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SPECIAL OBSERVATIONS, TESTS AND INVESTIGATIONS AND THEIR INFLUENCE UPON THE WORK.

OUR notes last month were addressed to the whole Merchant Navy and in them it was necessary to give an account of the Specialist work of our Corps. These notes are more specially addressed to the Commanders and Officers of Regular Observing Ships, but they may be of assistance to others who are interested in the development of Marine Meteorology.

Since the reorganisation after the Great War much time has been spent in making special observations and in carrying out tests and investigations with ever increasing results in the furtherance not only of Meteorological and Oceanographical Science, but in those more practical objects which so intimately concern the Master Mariner. And it is members of the Voluntary Corps of Marine Observers who have done most of this work; they have done it and done it well for no other reward than the satisfaction of helping on **The Work**.

One of the first investigations carried out in our post-war work was that of the pumping of the barometer.

At sea our custom was, and that of seamen of our acquaintance, to take the mean height of the barometer when it was pumping, but the MARINE OBSERVER'S HANDBOOK, 2nd edition, published in 1918, said :—

“ If the barometer is pumping at the time of observation the vernier should be set for reading when the mercury rising and

falling in the tube with the heave of the ship has completed its downward movement.”

Thus practice at sea and the instructions differed.

In response to a request made by circular letter to the Commanders of observing ships—we had no MARINE OBSERVER then to promulgate requests—a large number of special observations of pumping under different conditions were made and not only was it found that sea custom gave the more accurate results, but these observations proved of considerable value in improving the design of the Kew pattern Marine Mercurial Barometer the parts of which have now been standardised, and a barometer with uniform parts is replacing the older instruments.

We mention this to show the great value of special observations, tests and investigations carried out under ordinary service conditions at sea. Without them co-ordination of the work would be impossible. Observations may be divided into those which are routine and those which are special, the latter being required to improve the former, and of such a nature as to require more and exact work.

There are a number of special observations which have been asked for from time to time of which we would remind Marine Observers, and there are others which are highly desirable but which we have

not asked for because the demands upon our corps are already great. There are also routine observations which are desired, the recording of which we have not specially encouraged up to the present for the same reason.

The Corps of Marine Observers is now better able to see the fruits of its labours and therefore understand and appreciate requests for particular information and so may be glad of these reminders and hints.

#### Sea and Swell Measurements.

Possibly there is no information which is more desirable in modern seamanship connected with Marine Meteorology than are measurements of sea and swell, both linear and in time, for ship stability and design as well as for dimensions for the Douglas scale. Full information of the data required with methods which are suitable for use in ordinary sea service are given in the MARINE OBSERVER'S HANDBOOK, 4th edition, and an article will be found on pages 103-112, Volume II, of this Journal giving the theory of deep sea waves with general information. Ship stability, rolling, pitching and resistance are dealt with in TAKE CARE OF THE SHIP, by Captain J. F. RUTHVEN, a member of our Corps for many years who devoted much time to the observation of waves. Improvement of ship design by naval architects requires this assistance from seamen and of recent years they have frequently expressed the desire for measurements of waves. Marine Observers will find the taking of these measurements under different conditions of weather an interesting pursuit and results obtained if carefully recorded will be valuable contributions to **The Work**.

#### Ocean Currents.

The observation of set and drift of surface current is possibly the most important problem in navigation for the advancement of Marine Meteorology and Oceanography, and this observation has been improved by the Corps of Voluntary Marine Observers more than any other of recent years. It is, of course, a routine observation and not a special one. Special observations are much required of sub-surface current, and though merchantmen may seldom have opportunity of making such observations there may be times in some ships, and particularly in Cable vessels, when an estimation of sub-surface current and observation of sub-surface temperature can be made.

#### Wind.

The observation of the force and direction of the wind is by far the most important of routine weather observations and the logging of the True direction observed by compass and the force estimated by Beaufort Scale by the appearance of the sea surface is generally well understood by seamen. There has, however, been some evidence that in some ships, not on our list, the method of estimating the velocity of the wind in miles per hour has been used, without special instruments; this is not a desirable practice. The estimation to the nearest Beaufort Scale number is all that is practicable and force gives a much better idea of the strength of the wind than velocity.

The estimation of the True direction of the wind by watching the smoke from the funnel and allowing for course and speed of ship is also undesirable.

Generally comparison indicates that wind observation carried out by appearance of sea surface is more accurate than any other method of estimation. Special observations of wind made with suitable anemometers will in time no doubt help in the improvement of routine observation at sea.

#### Rain.

The amount of Rainfall over the oceans is probably less definitely known than are many other elements and this is of great importance to Meteorology. Meteorologists are anxious to have reliable averages. Marine Observers are therefore asked not only to log the precipitation at the hours of observation by means of the letters d. h. p. r. rs. and s but to note in the remarks column the time of commencement and ending of precipitation. These are essentially routine observations.

