Tuléar, Ambohibé, Morondava, Maintirano, Namela, Majunga, Analalava, Nosi Bé, Diégo Suarez, Vohemar, Maroantsetra, Dzaudzi, and St. Mary.

The signals, which are made from a flagstaff by a black cylinder and black cones, are as follows:—

Signal.	Locality threatened.
	Between Diégo and Antálaha.
	Between Antálaha and St. Mary.
	Between St. Mary and Vatmandri.

Signal.	Locality threatened.	Signal.	Meaning.
	Between Vatomandri and Mananjari.		Cyclone approaching from the north-eastward.
	Between Mananjari and Farafangana.		Cyclone appears likely to pass at a <i>considerable</i> distance northward of the island.
	Between Farafangana and Fort Dauphin.		Cyclone appears likely to pass a <i>short</i> distance northward of the island.
	Between Diego and Nosi Bé.		Cyclone appears likely to pass southward of the island, travelling from north-eastward to south-westward.
	Between Nosi Bé and Majunga.		Cyclone appears likely to pass southward of the island, travelling from north-westward to south-eastward.
	Between Majunga and Maintirano.		Cyclone appears likely to pass westward of the island, travelling from northward to southward.
	Between Maintirano and Morondava.		Cyclone appears likely to pass eastward of the island.
	Between Morondava and Tuléar.		Cyclone, which had already passed in a northerly direction, appears to have recurved, and is again approaching the island, travelling from N.W. to S.E.
	Between Tuléar and Fort Dauphin.		Barometer rising ; all danger over.
			By Night.
			Vessels should prepare for a storm.
			Cyclone approaching, take all precautions.

and gun fired.

The lights displayed are *white*.

REUNION ISLAND.

CYCLONE signals are displayed at Port des Galets, St. Denis, St. Paul, and St. Pierre signal stations, and also on the Vigie flagstaff, St. Denis, to indicate the probable approach and general track of cyclones in the vicinity of Reunion. The signals are to be taken as a general guide only, to assist mariners in using their own judgment as to the best way of avoiding storms.

The symbols employed (*black*) and their meanings are as follows:—

Signal.	By Day.	Meaning.
		Cyclone expected.

MAURITIUS.

Storm Signals.

DURING the cyclone season, from 1st November to 15th May, annually, a storm signal is hoisted daily, except Sundays and public holidays, at the Port office at Port Louis, to indicate the weather conditions prevailing in the *vicinity* of Mauritius. The storm signal consists of four International Code flags or pennants and a cone.

- The upper flag refers to the quadrant from east to north.
- The second " " " " north to west.
- The third " " " " west to south.
- The fourth " " " " south to east.

(The flags are placed vertically.)

When the signal is headed by a cone the information refers to the area within a circle with a radius of 300 miles.

When the answering pennant is hoisted below the fourth flag it indicates that no information has been received, and that the signal refers to the previous day.

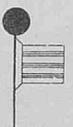
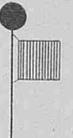
International Code Flags and Pennants used and their meanings.

- A. There are no indications of disturbed weather.
- B. Weather is unsettled, but there are no indications of a cyclonic storm.
- C. Weather is unsettled, and may lead to the formation of a cyclonic storm.
- D. There are indications that a cyclonic storm is forming.
- E. There is distinct evidence of the existence of a cyclonic storm.
- F. The disturbed weather is apparently due to an extra tropical storm to the southward, "Southerly buster."
- G. The weather is clearing, but the sea may still be heavy.
- H. The cyclonic storm is moving south-westward.
- I. The cyclonic storm is moving southward.
- J. The cyclonic storm is moving south-eastward.
- K. The cyclonic storm is moving westward, northward of Mauritius.
- L. The cyclonic storm is moving eastward, southward of Mauritius.

The above signals are made when bad weather is approaching, and it is not safe for any vessel to proceed to sea.

Cyclone Signals.

When bad weather is approaching and precautions are necessary in the harbour, the following cyclone signals are made to vessels in the harbour and roadstead from the flagstaff of the Port office, Port Louis, at the head of the harbour, and repeated from Fort George:—

Signal.	By Day.	Meaning.
		Send down top-gallant yards and prepare for bad weather. The masters of all ships and vessels in this port are required immediately to repair on board their respective vessels, and half the crew should be kept on board; vessels at the Outer anchorage ought to proceed to sea.
		Vessels in the port are to strike lower yards and topmasts. Vessels at the Outer anchorage to go to sea.

Vessels are required to answer the signals by hoisting their national ensign at the main.

Signal.	By Night.	Meaning.
		Vessels at the Outer anchorage to proceed to sea forthwith, and vessels in the port to make every preparation for bad weather.

and gun fired



Blue



Red



Black.

Special Notices regarding Personnel.

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

Captain T. Howell.

Captain THOMAS HOWELL, Commodore Red Star Fleet, and Commander of Red Star Liner *Belgenland*, has retired from active service after 45 years' service at sea, of which 28 years have been spent in command of ships of the INTERNATIONAL MERCANTILE MARINE COMPANY. Captain HOWELL has been a member of the Corps of Voluntary Marine Observers since 1920 and Marine Observers will join with the Marine Division in wishing him long life and happiness in his well-earned retirement.

Captain J. Dove

Captain JOSEPH DOVE, Commander of Messrs. HOULDER BROTHERS S.S. *Royal Transport*, has retired after 55 years at sea.

Serving his apprenticeship in the Barque *Cyrene*, owned by Messrs. G. & M. A. FOREMAN, of Sunderland, Captain DOVE remained in sail until he obtained his Master's Certificate in 1882, when he transferred to steam, commanding the S.S. *Roseville*, owned by Messrs. R. SHADFORTH & Co., of Sunderland.

In 1900 this firm sold their ships and Captain DOVE entered the service of Messrs. RICKINSON SONS & Co., remaining in command of their steamers until 1910, when he transferred to the AGINCOURT STEAMSHIP COMPANY. On his ship being transferred to the Dutch Flag in 1914 he joined the service of Messrs HOULDER BROTHERS, from which Company he has recently retired, having been over 45 years in command, trading to all parts of the World.

A member of the Corps of Voluntary Marine Observers since 1920, Marine Observers will join with the Marine Division in wishing Captain DOVE long life and happiness in his well-earned retirement.

Obituary.

The death of Captain G. PARK of S.S. *Risaldar* at Leysin, Switzerland, on 6th August, 1927, is noted with deep regret.

Born at St. Bees on 26th August, 1879, GILLIOT PARK, who came of a seafaring family, was educated in Liverpool. After spending three years in the Training Ship *Indefatigable* off Rock Ferry, he commenced his sea career on 22nd October, 1895, as an apprentice in Messrs. THOMPSON ANDERSON and Company's Ship *Sierra Segua*, in which ship he completed his time and served for another year as an officer.

On the 1st August, 1900, PARK was appointed 4th Officer of the ASIATIC STEAM NAVIGATION Company's S.S. *Nadir*, and rising through all grades in the steamers of the Company, he obtained command on 4th March, 1911, at the age of 31, of S.S. *Nawab*, and commanded most of the Company's steamers.

During the Great War the ships under Captain PARK's command were employed upon Government service and put up a fine record in the carriage of troops and stores to the different theatres of war.

In 1922 Captain PARK became a Member of the Corps of Marine Observers and did much fine voluntary work in the interests of British Marine Meteorology.

The ships under his command contributed 26 Forms 911, and six Meteorological Logs, of which four were "Excellent." In 1926, Captain PARK wrote and published at his own expense and upon his own responsibility a pamphlet for the guidance and assistance of his brother seamen in Indian Waters, entitled "Bay of Bengal Wireless and Weather an aid to Navigation," which was specially referred to in the August, 1926, number of this Journal.

For many years PARK made a special study of Land Marks, and made sketches of them, his collection, of which samples have been reproduced in THE MARINE OBSERVER, being a very fine one.

Captain G. PARK was an ardent worker in the best interests of the Merchant Service, he did much to encourage the practical application of Marine Meteorology amongst seamen in Indian waters, and his death causes a great loss to the Corps of Voluntary Marine Observers and the Marine Division.

WEATHER CHART, MORNING OF NOVEMBER 7TH, 1923.

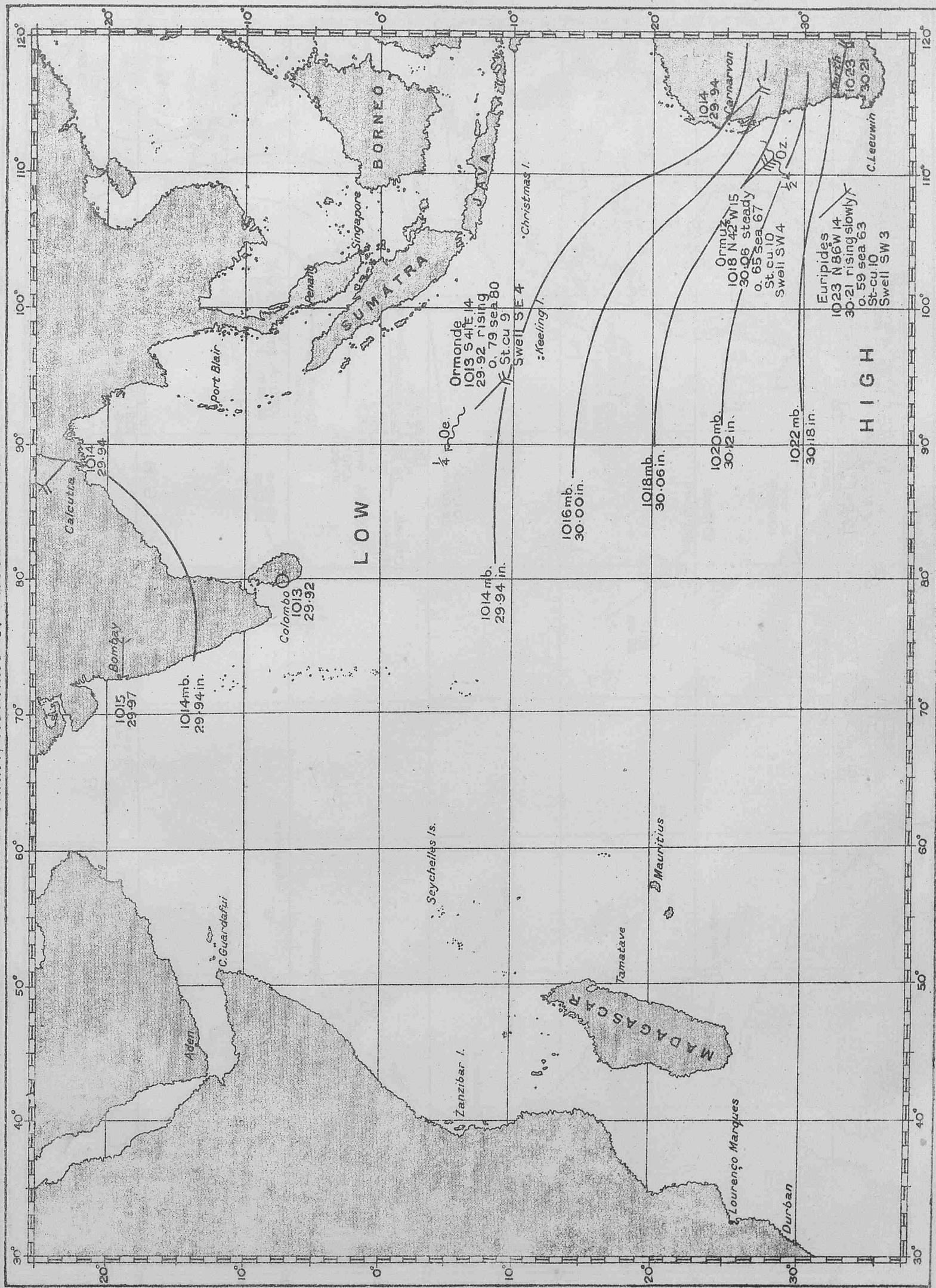


Chart LXI - "WIRELESS AND WEATHER."

WEATHER CHART, MORNING OF NOVEMBER 8TH. 1923.

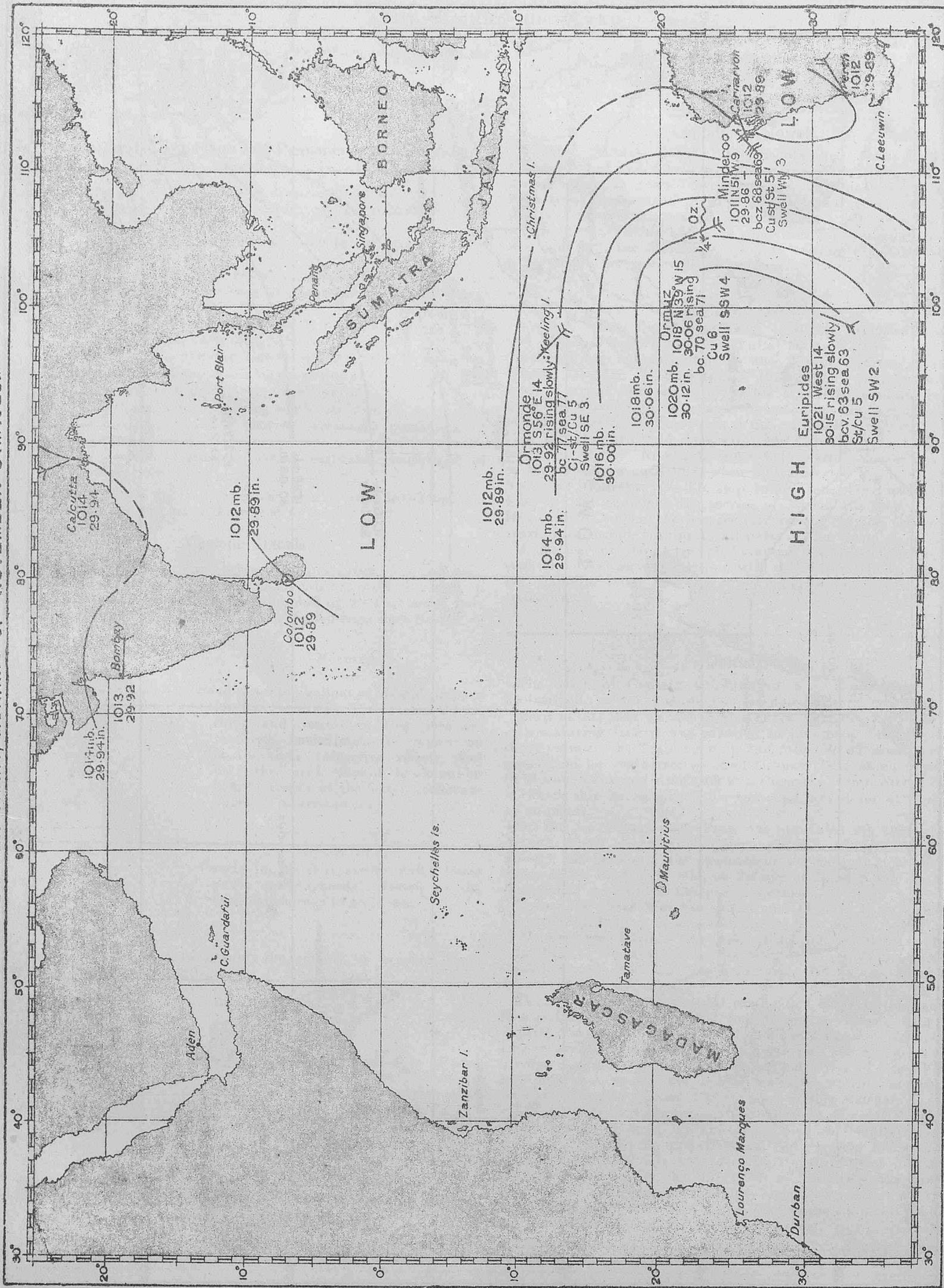


Chart LXII—WIRELESS AND WEATHER.

WEATHER CHART, MORNING OF NOVEMBER 9TH. 1923.

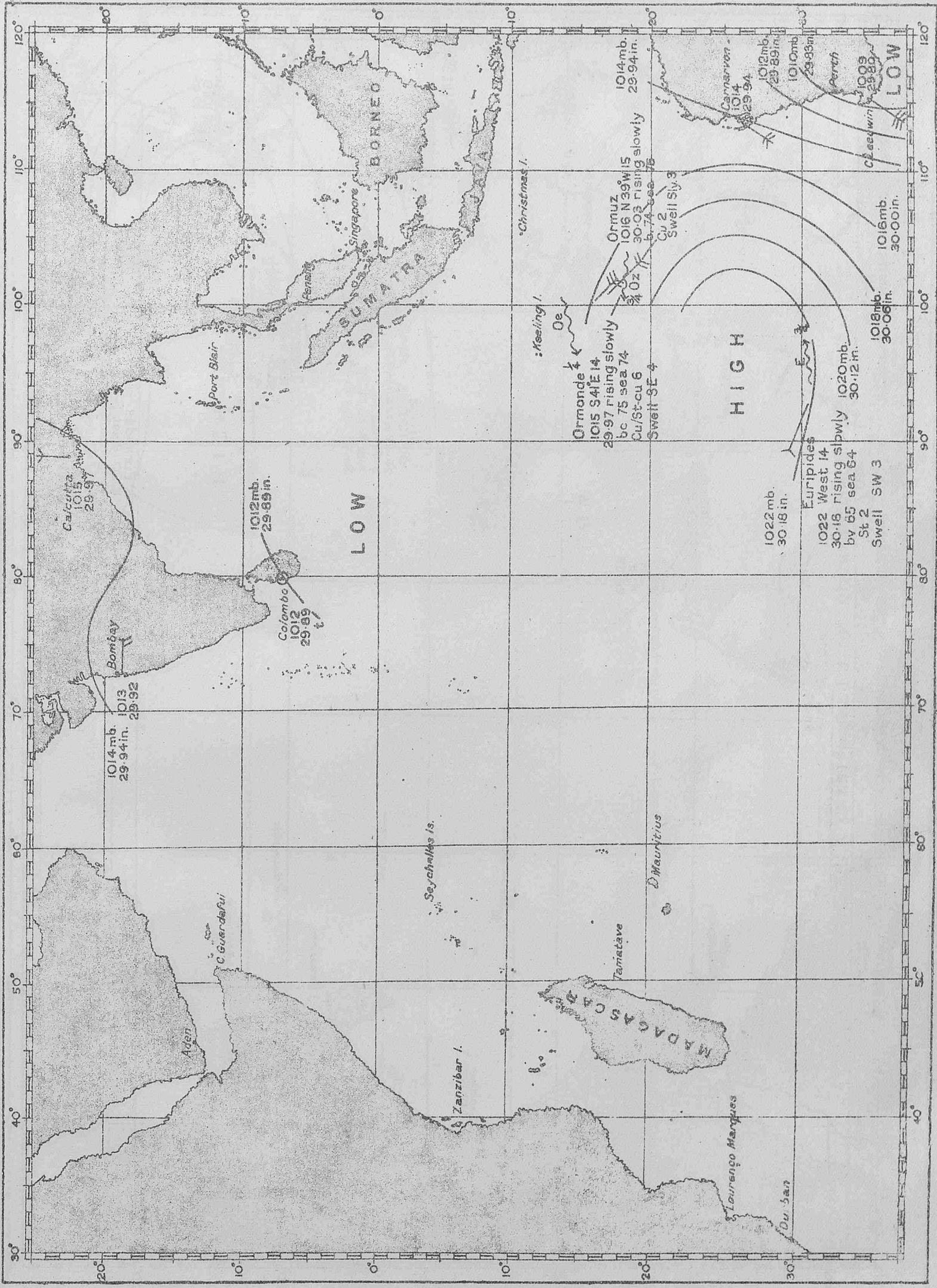


Chart LXIII "WIRELESS AND WEATHER."

WEATHER CHART, MORNING OF NOVEMBER 10TH, 1923.

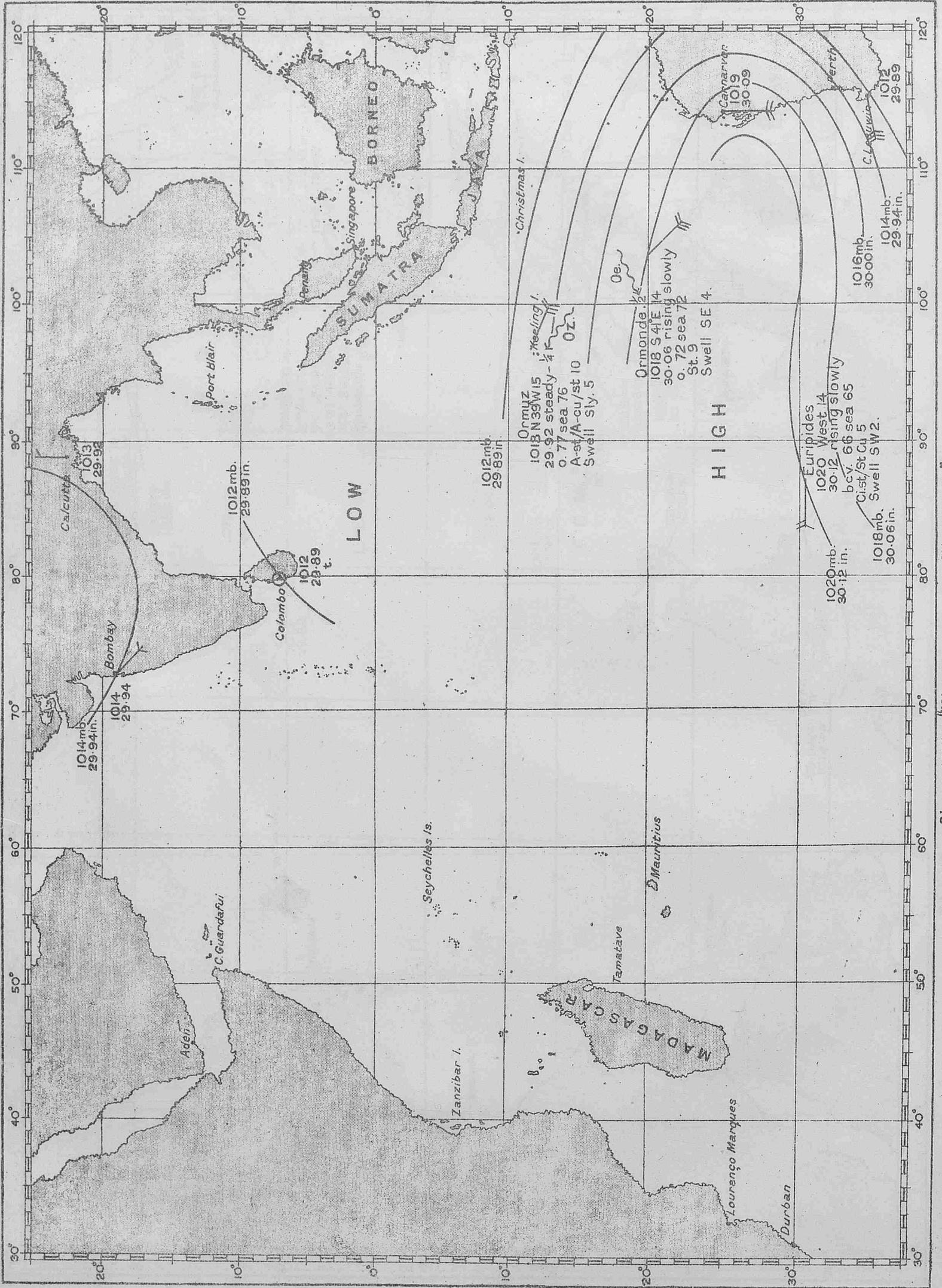


Chart LXIV - "WIRELESS AND WEATHER."

WEATHER CHART, MORNING OF NOVEMBER 12TH. 1923.

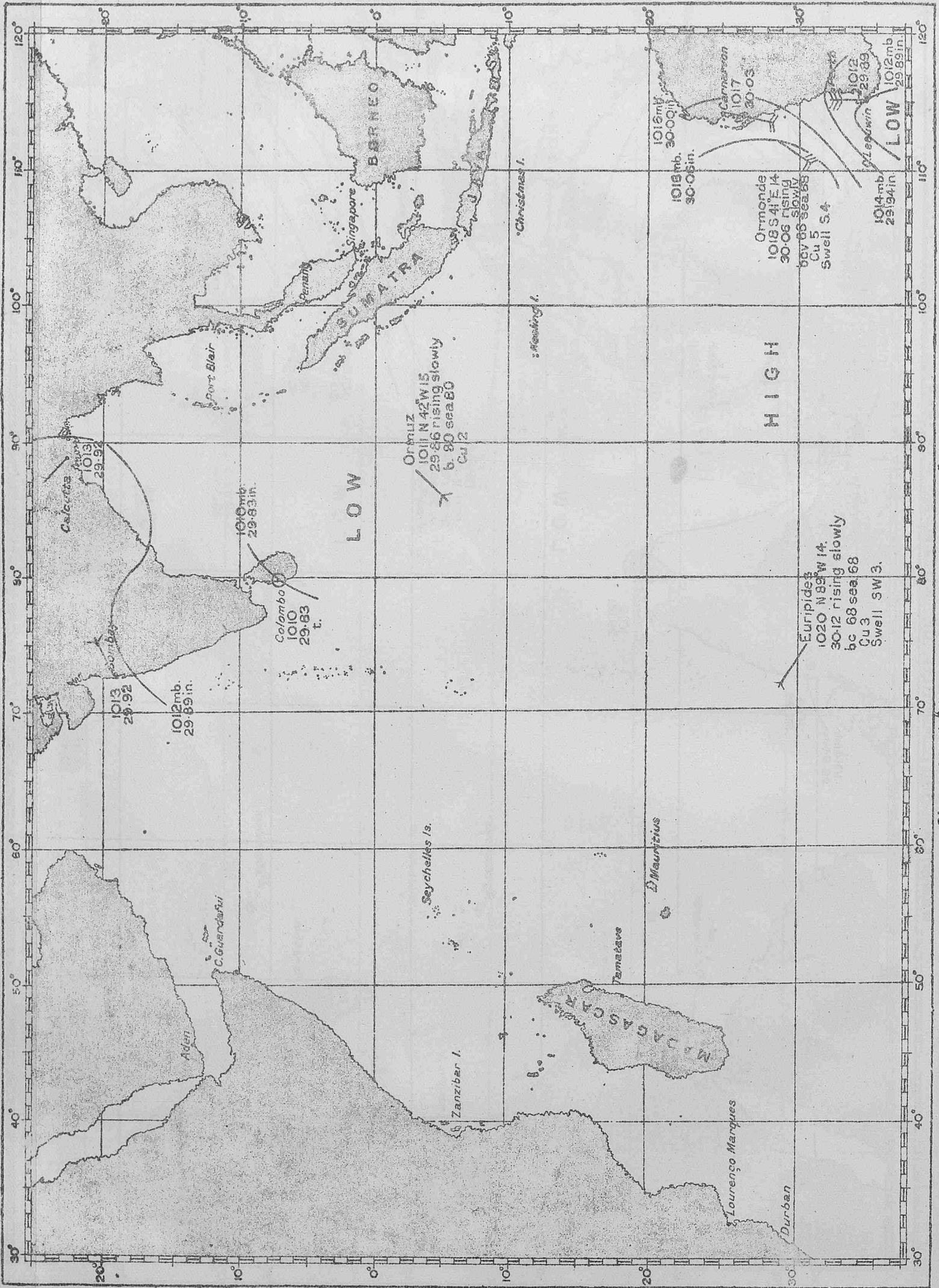


Chart LXVI—WIRELESS AND WEATHER.

CYCLONE IN S.E. TRADE REGION OF THE INDIAN OCEAN—FEBRUARY 1904.