For the purpose of measuring rainfall at sea a special rain gauge was introduced towards the end of Captain CAMPBELL HEPWORTH'S time as Marine Superintendent, but owing to the many important

calls upon the time of Marine Observers in post-war organisation we have not pressed for these measurements. The measurement of rainfall in a ship under way at sea is one which presents difficulties which are obvious, and accurate measurements by rain gauge under ordinary sea service conditions requires much attention. Such observations would be useful in conjunction with the data provided by Beaufort notation and some rain gauges are available for supply to a few ships in different trades in which the Commanders may care to undertake these special observations.

#### Cloud.

For the purpose of improving cloud observation at sea more photographs are necessary and a note entitled "Cloud Photography" and an article "Clouds and What they Signify" indicate what is desired, in Volume IV, No. 46 of this Journal (October, 1927).

#### Exceptional Visibility, Mirage and Refraction.

Carefully noted measurements of exceptional visibility at sea, sketches and descriptions of Mirage, and observations of Refraction are matters of very great importance. The more reliable observations of these that can be published the better, for light plays queer tricks in the atmosphere over the sea which if the Mariner is not conversant with and on the look-out for may mislead him. A case was recently brought to our notice where the use of the vertical angle of a terrestrial object, owing to unsuspected refraction, had given an entirely incorrect distance off a charted danger.

#### Fog.

The value of carefully recorded observations before, during and after fog is so evident that it seems scarcely necessary to mention them; but it is most desirable that Marine Observers should fully understand what observations are required for the prediction of fog and why they are required so that they themselves may reap all possible benefit. In the first volume of THE MARINE OBSERVER an article on Fog was published, this has now been revised and is reproduced in this number.

#### Sound.

Though much has been learnt of recent years about sound in water and as a result we have submarine sound signalling, the hydrophone, and echo sounding gear, much remains to be learnt of sound in the air over the sea.

Since the great war, experiments have been made ashore when destroying surplus explosives to ascertain how far sound carried, and the extent of the zones of silence and of audibility with a view to explaining the anomalies of the propagation of sound through the air.

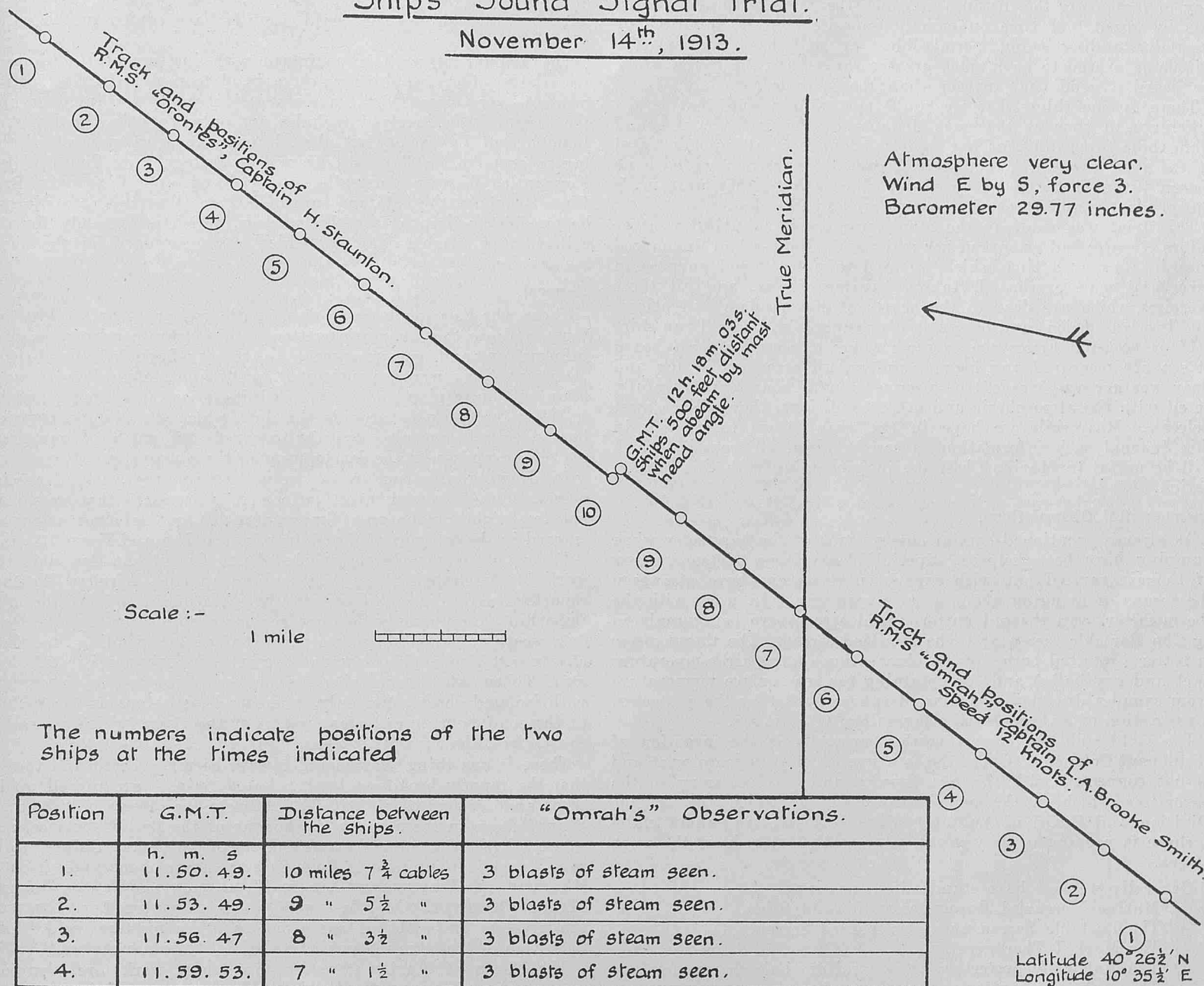
Information of the range of sound through the air at sea in clear and thick weather and its vagaries is so desirable for safe navigation that it may be wondered why this important subject, acoustics, has not been put forward for special observation before. This is one of those observations which, because of the many calls upon the time of Marine Observers, has not been mentioned in post war organisation, but now **The Work** is becoming so highly developed it may be found that observations of sound can have a most useful place in the work of our corps. Conditions of acoustics in the air over the sea are known to depend upon temperature, humidity and wind, the height of the barometer in itself does not affect them.