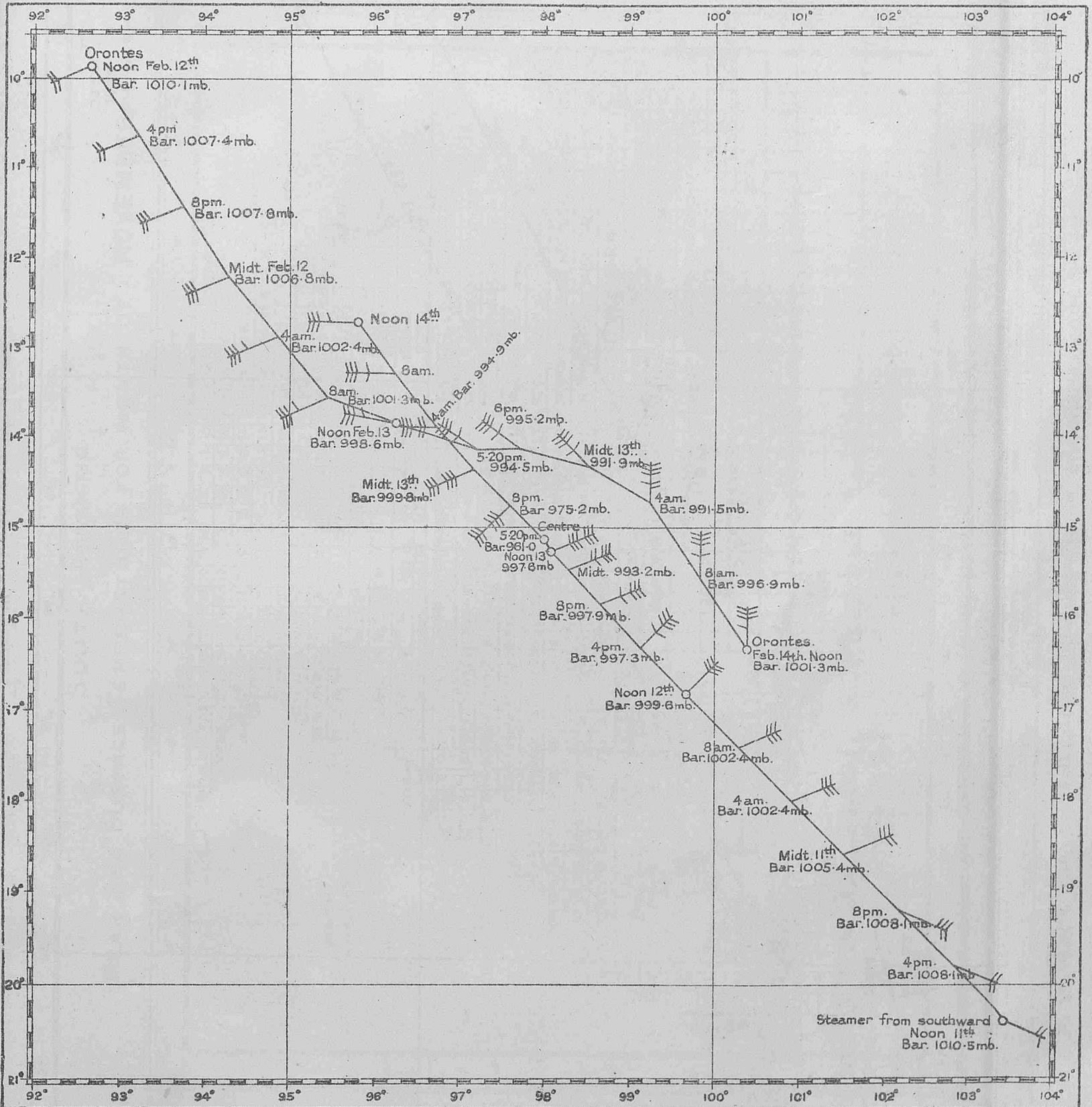
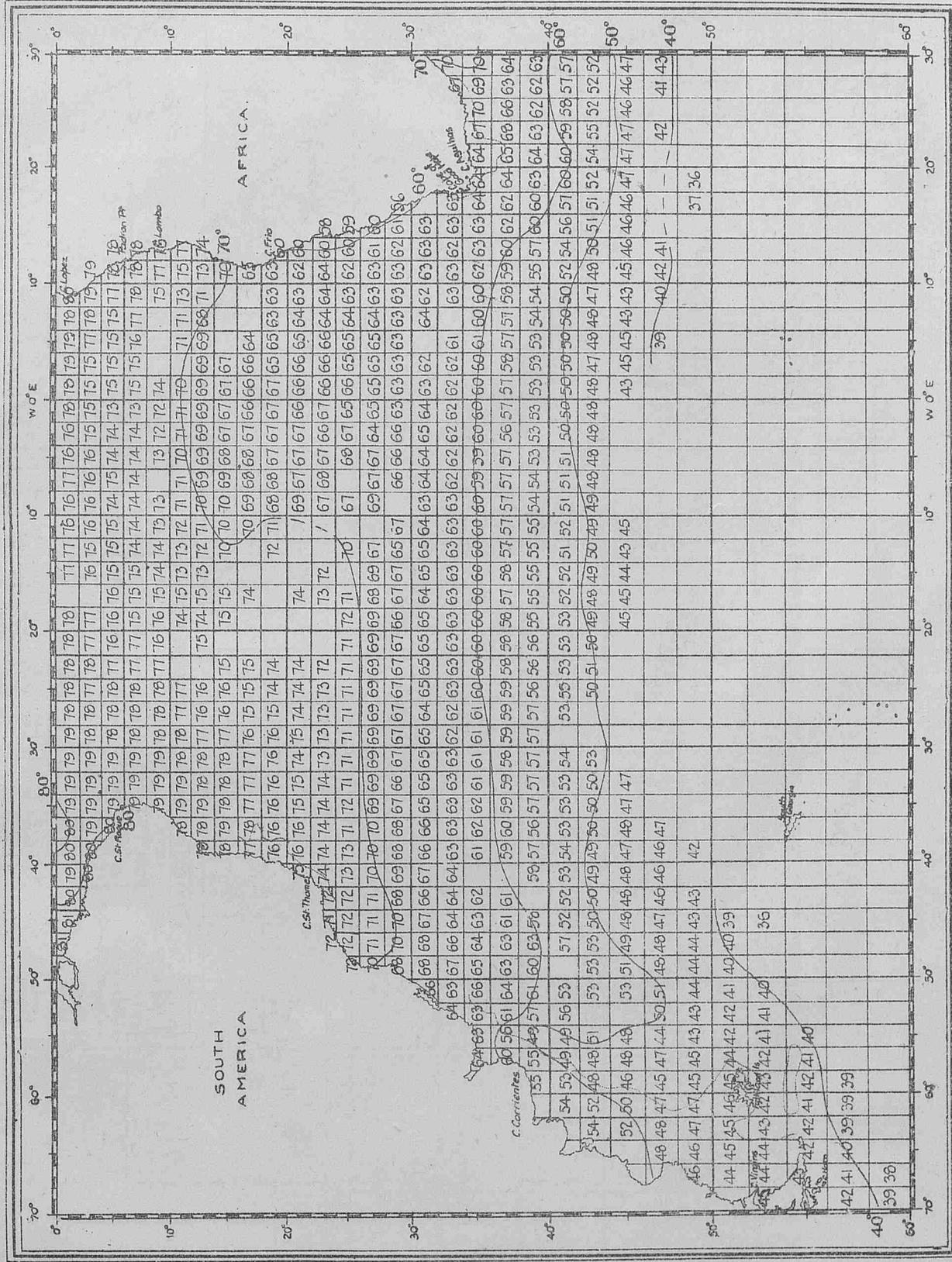


Chart LXVII—"WIRELESS AND WEATHER."

SOUTH ATLANTIC.
MEAN SEA SURFACE TEMPERATURES FOR MONTH OF NOVEMBER,

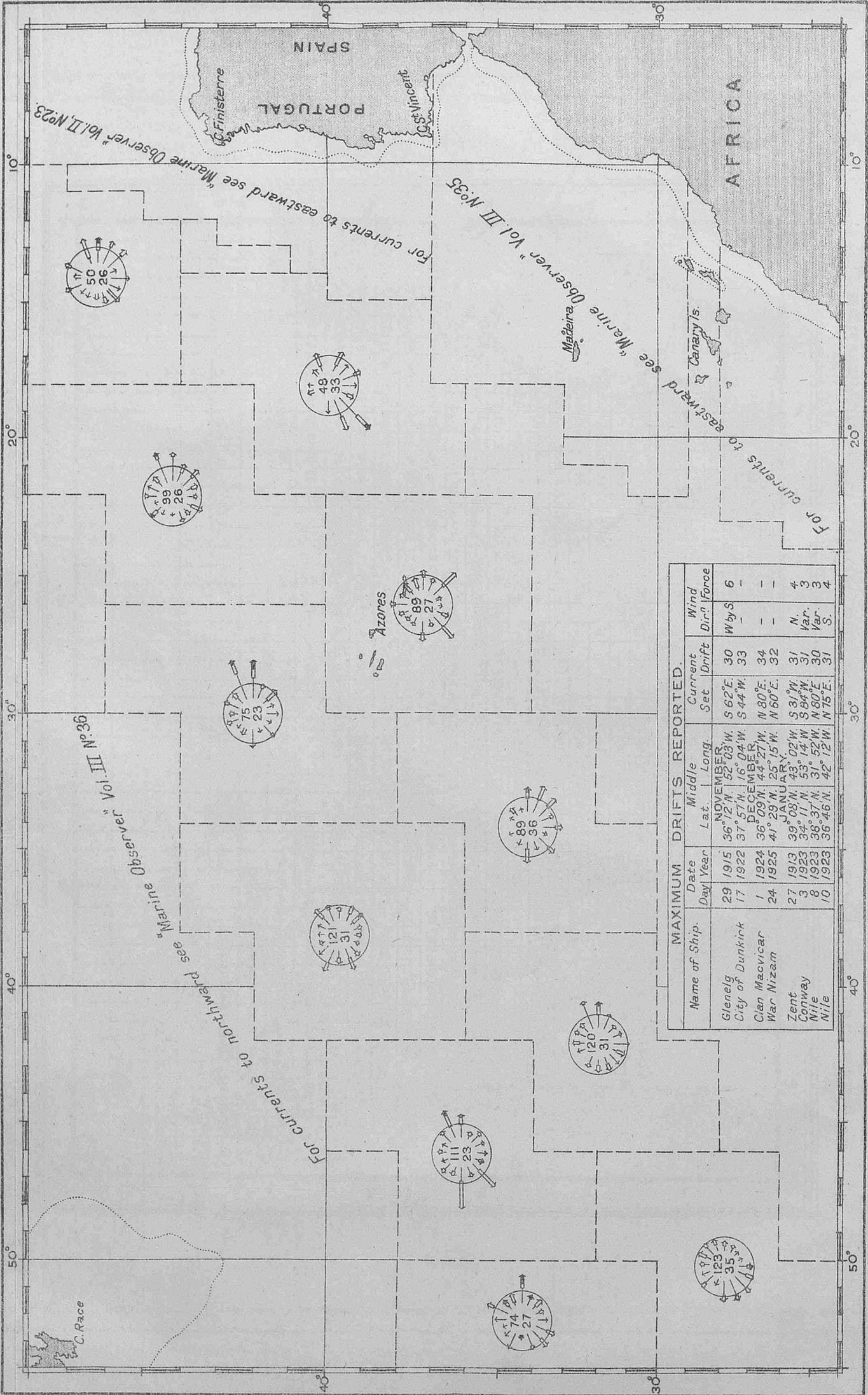


Computed from observations of British ships during the years 1855 to 1899 except to the Southward and Eastward of Latitude 30° South and Longitude 10° East where the observations are for the years 1855 to 1878.

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

NOVEMBER, DECEMBER AND JANUARY.

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



Name of Ship.	MAXIMUM DRIFTS REPORTED.			Current Set.	Current Drift.	Wind Dir. ^o	Wind Force.
	Date Day Year	Lat.	Long.				
Glenelg	29	1915	36° 12' N. 15° 03' W.	S. 62° E.	30	W by S.	6
City of Dunkirk	17	1922	37° 57' N. 16° 04' W.	S. 44° W.	33	-	-
Cian Macvicar	1	1924	36° 09' N. 44° 27' W.	N. 80° E.	34	-	-
War Nizam	24	1925	41° 29' N. 25° 15' W.	N. 60° E.	32	-	-
Zent	27	1913	39° 08' N. 43° 02' W.	S. 31° W.	31	N.	4
Conway	3	1923	34° 11' N. 53° 14' W.	S. 84° W.	31	Var.	3
Nile	8	1923	36° 37' N. 31° 52' W.	N. 80° E.	30	Var.	3
Nile	10	1923	36° 46' N. 42° 12' W.	N. 75° E.	31	S.	4

EXPLANATION OF CURRENT ROSES

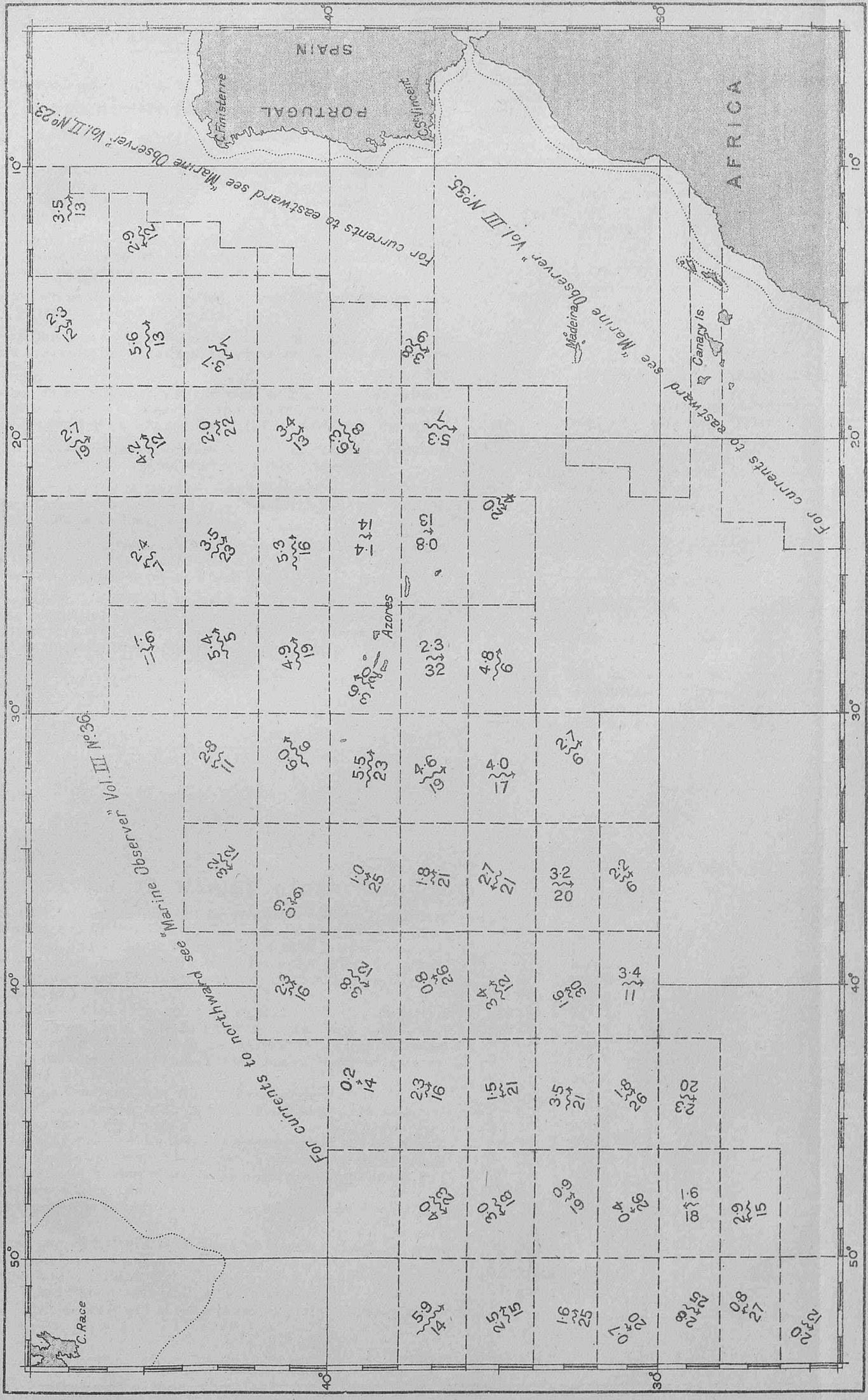
The current roses are drawn from observations within the pecked lines.
Arrows flow with the current, length represents frequency, thickness strength.

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.

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

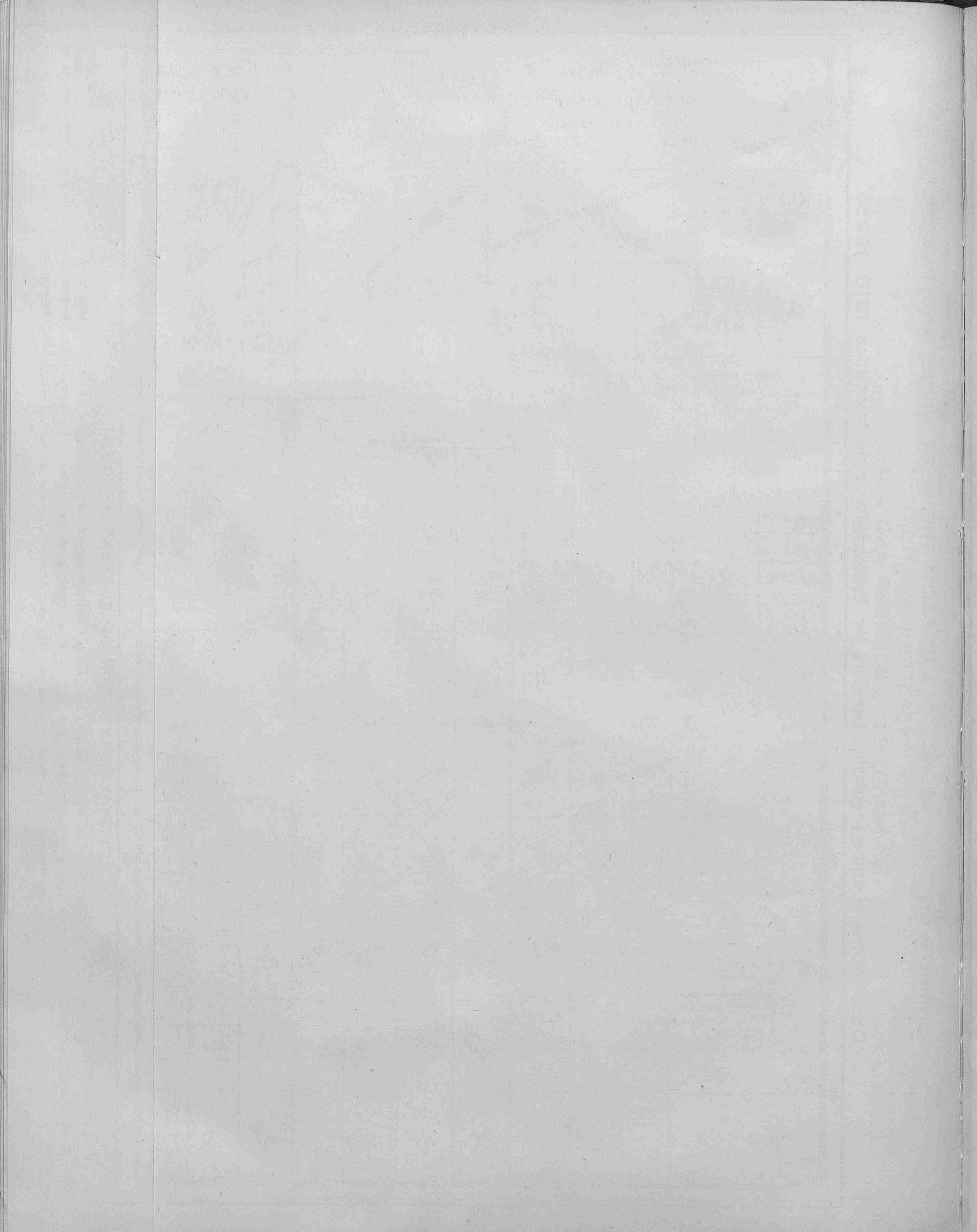
CURRENTS ON THE TRACKS TO AND FROM THE WEST INDIES AND PANAMA. (EASTERN PORTION)

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.



IMPORTANT.

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

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

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

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

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

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

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

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

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

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

SEA AND SWELL MEASUREMENTS.

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

An article will be found in Volume II, No. 19, upon "Sea and Swell" giving suggestions as to how to take these observations and Form 684 has been circulated to all regular observing ships for the purpose. Further supplies of Form 684 may be had on request.

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.

INVITATION TO MARINE OBSERVERS.

The Marine Superintendent will be pleased to see the Captains of Observing Ships or their Observing Officers when they are in London, between 10 a.m. and 4 p.m. at Room 319, Adastral House, Kingsway, W.C.2. Telephone No., Holborn 3434, Extension 421. Telegrams, Marine Superintendent, Weather, London. (Nearest Station, Temple, District Railway.)

Personal touch is not only conducive to efficient work, but by this means we may be better able to advance upon lines which will further the practice of Meteorology in Navigation and at the same time provide the most suitable data for the general needs of Meteorological Science.

Those Marine Observers who do not come to London wishing to discuss matters connected with Marine Meteorology, are asked to consult the Agents at the Ports.

The Marine Agencies in the British Isles are visited at least once a year by the Marine Superintendent, and it is hoped by these means to further promote voluntary co-operation between ships at sea, and with the Meteorological Office.

Usually the Marine Superintendent visits the Marine Agencies as follows:—

- Southampton and Cardiff, first week of March.
- Belfast and Liverpool, last week of May.
- Glasgow and Liverpool, early October.
- Leith, North Shields and Hull, mid November.

Marine Agencies are given about two weeks notice of exact dates.

CONVERSION TABLE.

To Convert Inches into Millibars.

Inch.	mb.	Inch.	mb.	Inch.	mb.
27.50	931.2	28.65	970.2	29.85	1,010.8
27.55	932.9	28.70	971.9	29.90	1,012.5
27.60	934.6	28.75	973.6	29.95	1,014.2
27.65	936.3	28.80	975.3	30.00	1,015.9
27.70	938.0	28.85	976.9	30.05	1,017.6
27.75	939.7	28.90	978.6	30.10	1,019.3
27.80	941.4	28.95	980.3	30.15	1,021.0
27.85	943.1	29.00	982.0	30.20	1,022.7
27.90	944.8	29.05	983.7	30.25	1,024.4
27.95	946.5	29.10	985.4	30.30	1,026.1
28.00	948.2	29.15	987.1	30.35	1,027.7
28.05	949.9	29.20	988.8	30.40	1,029.4
28.10	951.6	29.25	990.5	30.45	1,031.1
28.15	953.2	29.30	992.2	30.50	1,032.8
28.20	954.9	29.35	993.9	30.55	1,034.5
28.25	956.6	29.40	995.6	30.60	1,036.2
28.30	958.3	29.45	997.3	30.65	1,037.9
28.35	960.0	29.50	999.0	30.70	1,039.6
28.40	961.7	29.55	1,000.7	30.75	1,041.3
28.45	963.4	29.60	1,002.4	30.80	1,043.0
28.50	965.1	29.65	1,004.0	30.85	1,044.7
28.55	966.8	29.70	1,005.7	30.90	1,046.4
28.60	968.5	29.75	1,007.4	30.95	1,048.1
		29.80	1,009.1		

ICE CHART. WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE

- (C) From 1st September to 31st January, inclusive.
- (F) From 16th May to Opening of Belle Isle route, and to 30th November when not using Belle Isle route.
- (G) Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race.
- (G) Eastbound, steer from position 25 miles S. of Cape Race.
- (G) From the opening of the Straits of Belle Isle to 14th November.

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

ROUTE NOTICES.

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

SYMBOLS USED ON THE CHART.

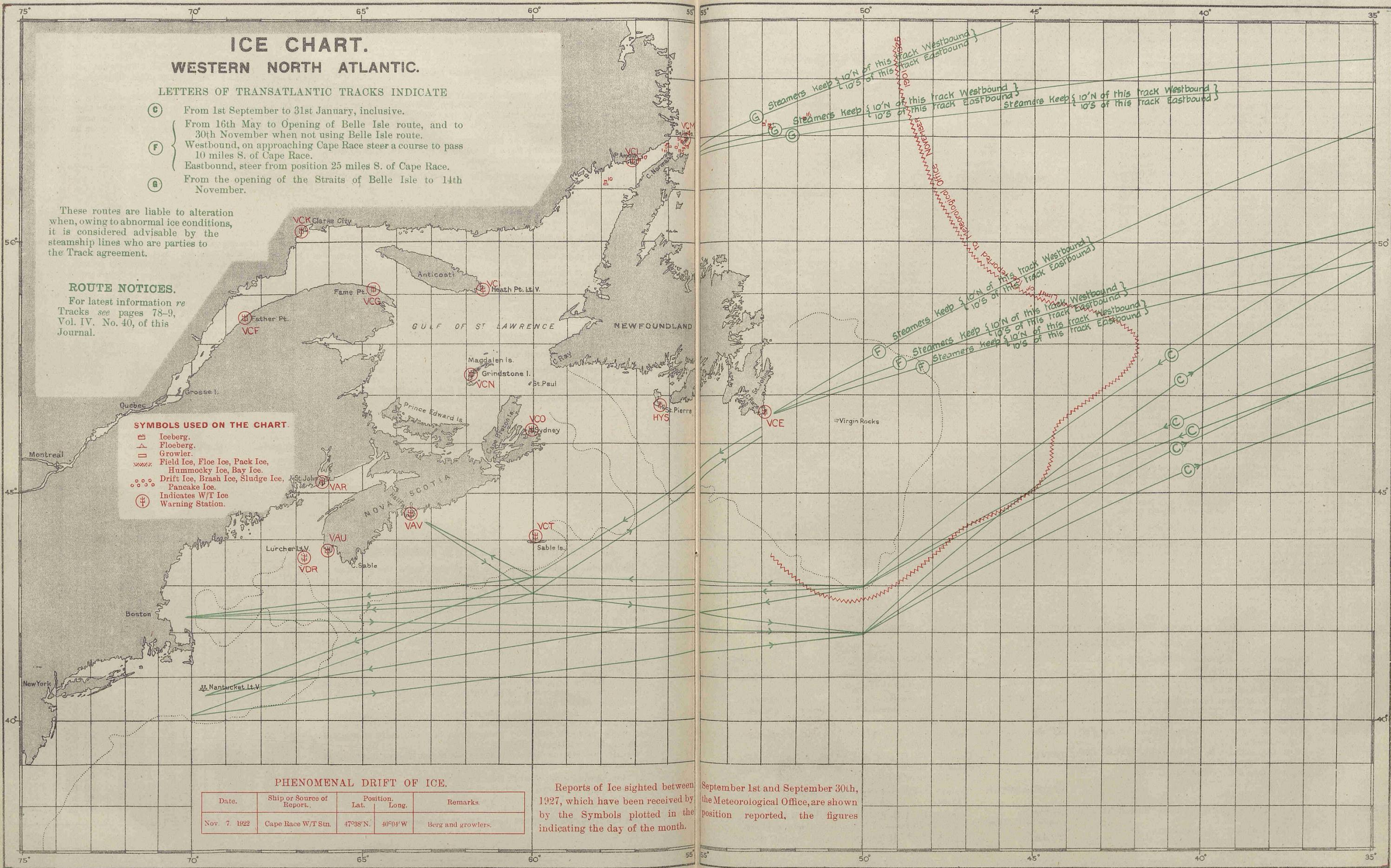
- Iceberg.
- Floeberg.
- Growler.
- Field Ice, Floe Ice, Pack Ice, Hummocky Ice, Bay Ice.
- Drift Ice, Brash Ice, Sludge Ice, Pancake Ice.
- Indicates W/T Ice Warning Station.

PHENOMENAL DRIFT OF ICE.

Date.	Ship or Source of Report.	Position.		Remarks.
		Lat.	Long.	
Nov. 7. 1922	Cape Race W/T Stn.	47°38' N.	40°04' W	Berg and growlers.

Reports of Ice sighted between September 1st and September 30th, 1927, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

Reports of Ice sighted between September 1st and September 30th, 1927, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.



MARINE METEOROLOGY.

Co-operation of Shipowners, Masters and Mates.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

For sample weather report message see pages 15 and 17 of Vol. IV. No. 37

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

LATE PRESS.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
15.9.27	53°10'N.	3°35'E.	Submerged object.
17.9.27	54°10'N.	5°11'E.	Floating iron object, dangerous to navigation.
25.9.27	55° 4'N.	7°28'E.	Top of mast, 6 feet above surface, apparently attached to wreckage.
ENGLISH CHANNEL.			
11.9.27	50°27'N.	0°23'W.	Heavy log, floating vertically as if attached to wreckage; Wreckage.
12.9.27	50°30'N.	1°00'W.	
18.9.27	49°54'N.	2°23'W.	Iron buoy, just awash.
NORTH ATLANTIC.			
2.9.27	26°20'N.	71°28'W.	Can buoy marked "9," floating upright.
3.9.27	36°55'N.	74°11'W.	Piece of wreckage about 100 feet long, awash, apparently small vessel bottom up.
4.9.27	26°17'N.	75°10'W.	Heavy spar about 100 feet long.
5.9.27	37°17'N.	41°04'W.	Heavy wreckage about 30 feet square, awash.
6.9.27	36°03'N.	75°06'W.	Spar about 60 feet long, 2 feet diameter.
6.9.27	28°30'N.	78°27'W.	Large can buoy painted white on top and marked "3."
6.9.27	34°58'N.	75°31'W.	Partly submerged barge, about 100 feet long.
9.9.27	29°02'N.	79°35'W.	Buff painted object.
11.9.27	43°05'N.	58°42'W.	Yellow dory bottom up.
11.9.27	26°12'N.	55°07'W.	Large red spherical buoy, with staff 6 feet high, 2 lanterns attached.
13.9.27	48°40'N.	38°30'W.	Large black conical gas buoy with red lantern attached, rusty and covered with marine growth.
14.9.27	32°48'N.	77°29'W.	Large log about 4 feet in diameter, floating end up.
15.9.27	34°10'N.	75°25'W.	Heavy tree stump projecting about 5 feet out of water.
15.9.27	40°05'N.	38°12'W.	Red gas buoy.
19.9.27	49°50'N.	16°17'W.	Heavy spar about 40 feet long, covered with marine growth, dangerous to navigation.
22.9.27	40°23'N.	37°15'W.	Large section of bottom of wooden vessel about 60 feet long, dangerous to navigation.
23.9.27	30°08'N.	15°38'W.	Large floating object, apparently round buoy.
24.9.27	36°29'N.	26°44'W.	Portuguese 3-masted cutter, <i>San Pedro Gonzales</i> , abandoned, very dangerous to navigation, a ship's boat floating in the vicinity.
25.9.27	53°01'N.	24°48'W.	Submerged wreck, mast about 3 feet above water dangerous to navigation.
CARIBBEAN SEA.			
15.9.27	14°55'N.	67°05'W.	Large tree trunk, partly submerged.
NORTH PACIFIC.			
3.9.27	31°50'N.	130°15'W.	Log about 20 feet long, 3 feet diameter.
4.9.27	32°13'N.	138°01'W.	Small log.
4.9.27	31°56'N.	123°40'W.	Short log about 3 feet diameter.
4.9.27	32°13'N.	136°14'W.	Small log.
5.9.27	35°09'N.	130°59'W.	Small log.

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

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Agents (contd.).

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TYNE Captain J. J. MCEWAN, Marine School, South
Shields.

VANCOUVER,
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LIST OF VOLUNTARY OBSERVING SHIPS

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 16.9.27.	Date Received.
<i>Aba</i> ...	Yardley, H. A., D.S.C.	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
<i>Abinsi</i> ...	Williams, T. E.	E. W. Bascombe	No. A.	" " ...	Form 911 29.12.26 to 23.2.27 ...	3.3.27
<i>Achilles</i> ...	Millon, H. E.	A. Gillard, A. M. Wright, F. B. Allen.	M.L.	A. Holt " ...	Met. Log. 27.12.26 to 1.5.27 ...	10.6.27
<i>Actor</i> ...	Wilson, C. A.	A. Frew, J. McKay, G. Morrice.	"	Harrison ...	" 7.5.27 to 17.8.27 ...	1.9.27
<i>Adda</i> ...	Haylett, E.	A. E. Longlen ...	M.L.	Elder Dempster ...	Form 911 11.5.27 to 19.6.27 ...	22.6.27
<i>50 Adriatic</i> ...	Toft, J. T.	R. G. Roberts, O. V. Lucas ...	W.T.	White Star ...	W.T. Reg. 22.8.27 to 10.9.27 ...	13.9.27
<i>Aeneas</i> ...	Hickson, V. W., Lieut. R.N.R.	E. R. Owen ...	No. A.	A. Holt ...	Form 911 20.8.27 to 30.8.27 ...	9.9.27
<i>Agapenor</i> ...	Wallace, W. K.	S. G. Ellams ...	" A.	" " ...	" 22.7.27 to 25.8.27 ...	8.9.27
<i>Aidan</i> ...	Ramsay, J.	J. S. Thompson ...	" A.	Booth ...	" 13.6.27 to 9.8.27 ...	16.8.27
<i>Alban</i> ...	Pym, J.	" " ...	" A.	" " ...	" 27.7.27 to 9.8.27 ...	6.9.27
<i>Alpore</i> ...	Welsh, A.	D. A. C. Butler ...	" M.	P. and O. ...	" 29.5.27 to 8.8.27 ...	30.8.27
<i>Almanzora</i> ...	Smith, H. E., R.D. Lt.-Commr., R.N.R.	D. O. Llewellyn ...	" A.	R.M.S.P. ...	" 14.5.27 to 27.6.27 ...	29.6.27
<i>Albertic</i> ...	Clarke, E. C.	J. Farrell ...	" A.	White Star ...	" 13.8.27 to 2.9.27 ...	5.9.27
<i>Alondra</i> ...	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	H. Peters ...	" A.	Yeoward ...	" 30.7.27 to 20.8.27 ...	24.8.27
<i>Alpinbank</i> ...	Prendergast, J. J.	Clayton, W. E.	No.	A. Weir & Co. ...	" " ...	" " ...
<i>Ampetco</i> ...	Vandenkerckhove, A.	L. Brachs ...	" A.	American Petroleum ...	" 5.7.27 to 13.8.27 ...	19.8.27
<i>Andaluca</i> ...	Thomas, R. J.	C. W. Vaughan ...	" M.	Blue Star ...	" 21.7.27 to 6.9.27 ...	13.9.27
<i>Anchises</i> ...	Woodgett, R. J.	" " ...	" A.	A. Holt ...	Form 911 27.3.27 to 15.4.27 ...	9.5.27
<i>Andes</i> ...	Smith, W. E.	F. J. Horan ...	" M.	R.M.S.P. Co. ...	" 4.6.27 to 18.7.27 ...	25.7.27
<i>Antiochus</i> ...	Clark, J. W.	O. P. H. Wynne ...	" A.	A. Holt ...	" 16.6.27 to 5.7.27 ...	9.8.27
<i>Aorangi</i> ...	Crawford, R.	G. H. Kime, E. Anderson, C. G. Eustace, D. Richards, J. L. Crossdaile, J. Locke, D. MacLean.	M.L.	Canadian-Australasian Cunard ...	Met. Log. 15.12.26 to 26.5.27 ...	16.6.27
<i>30 Aquitania</i> ...	McNeil, S. G. S., R.D., Capt. R.N.R.	J. M. Appleby, W. Jackman, J. S. Butchard.	W.T.	White Star ...	W.T. Reg. 14.8.27 to 30.8.27 ...	1.9.27
<i>62 Arabic</i> ...	Bulman, J. B.	G. C. Smith, R. Lloyd Harry, C. G. Knight, B. W. Dun, D. Aitchison, A. C. Jones, J. Jackson.	"	" " ...	" 22.8.27 to 10.9.27 ...	12.9.27
<i>Arafura</i> ...	Gordon, A. S.	" " ...	M.L.	Eastern and Australian Shaw, Savill and Albion ...	Met. Log. 28.1.27 to 26.4.27 ...	18.6.27
<i>Arava</i> ...	Summers, W. G.	" " ...	"	" " ...	" 30.3.27 to 28.7.27 ...	11.8.27
<i>Archimedes</i> ...	Downs, E. B.	E. R. Hartley ...	No. A.	Lampont & Holt ...	Form 911 19.6.27 to 8.7.27 ...	13.8.27
<i>Argyllshire</i> ...	Wallace, J.	J. M. Crone ...	" M.	Federal ...	" 22.4.27 to 12.5.27 ...	2.6.27
<i>Ariguani</i> ...	Scudamore, J. H. H., D.S.C., R.D., Commr., R.N.R.	J. W. Kendal ...	M.L.	Elders & Fyffes ...	Met. Log. 15.1.27 to 14.5.27 ...	4.7.27
<i>Armada Castle</i> ...	Owen, S. H.	A. B. Connon, G. D. Pennick, L. G. May.	"	Union Castle ...	" 31.10.26 to 24.4.27 ...	9.5.27
<i>Arracan</i> ...	Imlah, C. B.	R. McInnes, G. B. Christie, C. C. Weir.	"	P. Henderson ...	" 22.5.26 to 3.12.26 ...	4.4.27
<i>Arundel</i> ...	Willis, M.	Mr. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 15.9.27 ...	15.9.27
<i>Arundel Castle</i> ...	Short, H.	R. May ...	No. A.	Union Castle ...	Form 911 23.7.27 to 11.9.27 ...	13.9.27
<i>Astronomer</i> ...	George, J., O.B.E.	A. Brown, J. Glen, A. Thompson	M.L.	Harrison ...	Met. Log. 22.1.27 to 20.6.27 ...	28.6.27
<i>Ascanius</i> ...	Richards, J.	" " ...	" A.	A. Holt ...	" " ...	" " ...
<i>Athenis</i> ...	Agnew, J.	W. Hill ...	No. A.	White Star ...	Form 911 31.7.27 to 7.9.27 ...	12.9.27
<i>Atreus</i> ...	Binks, J. W.	F. A. Brown ...	" A.	A. Holt ...	" 26.6.27 to 29.7.27 ...	19.8.27
<i>Atsuta Maru</i> ...	Salter, G. H.	A. Hurakami ...	" A.	Nippon Yusen Kaisha ...	" 12.2.27 to 13.6.27 ...	17.6.27
<i>Auditor</i> ...	Shibutami, S.	T. E. Steel ...	" M.	Harrison ...	" 2.7.27 to 22.7.27 ...	3.8.27
<i>Autolyceus</i> ...	Owen, W. T.	" " ...	" A.	A. Holt ...	" " ...	" " ...
<i>Ausonia</i> ...	Dunlop, J. K.	" " ...	" A.	Cunard ...	Form 911 26.6.27 to 31.7.27 ...	16.8.27
	Stafford, W., D.S.C., R.D., Lt.-Commr., R.N.R.	" " ...	" A.			

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 18.9.27.	Date Received.
Avon	Hannam, F. S. ...	E. S. Dunch	No. M.	R.M.S.P.	Form 911 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	Summers, F. F., R.D., Commr., R.N.R.	J. W. Paine, J. Boyce, J. Law	W.T.	White Star	W.T. Reg. 8.8.27 to 27.8.27	1.9.27
Bampton Castle	Hutchings, A. H. ...	J. F. H. Coombes	No. A.	Union Castle	Form 911 7.8.27 to 27.8.27	1.9.27
Banbury Castle	Swiney, W. A.	C. G. Cuthbertson	" A.	" " " " " " " " " " " "	" " 18.6.27 to 20.7.27	15.8.27
Banffshire	Wynne, R. H.	W. F. Lockhead	" A.	Turnbull Martin	" " 21.4.27 to 9.5.27	9.6.27
Baradine	Rollo, W.	S. Gibson, C. Bowden, J. Alleyne, D. Buckley.	M.L.	P. & O. Branch	Met. Log. 19.7.27 to 28.7.27	6.8.27
Barpeta	Strachan, J.	B. R. Faithfull	No. M.	British India	Form 911 13.7.27 to 11.8.27	5.9.27
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.	" " 14.5.27 to 5.6.27	24.6.27
59 Belgenland	Morehouse, W. A. ...	C. J. Murray, F. Clitty ...	W.T.	Red Star	W.T. Reg. 15.8.27 to 3.9.27	5.9.27
Bellana	Allin, C. H. C.	F. Ardern	No. M.	P. & O. Branch	Form 911 10.8.27 to 3.9.27	5.9.27
Benalder	Cole, J. H., D.S.C. ...	" " " " " " " " " " " "	" A.	Ben Line	" " 23.6.27 to 19.7.27	9.8.27
Bendigo	Nicholl, R. N. C. ...	J. Young	" M.	P. & O. Branch	" " 3.7.27 to 15.7.27	25.7.27
Benefactor	Jones, C. W.	A. Watson	" M.	Harrison	" " 4.2.27 to 18.3.27	24.3.27
Bengloe	" " " " " " " " " " " "	" " " " " " " " " " " "	No.	Ben Line	" " 21.8.27 to 1.9.27	9.9.27
31 Berengaria	Rostron, A. H., Sir, K.B.E., R.D., Capt. R.N.R.	J. A. Myles, W. C. A. Robson, E. W. Connell.	W.T.	Cunard	W.T. Reg. 31.7.27 to 16.8.27	19.8.27
Berrima	Short, C. E.	T. Ferguson	No. M.	P. & O. Branch	Form 911 22.8.27 to 5.9.27	9.9.27
Berwyn	McCombie, G.	D. Dunn	" A.	Canadian Pacific	" " 4.8.26 to 5.12.26	7.12.26
Bitang	Morzer Bruyns, M. F.	M. C. Altins	" M.	Nederland	" " 23.1.27 to 19.3.27	24.3.27
Bogota	Pape, E. R.	S. E. Ayland	" M.	R.M.S.P. Co.	" " 26.2.27 to 25.3.27	29.3.27
Bolingbroke	Murray, M. F.	J. B. Hewson, F. G. Webster, N. Scallon, R. Davidson.	M.L.	Canadian Pacific	Met. Log. 24.7.27 to 1.8.27	19.8.27
Borda	Holland, R.	" " " " " " " " " " " "	No. M.	P. & O. Branch	Form 911 16.9.26 to 13.2.27	9.6.27
Bothwell	Rothwell, A. J.	— Biggs	" A.	Canadian Pacific	" " 18.2.27 to 28.6.27	7.7.27
Brecon	Rothwell, A.	E. H. Coleman	" A.	Canadian Pacific	" " 6.3.27 to 14.4.27	20.4.27
Brenda	Lamont, A.	N. Ross	" A.	Scottish Fishery Board	" " 5.5.27 to 6.6.27	14.6.27
Brighton	Hill, A.	Mr. Munton	C.C.	Southern Railway	" " 1.8.27 to 31.8.27	15.9.27
British Advocate	Taylor, R. J.	E. Williams	No. M.	British Tankers	Telegraphic Report 16.9.27	16.9.27
British Engineer	Joures, F. W.	W. Evans	" M.	" " " " " " " " " " " "	Form 911 17.4.27 to 26.8.27	1.9.27
British Enterprise	Putt, R. O.	T. Seaman	" M.	" " " " " " " " " " " "	" " 11.2.27 to 26.2.27	25.5.27
British Soldier	Putt, R. O.	H. J. Crangle	" A.	" " " " " " " " " " " "	" " 30.4.27 to 18.7.27	5.8.27
Bronze	Crappier, J. S.	W. Jones, C. E. Legg	" A.	Lampart & Holt	Form 911 17.11.26 to 10.12.26	3.1.27
Burma	Reid, R. B.	J. Henderson	" A.	Henderson	" " 5.6.27 to 1.7.27	8.8.27
Cambria C.S.	Sherwood, C. A., D.S.C.	A. J. English, B. C. Farrow, C. F. St. John.	No.	Eastern Tel. Co.	" " 24.7.26 to 10.10.26	29.10.26
Cambria	Telfer, J. E., O.B.E. ...	V. S. Phillips	C.C.	L.M. & S. Rly	Telegraphic Report 10.9.27	10.9.27
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. Mer- cantile Marine.	Form 911 21.6.27 to 24.7.27	11.8.27
Canadian Inventor	Boulton, F. W.	O. Dalcorn	" A.	" " " " " " " " " " " "	" " 13.2.27 to 2.6.27	9.6.27
Canadian Scottish	Wallace, C.	" " " " " " " " " " " "	" A.	" " " " " " " " " " " "	" " 26.5.27 to 11.7.27	19.8.27
Canadian Skir- misher	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	" " 24.7.27 to 13.8.27	12.9.27
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. 7.8.27 to 26.8.27	29.8.27
Carnarvon Castle	Hague, J. W., Commr., R.N.R.	B. Simpson, H. A. Causton, G. Gorringe, H. A. Deller.	M.L.	Union Castle	Form 911 7.8.27 to 26.8.27	30.8.27
34 Caronia	Strong, H., R.D., Commr., R.N.R.	P. F. Collins, H. G. Hayward.	W.T.	Cunard	Met. Log. 29.4.27 to 21.8.27	27.8.27
Casanare	Hossack, W. H., R.D., Capt., R.N.R.	R. O. Jones	No. A.	Elders & Fyffes	W.T. Reg. 1.8.27 to 19.8.27	25.8.27
Cavina	Steidelmann, H.	W. J. Dodd	" A.	" " " " " " " " " " " "	Form 911 1.8.27 to 19.8.27	25.8.27
52 Cedric	Riseley, A. D.	S. S. Fieldwood, D. W. Cham- berlain, F. Patchett.	W.T.	White Star	" " 25.6.27 to 11.9.27	16.9.27
53 Celtic	Smith, R. G.	J. Peters, T. Pratt, A. Thompson.	"	" " " " " " " " " " " "	W.T. Reg. 1.8.27 to 2.9.27	6.9.27
Centaur	Rose, A. F.	L. Johnstone	No. M.	A. Holt & Co.	Form 911 14.8.27 to 4.9.27	7.9.27
Ceramic	Roberts, J., C.B.E., D.S.O., R.D., Capt., R.N.R.	H. J. Yates	" A.	White Star	Form 911 31.7.27 to 28.8.27	24.8.27
Changte	Gambrill, F. C.	J. Thomas, D. D. Tyer, J. A. Allan.	M.L.	Yuill & Co.	Form 911 31.7.27 to 20.8.27	24.8.27
Changuinola	Thorburn, R. A.	W. G. Chanter, M. H. Thomson.	No. A.	Elders & Fyffes	" " 22.12.26 to 2.2.27	14.3.27
China	Furlong, G. H. S., R.D., Capt., R.N.R.	M. K. Stone	No. M.	P. & O.	Met. Log. 14.4.27 to 20.5.27	21.5.27
Chindwara	Brooks, E. G.	J. J. Smith	" M.	British India	Form 911 8.10.26 to 27.10.26	15.11.26
Chindwin	Esslemont, C.	W. D. Tulloch	" A.	Henderson	" " 20.11.26 to 28.11.26	29.12.26
Chirripo	McColm, F.	A. Beatson, E. H. Roulledge, H. C. Snow.	No.	Elders & Fyffes	" " 22.1.27 to 8.4.27	13.4.27
City of Baroda	McMillan, J.	C. G. Inglis	M.L.	Ellerman	Met. Log. 1.8.27 to 2.9.27	6.9.27
City of Benares	Anderson, W. W.	D. W. F. Reilly	No. A.	" " " " " " " " " " " "	Form 911 19.7.27 to 19.8.27	12.9.27
City of Brisbane	Seaborne, F. O., D.S.C.	W. F. Munro	" A.	" " " " " " " " " " " "	" " 19.5.27 to 15.6.27	21.6.27
City of Canterbury	Bremner, D. M.	H. A. Hazell	" A.	" " " " " " " " " " " "	" " 1.5.27 to 22.5.27	9.6.27
City of Carlisle	Mordue, J. A.	N. G. Fraser	No. M.	" " " " " " " " " " " "	Met. Log. 21.9.26 to 5.2.27	23.2.27
City of Chester	Letton, F. W.	S. J. Nash	" A.	" " " " " " " " " " " "	Form 911 17.2.27 to 9.4.27	13.4.27
City of Edinburgh	Wyper, J.	" " " " " " " " " " " "	"	" " " " " " " " " " " "	" " 26.6.27 to 30.8.27	1.9.27
City of Hong Kong	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	J. McHattie	" A.	" " " " " " " " " " " "	" " " " " " " " " " " "	" " " " " " " " " " " "
City of London	Parker, F. W., R.D., Commr., R.N.R.	E. R. Wildermoth, R. H. Stewart, G. T. Willet.	M.L.	" " " " " " " " " " " "	Form 911 26.2.27 to 8.5.27	28.5.27
City of Rangoon	Jones, P.	" " " " " " " " " " " "	"	" " " " " " " " " " " "	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

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.9.27.	Date Received.
<i>Clan Alpine</i> ...	Lyall, A. B. ...	H. J. Winchester ...	No. A.	Clan ...	Form 911 17.6.27 to 6.7.27 ...	10.8.27
<i>Clan Lamont</i> ...	Urquhart, P., D.S.O.	P. de Gruchy ...	" A.	" ...	" 10.7.27 to 24.7.27 ...	22.8.27
<i>Clan Lindsay</i> ...	Worthington, J. H. ...	E. P. Smith ...	" A.	Clan ...	" 26.5.27 to 11.6.27 ...	20.6.27
<i>Clan Macbeth</i> ...	Young, A. H., R.D., Lieut. - Comdr. R.N.R.	J. M. Lorimer ...	" A.	" ...	" 18.6.27 to 11.7.27 ...	13.8.27
<i>Clan Macfadynen</i> ...	Stenson, F. J. R.D., Capt. R.N.R.	H. M. Wavell ...	" A.	" ...	" 25.3.27 to 23.4.27 ...	27.4.27
<i>Clan Macgillivray</i> ...	West, W. F. ...	R. W. Roberts ...	" A.	" ...	" 27.4.27 to 24.5.27 ...	20.6.27
<i>Clan Macindoe</i> ...	West, W. F. ...	D. McAllister ...	" A.	" ...	" 3.8.27 to 27.8.27 ...	30.8.27
<i>Clan Mackellar</i> ...	Smith, W. P. ...	G. A. A. Grant ...	" A.	" ...	" 30.7.27 to 12.8.27 ...	5.9.27
<i>Clan Mackinnon</i> ...	McComish, A. B. ...	W. F. Isaac, G. E. G. Davey, J. W. Innes.	M.L.	" ...	Met. Log. 21.12.26 to 5.5.27 ...	13.5.27
<i>Clan Macphee</i> ...	Gourlay, J. B. ...	D. S. Rae, A. F. Martin, W. A. Shewan.	"	" ...	" 14.5.26 to 2.5.27 ...	9.6.27
<i>Clan Macnaughton</i> ...	Simpson, A. W. ...	F. Cossar ...	No. A.	" ...	Form 911 8.6.27 to 27.6.27 ...	3.8.27
<i>Clan Mactaggart</i> ...	Mee, F. T. ...	S. A. Carter, R. J. Richardson	" A.	" ...	" 9.4.27 to 16.5.27 ...	21.5.27
<i>Clan Macwhirter</i> ...	Waterhouse, J. ...	W. A. Robbie, E. A. Brown, D. Timms.	M.L.	" ...	Met. Log. 11.2.27 to 15.8.27 ...	23.8.27
<i>Clan Macwilliam</i> ...	Thompson, W. ...	T. B. Cranwill ...	No. A.	" ...	Form 911 7.12.26 to 20.6.27 ...	11.7.27
<i>Clan Malcolm</i> ...	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
<i>Clan Morrison</i> ...	Porterfield, W. M. ...	L. C. Higgins ...	No. A.	" ...	Form 911 5.7.27 to 2.8.27 ...	3.8.27
<i>Clan Murdoch</i> ...	Miller, W. ...	H. F. M. Preston ...	" A.	" ...	" 13.7.27 to 18.8.27 ...	12.9.27
<i>Clan Ranald</i> ...	Laird, C. ...	" ...	" A.	" ...	" 18.7.27 to 10.8.27 ...	15.9.27
<i>Clan Ross</i> ...	Openshaw, L. G. ...	H. T. Booth ...	" A.	" ...	" 8.7.27 to 27.7.27 ...	23.8.27
<i>Clan Sinclair</i> ...	George, L. S. ...	N. Macleod ...	" A.	" ...	" 8.6.27 to 30.7.27 ...	9.8.27
<i>Clan Urquhart</i> ...	Baker, E. W. ...	E. A. Hewson ...	" A.	" ...	" 8.2.27 to 8.5.27 ...	12.5.27
<i>Colonia, C.S.</i> ...	Carlton, G. F., O.B.E., Commr. R.N.R.	W. E. Allen, W. F. Anderson, F. B. Bolingbroke.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 4.12.26 to 25.2.27 ...	8.3.27
<i>Colonian</i> ...	Gittins, R. P. ...	" ...	No. A.	Leyland ...	Form 911 23.7.27 to 16.8.27 ...	22.8.27
<i>Comorin</i> ...	Miller, E. C. ...	E. C. White ...	" M.	P. & O. ...	" 18.6.27 to 28.7.27 ...	5.9.27
<i>Concordia</i> ...	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
<i>Corinthic</i> ...	Hart, F. ...	E. Burt, M. Bennett, S. A. Macnaughton.	"	White Star ...	" 24.4.27 to 6.8.27 ...	10.8.27
<i>Cornwall</i> ...	Haines, F. P. ...	H. S. White ...	No. A.	Federal ...	Form 911 26.1.27 to 28.2.27 ...	12.4.27
<i>Craftsman</i> ...	Gibbins, W. ...	J. Williams ...	" A.	Harrison ...	" 20.7.27 to 9.8.27 ...	30.8.27
<i>Crawford Castle</i> ...	Morgan, A. O., R.D., Commr. R.N.R.	J. A. Wilson ...	" A.	Union Castle ...	" 12.5.27 to 30.6.27 ...	7.7.27
<i>Culebra</i> ...	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
<i>Cumbertland</i> ...	Macmillan, D. ...	J. D. Marks ...	No. A.	Federal ...	Form 911 13.7.27 to 20.8.27 ...	26.8.27
<i>Cuthbert</i> ...	Barlow, F. P. ...	" ...	" A.	Booth ...	" 25.6.27 to 16.7.27 ...	3.8.27
<i>Cyclops</i> ...	Cosker, W. ...	J. R. C. Evans ...	" A.	A. Holt ...	" 13.6.27 to 15.7.27 ...	15.8.27
<i>Dardanus</i> ...	Williams, D. T. ...	A. S. Holland ...	" A.	" ...	" 27.8.27 to 6.9.27 ...	16.9.27
<i>Darian</i> ...	Masters, W. ...	" ...	" A.	Leyland ...	" 13.8.27 to 25.8.27 ...	8.9.27
<i>Darro</i> ...	Matthews, G. P. ...	W. Halder-Campe ...	" M.	R.M.S.P. Co. ...	" 28.5.27 to 22.7.27 ...	25.7.27
<i>Demerara</i> ...	Shillitoe, B., R.D., Commr. R.N.R.	J. R. Baty ...	" M.	" ...	" 17.5.27 to 7.7.27 ...	14.7.27
<i>Demosthenes</i> ...	Ogilvy, A. ...	J. Cruickshank ...	" M.	Aberdeen ...	" 27.6.27 to 11.7.27 ...	3.8.27
<i>Desado</i> ...	Purvis, A. ...	" ...	" M.	R.M.S.P. Co. ...	" 11.6.27 to 6.8.27 ...	16.8.27
<i>Desna</i> ...	Green, J. ...	A. F. Walker ...	" M.	" ...	" 3.12.26 to 19.1.27 ...	31.1.27
<i>Deucalion</i> ...	Melling, C. F. ...	R. Wilson ...	" A.	A. Holt ...	" 28.5.27 to 20.6.27 ...	11.7.27
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	" C.C.	Southern Railway ...	Telegraphic Report 19.3.27 ...	19.8.27
<i>Dimboola</i> ...	Lloyd, T. L. ...	H. L. Price ...	No. A.	Melbourne S.S. Co. ...	Form 911 9.7.27 to 4.8.27 ...	5.9.27
<i>Discoverer</i> ...	Ling, J. T. ...	H. W. Gostage ...	" M.	Harrison ...	" 8.4.27 to 9.7.27 ...	12.7.27
<i>Discovery, R.R.S.</i> ...	Stenhouse, J. R., D.S.O. D.S.C., O.B.E., R.D., Commr. R.N.R.	T. W. Goodechild ...	M.L.	Discovery Expedition	Met. Log. 21.9.26 to 31.1.27 ...	20.7.27
<i>Domala, M.V.</i> ...	Kitson, A. G. ...	J. G. Wallace ...	No. M.	British India ...	Form 911 28.3.27 to 4.6.27 ...	15.6.27
<i>Dominia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr. R.N.R.	S. A. Garnham, C. Bullock, L. J. Hegarty, R. Johnson.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 11.9.26 to 4.2.27 ...	25.2.27
<i>Dominic</i> ...	Harris, F. C. P. ...	C. C. Beal ...	No. A.	Booth ...	Form 911 22.7.27 to 5.8.27 ...	5.9.27
<i>Doric</i> ...	Bolton, S., D.S.C., R.D., Commr. R.N.R.	H. R. Wilkinson ...	" A.	White Star ...	" 7.8.27 to 27.8.27 ...	30.8.27
<i>Doric Star</i> ...	Thomas, R. T. ...	L. McDermott ...	" A.	Blue Star ...	" 22.11.26 to 20.12.26 ...	10.1.27
<i>Dorington Court</i> ...	Clarke, E. J. ...	E. W. Blomberg ...	" A.	Haldin & Co. ...	" 11.2.27 to 1.5.27 ...	9.5.27
<i>Dromore Castle</i> ...	MacMahon, J. ...	D. H. McDougall ...	" A.	Union Castle ...	" 14.4.27 to 26.8.27 ...	9.9.27
<i>Dryden</i> ...	Major, T. W. ...	" ...	" M.	Lampart & Holt ...	" 27.2.27 to 18.3.27 ...	4.5.27
<i>Duendes</i> ...	Pape, E. R. ...	S. E. Ayland ...	" M.	P.S.N. Co. ...	" 9.7.27 to 23.7.27 ...	5.8.27
<i>Dunaff Head</i> ...	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
<i>Dundrum Castle</i> ...	Weller, H. E. ...	H. H. F. Trew ...	" A.	Union Castle ...	" 17.6.27 to 15.7.27 ...	28.7.27
<i>Dunrobin</i> ...	Ramsay, J. D. ...	C. H. Kendall ...	" A.	Glen & Co. ...	" 9.7.27 to 11.8.27 ...	30.8.27
<i>Duquesa</i> ...	Ellis, F., D.S.C.	E. W. Denman ...	" A.	Furness Withy ...	" 12.6.27 to 10.8.27 ...	18.8.27
<i>Duquesa</i> ...	Beeching, P. H. ...	" ...	" A.	British India ...	" ...	"
<i>Edinburgh Castle</i> ...	Knight, A. ...	" ...	No. A.	Union Castle ...	" 6.5.27 to 22.5.27 ...	24.5.27
<i>Egori</i> ...	Sola, P., D.S.O.	" ...	No.	Elder Dempster ...	" ...	"
<i>Egyptian Prince</i> ...	Ord, T. ...	" ...	" A.	Prince ...	" 13.1.27 to 7.3.27 ...	31.3.27
<i>El Paraguayo</i> ...	St. Pierre, P. ...	S. B. Wright ...	" M.	Houlder Bros. ...	" 22.5.27 to 13.7.27 ...	9.8.27
<i>Elpenor</i> ...	Gordon, A. L. ...	M. Robertson, C. Kavanagh	M.L.	A. Holt ...	Met. Log. 27.3.27 to 30.7.27 ...	18.8.27
<i>Elysia</i> ...	Duncan, A. R. ...	A. Laidlaw, H. C. Fry, J. Herbert.	"	Anchor ...	" 4.5.27 to 7.7.27 ...	13.7.27
<i>Empress of Asia</i> ...	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
<i>Empress of Canada</i> ...	Robinson, S., C.B.E., R.D., Commr. R.N.R.	" ...	"	" ...	" 26.2.27 to 18.6.27 ...	14.7.27
<i>Empress of France</i> ...	Hailey, A. J. ...	E. Roberts, W. Ewens, W. Pickersgrill.	"	" ...	" 29.1.27 to 15.4.27 ...	1.5.27
<i>Empress of Russia</i> ...	Griffiths, E. ...	" ...	"	" ...	" 25.12.26 to 8.5.27 ...	13.6.27
<i>Empress of Scotland</i> ...	Hosken, A. J. ...	F. A. R. Dobbin ...	"	" ...	" 14.11.26 to 22.4.27 ...	3.5.27
<i>Empress of Scotland</i> ...	Latta, R. G. ...	P. Powys Smith, T. Sargent, E. Aikman.	"	" ...	" ...	"
<i>Endeavour</i> ...	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
<i>Essequibo</i> ...	Kite, E. ...	J. E. Williams ...	No. M.	R.M.S.P. Co. ...	Form 911 14.7.27 to 31.7.27 ...	13.8.27
<i>Eumaeus</i> ...	Read, J. W. ...	" ...	" A.	A. Holt ...	" 15.6.27 to 26.8.27 ...	5.9.27
<i>Euryptides</i> ...	Collins, P. J., O.B.E.	H. S. Cox, K. D. Fisher, P. Congdon.	M.L.	Aberdeen ...	Met. Log. 1.1.27 to 8.5.27 ...	14.5.27

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.9.27.	Date Received.
Laguna ...	Kirkwood, J. H. ...	R. H. A. Clark ...	No. A.	Pacific S.N. Co. ...	Form 911 16.7.27 to 8.8.27 ...	2.9.27
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.	Lampart & Holt ...	" 25.3.27 to 26.6.27 ...	11.7.27
Lancashire ...	de Legh, P. ...	F. Holdsworth ...	" A.	Bibby ...	" 9.4.27 to 18.6.27 ...	27.6.27
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. 19.6.27 to 3.9.27 ...	8.9.27
Laomedon ...	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	H. A. Standfield ...	No. A.	A. Holt... ...	Form 911 18.6.27 to 4.9.27 ...	7.9.27
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.	Lampart & Holt ...	" 15.4.26 to 28.6.27 ...	30.8.27
5 Lapland ...	Harvey, H. ...	E. Cornellie, J. C. Flett ...	W.T.	Red Star ...	W.T. Reg. 7.8.27 to 27.8.27 ...	29.8.27
Lautaro, M.V. ...	Dunn, R. E., O.B.E. ...	E. Sandon ...	No. M.	Pacific S.N. Co. ...	Form 911 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.	Lampart & 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
Llandoverly 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. ...	H. P. Longland... ...	" A.	Furness Withy ...	" 9.7.27 to 20.7.27 ...	15.8.27
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
Lori 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. ...	E. Baxter ...	" M.	" ...	" 23.2.27 to 16.5.27 ...	24.5.27
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 ...	" 17.6.27 to 27.7.27 ...	3.8.27
Maharani ...	Elliott, G. F. ...	M. Haslett ...	" M.	Asiatic S.N. Co. ...	Form 911 16.5.27 to 5.6.27 ...	7.7.27
Maihar ...	Rowe, J. P. ...	C. Shaw, C. Cadwallader, S. S. Slade.	M.L.	Brocklebank ...	Met. Log. 24.7.26 to 1.5.27 ...	10.5.27
Maimyo ...	Smith, G. C. ...	" ...	No. A.	" ...	Form 911 26.5.27 to 1.7.27 ...	18.8.27
Maiwara ...	Brown, T. M. ...	" ...	M.L.	Burns Philp ...	" ...	" ...
8 Majestic ...	Metcalfe, G. R. ...	W. W. Pearson, L. Thompson ...	W.T.	White Star ...	W.T. Reg. 25.8.27 to 8.9.27 ...	10.9.27
Makambo ...	Brown, T. M. ...	F. C. Vogelmann, W. O. L. Wilding, J. B. Norris, R. W. Holmes.	M.L.	Burns Philp ...	Met. Log. 16.10.26 to 3.3.27 ...	17.5.27
Makura ...	Mawson, J. ...	D. M. Todd, W. J. Weber, L. P. Bourke, L. Thomas, A. Gell.	"	Canadian-Australasian } Form 911 26.1.27 to 11.6.27 ...	" 15.7.27 to 1.9.27 ...	1.9.27 15.9.27
Malabar ...	Hillman, E. J. ...	R. Morris ...	"	Burns, Philp & Co. ...	Met. Log. 6.7.26 to 15.12.26 ...	23.3.27
Malakuta ...	Adamson, F. L. ...	N. Grayson ...	No. M.	Brocklebank ...	Form 911 15.4.27 to 19.5.27 ...	24.5.27
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. ...	" 1.7.27 to 22.7.27 ...	16.8.27
Mamari ...	Falconer, H. ...	P. Campbell ...	" A.	Shaw, Savill & Albion ...	" 16.5.27 to 12.6.27 ...	28.7.27
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. ...	J. Shaw ...	No. A.	" ...	Form 911 28.5.27 to 25.6.27 ...	30.6.27
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 19.5.27 to 12.8.27 ...	23.8.27
Manora ...	Hudson, H. T., R.D., Commr., R.N.R.	" ...	" M.	British India... ...	" ...	" ...
Mantua ...	Randell, G. G. ...	D. B. Leader ...	" M.	P. & O. ...	" 15.5.27 to 27.7.27 ...	13.8.27
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.	Woods, Tyler & Brown ...	" ...	" ...
Margha ...	Milne, R. A., R.D., Commr., R.N.R.	P. Wright, H. E. Evans, R. M. Wyatt, R. A. Clarke.	M.L.	British India... ...	Met. Log. 27.2.27 to 7.5.27 ...	18.5.27
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
Mastrah ...	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. ...	R. M. Morrison... ...	No. M.	British India... ...	Form 911 18.4.27 to 24.5.27 ...	25.5.27
Maunganui ...	Showman, A. C. ...	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 ...	Davey, A. H. ...	J. A. Quarrie, G. Duguid, C. B. Osborne.	W.T.	Cunard ...	W.T. Reg. 7.8.27 to 22.8.27 ...	25.8.27
Medic ...	Diggle, E. G., R.D., Capt., R.N.R.	W. Nicoll... ...	No. A.	White Star ...	Form 911 28.8.27 to 12.9.27 ...	16.9.27
Megantic ...	Jones, W. H. ...	" ...	" A.	" ...	Form 911 10.3.27 to 18.4.27 ...	21.4.27
22 Melita ...	Trant, E. L., R.D., Commr., R.N.R.	" ...	" A.	" ...	" 30.7.27 to 20.8.27 ...	24.8.27
Memnon ...	Stewart, A. ...	J. Shearer ...	W.T.	Canadian Pacific ...	W.T. Reg. 5.8.27 to 23.8.27 ...	29.8.27
21 Metagama ...	Dougall, W. T. ...	R. E. Hannaford ...	No. A.	A. Holt... ...	Form 911 7.7.27 to 30.8.27 ...	12.9.27
Middlesex ...	Freer, A., Capt., R.N.R.	R. Walker, T. Gillette, G. Mowatt.	W.T.	Canadian Pacific ...	W.T. Reg. 21.8.27 to 9.9.27 ...	19.9.27
Minderoo ...	MacRae, A., D.S.C., Lt.-Commr., R.N.R.	C. Roberts ...	No. M.	Federal... ...	Form 911 7.8.27 to 19.8.27 ...	8.9.27
Minna ...	Richardson, E. ...	B. J. Bennie, W. J. McPhedran, J. H. Oxtan.	" A.	West Australia Nav. Co. ...	Met. Log. 2.5.26 to 4.10.26 ...	1.12.26
3 Minnedosa ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A.	Scottish Fishery Board. ...	Form 911 30.6.27 to 14.8.27 ...	18.8.27
Minnesota ...	Griffiths, J. N. ...	A. Mackie ...	W.T.	Canadian Pacific ...	W.T. Reg. 20.8.27 to 9.9.27 ...	12.9.27
Minnetonka ...	Pollard, W. F., D.S.O., Capt., R.N.R.	A. J. Smith ...	No. M.	Atlantic Transport... ...	Form 911 24.7.27 to 11.8.27 ...	16.8.27
Minnewaska ...	Gates, T. F., C.B.E. ...	H. E. Macartney ...	" M.	" ...	" 26.6.27 to 13.8.27 ...	17.8.27
Mirror, C.S. ...	Claret, F. H., C.B.E., Commr., R.N.R.	F. Mummery ...	" M.	" ...	" 31.7.27 to 20.8.27 ...	24.8.27
Mississippi ...	Gibson, L. ...	A. G. Watts ...	" M.	Eastern Tel. Co. ...	" 8.3.27 to 17.3.27 ...	8.4.27
	Wylie, J. T. J. ...	S. C. Skinner ...	" A.	Atlantic Transport ...	" 16.5.27 to 26.6.27 ...	8.7.27

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log. Register, or Report Contributed. Received up to 16.9.27.	Date Received.
<i>Peshawur</i> ...	Wilding, H. G. ...	J. C. Mellonie, J. K. Crone, R. G. Wood.	M.L.	P. & O. ...	Met. Log. 30.10.26 to 6.3.27 ...	18.3.27
<i>Piako</i> ...	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
<i>Polycarp</i> ...	Jackson, T. ...	...	No. A.	Booth ...	Form 911 14.6.27 to 11.7.27 ...	26.7.27
<i>Port Adelaide</i> ...	Williams, R. ...	E. N. Rogerson ...	M.L.	Commonwealth & Dominion.	Met. Log. 13.1.27 to 20.6.27 ...	12.7.27
<i>Port Albany</i> ...	Robinson, C. A. ...	E. A. Leavett, W. Eastoe, J. Thom.	"	" " "	" 24.12.26 to 10.5.27...	23.5.27
<i>" Auckland</i> ...	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
<i>" Bowen</i> ...	Gilling, W. ...	W. R. Johnston ...	No. A.	" " "	Form 911 8.2.27 to 20.3.27 ...	28.3.27
<i>" Caroline</i> ...	Hoad, A. C. ...	...	M.L.	" " "	Met. Log. 16.1.27 to 16.6.27 ...	29.6.27
<i>" Darwin</i> ...	Sawbridge, I. R. ...	S. Hearn, W. Lynd, E. T. N. Lawrey.	"	" " "	" 28.1.27 to 29.6.27 ...	4.7.27
<i>" Denison</i> ...	Ferris, J. ...	P. J. Howe ...	"	" " "	Form 911 25.5.27 to 7.7.27 ...	9.7.27
<i>" Dunedin</i> ...	Lea, W. H. ...	E. G. Jones, R. Needham, H. M. Post, E. Wheeler.	M.L.	" " "	Met. Log. 4.12.26 to 2.3.27 ...	5.4.27
<i>" Fremantle</i> ...	Kearney, F. J. ...	...	No.	" " "	... ..	...
<i>" Gisborne</i> ...	Hutchinson, ...	...	No. A.	" " "	... ..	...
<i>" Hacking</i> ...	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
<i>" Hobart</i> ...	Craven, R. ...	C. Hersee, L. Copeland, G. G. Langford, C. L. Webb.	"	" " "	" 4.2.27 to 30.5.27 ...	10.6.27
<i>" Hunter</i> ...	Cottell, S. C. ...	A. Cooper, R. Forrest, J. T. Weldin.	"	" " "	" 7.1.27 to 13.5.27 ...	7.6.27
<i>" Melbourne</i> ...	Brown, A. H. ...	D. G. H. Bradley, E. M. Fenton, L. H. B. Bloye.	"	" " "	" 28.10.26 to 3.3.27 ...	23.3.27
<i>" Napier</i> ...	Jones, C. N. ...	...	No. A.	" " "	Form 911 25.2.27 to 12.4.27 ...	21.4.27
<i>" Nicholson</i> ...	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
<i>" Pirie</i> ...	Kippins, T. ...	...	"	" " "	" 26.3.27 to 2.9.27 ...	13.9.27
<i>" Sydney</i> ...	Higgs, W. G. ...	H. G. Boys Smith, E. E. Roswell, K. D. Morgan.	"	" " "	" 1.4.27 to 17.8.27 ...	1.9.27
<i>" Victor</i> ...	Swan, L. H. ...	L. M. R. Bayly, J. B. Watson, A. Brown.	"	" " "	" 8.12.26 to 8.6.27 ...	13.6.27
<i>" Wellington</i> ...	Farmer, F. ...	P. H. Pedrick ...	No. A.	" " "	Form 911 14.10.26 to 2.2.27 ...	11.2.27
<i>President Jackson</i> ...	Griffith, J. ...	P. H. Treanor ...	" A.	Pacific Mail S.S. Co...	" 25.5.27 to 9.6.27 ...	22.7.27
<i>President Jefferson</i> ...	Nichols, F. R. ...	C. H. Moen, B. Christensen ...	" A.	Admiral Oriental Line	" 8.6.27 to 28.7.27 ...	19.8.27
<i>President Wilson</i> ...	Nelson, H. ...	A. M. Quinlan ...	" A.	Dollar ...	" 5.9.26 to 2.11.26 ...	22.11.26
<i>Protea, H.M.S.A.S.</i> ...	Woodhouse, A. F. B., Lt.-Commr., R.N.	...	M.L.	South African Naval Service.	" 1.2.27 to 28.2.27 ...	29.3.27
<i>Protesilaus</i> ...	Nelson, T. B. ...	...	"	A. Holt ...	... ..	...
<i>Pyrrhus</i> ...	Elford, W. J. ...	R. E. Wilks ...	No. A.	" " "	Form 911 15.6.27 to 2.7.27 ...	5.8.27
<i>Ranpura</i> ...	King, A. M., D.S.C. ...	F. W. J. Pearce ...	" M.	P. & O. ...	" 1.8.27 to 18.8.27 ...	19.8.27
<i>Regina</i> ...	Davies, E. ...	R. C. Cochrane ...	" A.	White Star-Dominion	" 21.8.27 to 9.9.27 ...	12.9.27
<i>Reindeer</i> ...	Langdon, C. ...	...	C.C.	G.W. Railway	Telegraphic Report 1.6.27 ...	1.6.27
<i>Remuera</i> ...	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
<i>Reventazon</i> ...	Jack, D. A. ...	B. R. Wickham Tarr ...	" A.	Elders & Pyfles ...	" 9.4.27 to 14.5.27 ...	21.5.27
<i>Rhodesian Transport</i> ...	Bullock, F. W. H. ...	H. B. Parkins ...	" A.	Houlder Bros. ...	" 6.4.27 to 22.5.27 ...	10.6.27
<i>Rimitaka</i> ...	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
<i>Risaldar</i> ...	Matthews, E. G. ...	R. H. Feindlande ...	No. M.	Asiatic S.N. Co.	Form 911 24.7.27 to 16.8.27 ...	5.9.27
<i>Rotorua</i> ...	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
<i>Royal Fusilier</i> ...	Dawson, J. ...	J. Fraser ...	No. A.	London & Edinburgh S.S. Co.	Form 911 19.5.27 to 7.7.27 ...	11.7.27
<i>Royal Transport</i> ...	Dove, J. ...	R. W. Wass ...	" A.	Houlder Bros. ...	" 7.5.27 to 15.8.27 ...	19.8.27
<i>Ruapehu</i> ...	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
<i>St. Albans</i> ...	Smith, G. L. ...	F. O. Colvin, R. S. Millington, J. Kavanagh.	"	Eastern and Australian.	" 2.4.27 to 28.6.27 ...	1.9.27
<i>St. Helier</i> ...	Mulhall, W. ...	C. Bell ...	C.C.	G.W. Railway	Telegraphic Report 14.9.27 ...	14.9.27
<i>St. Julien</i> ...	Langdon, C. H. ...	C. Joy ...	"	"	" 15.9.27 ...	15.9.27
<i>St. Andrew</i> ...	Bearpark, E. W. ...	J. G. Feint ...	No. A.	Rankin Gilmour ...	Form 911 2.1.27 to 17.2.27 ...	11.3.27
<i>Salaga</i> ...	Jones, W. ...	G. V. Evans ...	" A.	Elder Dempster ...	" 19.3.27 to 4.6.27 ...	15.6.27
<i>38 Samaria</i> ...	Malin, R. G., Lieut.-Commr., R.N.R.	C. S. Williams, A. B. Pasting, W. B. Tanner.	W.T.	Cunard ...	" 7.8.27 to 28.8.27 ...	1.9.27
<i>Samarinda</i> ...	Flack, Z. W. ...	R. F. Rikherd ...	No. M.	Rotterdam Lloyd ...	Form 911 8.5.27 to 3.6.27 ...	9.6.27
<i>Saxton</i> ...	Gardner, G. F., O.B.E.	G. H. Pickering, R. Rogers ...	" A.	Union Castle ...	" 16.7.27 to 4.9.27 ...	7.9.27
<i>Scholar</i> ...	Egerton, J. J. ...	J. McLellan ...	" M.	Harrison ...	" 25.5.27 to 8.8.27 ...	10.8.27
<i>Scotia</i> ...	Pritchard, S.D., M.B.E.	O. W. L. Jones ...	C.C.	L.M. & S. Railway	Telegraphic Report 9.9.27 ...	9.9.27
<i>Scottish Bard</i> ...	McDonnell, S. ...	J. W. Lilley ...	No. A.	Tankers Ltd. ...	Form 911 22.11.26 to 3.12.26...	3.1.27
<i>33 Seythia</i> ...	Prothero, W. ...	G. Overton, G. H. Morris, P. G. Britten.	W.T.	Cunard ...	W.T. Reg. 1.8.27 to 20.8.27 ...	23.8.27
<i>Sheaf Mount</i> ...	Groves, C. V. ...	W. Thomson ...	No. A.	W. A. Souter ...	Form 911 26.1.27 to 19.2.27 ...	3.3.27
<i>Sheaf Spear</i> ...	Whitfield, G. A., O.B.E.	S. J. Dring, T. B. Fishley ...	M.L.	"	Met. Log. 14.10.26 to 13.2.27...	20.7.27
<i>Shropshire, M.V.</i> ...	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
<i>Socrates</i> ...	Taylor, F. C. ...	W. E. Jordan ...	No. A.	Lamport & Holt ...	Form 911 1.4.27 to 18.6.27 ...	8.7.27
<i>Somerset</i> ...	Howell Price, J. ...	...	" A.	Federal ...	... ..	...
<i>Spero</i> ...	Montgomery, H. ...	D. Millward ...	M.L.	Ellerman Wilson ...	Met. Log. 24.12.26 to 3.7.27 ...	8.7.27
<i>Stockwell</i> ...	Thowless, E. ...	R. A. Kneen ...	No. A.	Brocklebank ...	Form 911 12.7.27 to 6.8.27 ...	30.8.27
<i>Surrey</i> ...	Lamb, C. B. ...	S. C. Bradley ...	" A.	Federal ...	" 28.3.27 to 15.8.27 ...	19.8.27
<i>Suva Maru</i> ...	Gotoh, M. ...	...	" A.	Nippon Yusen Kaisha	" 26.6.27 to 25.7.27 ...	4.8.27
<i>Sylvafield</i> ...	Biddick, E. ...	E. Holmes ...	" A.	Hunting & Son ...	" 17.8.27 to 26.8.27 ...	30.8.27
<i>Tainui</i> ...	Elford, H. C. ...	P. S. Horwood ...	" A.	Shaw, Savill & Albion	" 26.2.27 to 7.6.27 ...	10.6.27
<i>Tahiti</i> ...	Aldwell, B. M. ...	G. M. Coote ...	" A.	Union S.S. Co. of N.Z.	" 14.7.27 to 4.8.27 ...	24.8.27
<i>Taipung</i> ...	Frame, A. M. ...	F. Stratford, S. Moore, A. C. Kennedy.	M.L.	Yuill & Co. ...	Met. Log. 15.1.27 to 8.6.27 ...	15.9.27
<i>Talthybius</i> ...	Thomas, R. ...	R. T. Hames ...	No. A.	A. Holt ...	Form 911 26.7.27 to 10.8.27 ...	12.9.27
<i>Tamara</i> ...	Hartman, W. H. ...	F. W. Lutyens ...	" M.	Shaw, Savill & Albion	" 17.6.27 to 24.7.27 ...	1.9.27
<i>Tambora</i> ...	Huisman, N. ...	H. Van Manen ...	" M.	Rotterdam Lloyd ...	" 29.8.26 to 14.10.26...	30.10.26
<i>Tanda</i> ...	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
<i>Teiresias</i> ...	Wilkinson, W. H. ...	...	" A.	A. Holt & Co. ...	" 9.4.27 to 7.8.27 ...	12.8.27
<i>Tekoa</i> ...	Barnett, H. ...	D. J. Murray ...	" M.	New Zealand S.S. Co.	" 8.5.27 to 13.6.27 ...	25.7.27

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.9.27.	Date Received.
<i>Telamon</i> ...	Willcox, J. H. ...	F. Wardrobe, J. C. Oppen ...	No. A.	A. Holt ...	Form 911 20.7.27 to 4.8.27 ...	17.8.27
<i>Teucer</i> ...	Hodgson, R. N. ...	D. T. Thorne ...	" A.	" ...	" 22.5.27 to 10.6.27 ...	24.6.27
<i>Themistocles</i> ...	Jermyn, W. M. ...	H. C. Howe ...	" M.	Aberdeen ...	" 5.5.27 to 18.6.27 ...	30.6.27
<i>Theseus</i> ...	Jones, E. ...	" ...	" A.	A. Holt ...	" 27.8.27 to 6.9.27 ...	16.9.27
<i>Titan</i> ...	Power, J. ...	D. MacTavish, G. W. Best, C. F. Bailey.	M.L.	" ...	Met. Log. 4.4.27 to 10.8.27 ...	5.9.27
<i>Tongariro</i> ...	Williams, J. M. ...	E. A. Quick ...	"	New Zealand S.S. Co.	Form 911 7.6.27 to 12.7.27 ...	21.7.27
<i>Transylvania</i> ...	Bone, D. W. ...	P. Middleton ...	No. A.	Anchor ...	" 7.8.27 to 28.8.27 ...	1.9.27
<i>Traveller</i> ...	Worthington, B. ...	E. L. Stockley ...	" M.	T. & J. Harrison ...	" 3.5.27 to 21.6.27 ...	5.7.27
<i>Trematon</i> ...	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
<i>Turakina</i> ...	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
<i>Tuscania</i> ...	Smart, R. W. ...	" ...	W.T.	Anchor ...	" 25.6.27 to 14.7.27 ...	22.7.27
<i>Tyndareus</i> ...	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
<i>Ulimaroa</i> ...	Wylie, W. J. ...	A. N. Robertson ...	No. M.	Huddart Parker, Ltd.	Form 911 29.4.27 to 30.5.27 ...	25.7.27
<i>Ulysses</i> ...	Owen, R. D., O.B.E. ...	A. Studholme ...	" A.	A. Holt ...	" 2.3.27 to 10.7.27 ...	13.7.27
<i>Unvolost</i> ...	Barnes, E. W. ...	R. L. B. Ryde ...	" A.	Bullard King ...	" 4.7.27 to 9.8.27 ...	5.9.27
<i>Valacia</i> ...	Inch, F. ...	G. Meggitt ...	" M.	Cunard ...	" 28.7.27 to 26.8.27 ...	1.9.27
<i>Varadua</i> ...	Robinson, F. W. ...	" ...	" A.	" ...	" 31.5.27 to 12.6.27 ...	11.7.27
<i>Verbana</i> ...	Pooley, T. S. M. ...	A. F. Watts ...	" A.	" ...	" 8.2.27 to 26.3.27 ...	19.4.27
<i>Vigilant</i> ...	Simpson, E. S. S. ...	J. Hunter ...	" A.	Scottish Fishery Board.	" 1.8.27 to 31.8.27 ...	1.9.27
<i>Waiotapu</i> ...	Todd, D. ...	" ...	" M.	Canadian - Australasian.	" 13.7.27 to 19.8.27 ...	12.9.27
<i>Wairuna</i> ...	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
<i>Walmer Castle</i> ...	Owen, S. H. ...	A. E. Denn ...	No. A.	Union Castle ...	Form 911 27.5.27 to 17.7.27 ...	19.7.27
<i>Wangaratta</i> ...	Scutt, W. ...	T. W. Wordingham, S. R. Gillard, A. G. Brooks, J. K. Rigden.	M.L.	British India ...	Met. Log. 3.4.27 to 27.8.27 ...	3.9.27
<i>Warfield</i> ...	Steel, R. ...	C. M. Quick ...	No. A.	" ...	Form 911 6.7.27 to 25.7.27 ...	3.8.27
<i>War Nizam</i> ...	Moneriff, T. ...	" ...	" A.	British Tankers ...	" 3.7.27 to 14.8.27 ...	1.9.27
<i>Welshman</i> ...	Rollerson, W. ...	J. Mendus ...	" M.	White Star-Dominion Federal ...	" 22.10.26 to 14.11.26 ...	26.11.26
<i>Westmoreland</i> ...	Gardner, H. W. ...	" ...	M.L.	" ...	" ...	"
<i>Windsor Castle</i> ...	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
<i>Winifredian</i> ...	Harrocks W. ...	" ...	No. M.	Leyland ...	Form 911 6.8.27 to 5.9.27 ...	12.9.27
<i>Wonganella</i> ...	Suffern, H. ...	G. F. Phillips ...	"	W. Crossby & Sons ...	" 11.6.27 to 9.7.27 ...	24.8.27
<i>Woodarra</i> ...	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
<i>Yorkshire</i> ...	Millson, G. E. ...	W. M. C. Higginson, R. Allen	No. A.	Bibby ...	Form 911 23.4.27 to 4.7.27 ...	9.7.27
<i>Conway H.M.S.</i> ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ...	Cadets' M.L.	" ...	Cadets' Met. Log. 8.5.27 to 23.7.27 ...	27.7.27
<i>Pangbourne Nautical College</i> ...	Tracy, A. F. G., Commr., R.N.	" ...	"	" ...	Cadets' Met. Log. 1.5.27 to 22.7.27 ...	27.7.27
<i>Worcester, H.M.S.</i> ...	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
<i>Abaco</i> ...	" ...	The Keepers ...	Lighthouse Register.	" ...	Lighthouse Register 1.7.26 to 20.10.26	20.4.27
<i>Cay Lobos</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26	20.4.27
<i>Double Headed Shot</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26	20.4.27
<i>Inagua</i> ...	" ...	" ...	"	" ...	Lighthouse Register 15.7.26 to 23.1.27	20.4.27
<i>Sombrero</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.1.27 to 30.6.27	10.8.27
<i>Watling Island</i> ...	" ...	" ...	"	" ...	Lighthouse Register 17.1.26 to 20.7.26	10.11.26
<i>Cape Pembroke (Falkland Is.)</i> ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.26 to 31.12.26	24.2.27

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

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., received up to 31.8.27.	Date Received.
<i>Casanare</i> ...	Steidelman, H. ...	R. O. Jones ...	Elders & Fyffes ...	Water Samples ...	5.8.27
<i>Darro</i> ...	Matthews, G. P. ...	W. Halder-Campe ...	R.M.S.P. Co. ...	" ...	27.7.27
<i>Descado</i> ...	Purvis, J. ...	J. N. Duncan ...	" ...	" ...	3.6.27
<i>Hildebrand</i> ...	Maddrell, J. ...	A. Allan ...	Booth ...	" ...	29.8.27
<i>Reventazon</i> ...	Jack, D. A. ...	J. Hughes ...	Elders & Fyffes ...	" ...	15.8.27

November, M.O., 1927.