Sound is propagated by waves and like light is subject to reflection and refraction and therefore zones of silence at the surface may be accounted for by changes of temperature humidity and wind in the layers of the atmosphere. At sea many navigators have heard fog signals at great distances which have not been heard when the distance has been reduced, to be heard again when near. To investigate these vagaries information and observations are necessary.

When having a sailor's pleasure recently we came across some notes in our ditty box of a trial carried out in the good old days before the War to ascertain which of three kinds of fog signals could be heard farthest in clear weather, the Steam Whistle, Syren or Diaphone. As these may help to illustrate the nature of the information desired they are reproduced on the next page.\*

\*NOTE:—The photo of *Nardana's* steam whistle on p. 101 is of interest in this connection.



Ship's Sound Signal Trial.November 14<sup>th</sup>, 1913.

Position	G.M.T.	Distance between the ships.	"Omrah's" Observations.
1.	h. m. s. 11.50.49.	10 miles $7\frac{3}{4}$ cables	3 blasts of steam seen.
2.	11.53.49.	9 " $5\frac{1}{2}$ "	3 blasts of steam seen.
3.	11.56.47	8 " $3\frac{1}{2}$ "	3 blasts of steam seen.
4.	11.59.53.	7 " $1\frac{1}{2}$ "	3 blasts of steam seen.
5.	12.02.54.	5 " $9\frac{1}{4}$ "	3 blasts of steam seen, diaphone very faint.
6.	12.06.13	4 " 7 "	3 blasts of steam seen, diaphone heard.
7.	12.09.04.	3 " $4\frac{3}{4}$ "	3 blasts of steam seen. Siren heard 21 seconds after 2 <sup>nd</sup> blast seen. Diaphone heard 17 seconds after 3 <sup>rd</sup> blast seen.
8.	12.12.08.	2 " 3 "	3 blasts of steam seen. Whistle heard 12 seconds after 1 <sup>st</sup> blast seen. Siren heard ( ? ) after 2 <sup>nd</sup> blast seen. Diaphone heard 11 seconds after 3 <sup>rd</sup> blast seen.
9.	12.15.03.	1 " 2 "	3 blasts of steam seen. Whistle heard 7 seconds after steam seen. Siren heard 5 seconds after steam seen. Diaphone heard 4 seconds after steam seen.
10.	12.18.03.	Abeam.	

SUMMARY OF RESULTS OF WEATHER SHIP (OMRAH).

Maximum distance at which "Orontes" signals were heard distinctly :-

Diaphone	...	...	$4\frac{3}{4}$ miles.
Siren	...	...	$3\frac{1}{2}$ miles.
Whistle	...	...	$2\frac{1}{4}$ miles.

Before the ships sighted each other we arranged things by wireless, as we had no opportunity of planning before, and the only way of measuring the distance at which the Signals could be heard was by speed and time on exactly opposite courses, no hitch or misunderstanding being permissible. It will be seen that the Diaphone proved to have much greater range than the Syren which we heard a good deal further than the Whistle.

There is one thing that we could not explain and that is the difference in time at the same distance of the carriage of sound from these three different fog signals. Sounds of all pitches travel at the same rate. Yet though it is over 15 years ago we have no reason to doubt the accuracy of our observations; they were made independently and checked and compared by Wireless.

This trial was made in the Mediterranean in beautiful weather before *Orontes* had embarked her mails and after we had discharged ours in *Omrah*; a time which we used to put to good purpose in exercising man overboard, taking turning circles, and all those exercises which are dear to the hearts of commanders and officers who love an efficient and happy ship's company and a well run ship.

If as occasion arises the extreme range of sound signals heard at sea are measured and logged, and on all occasions in fog and clear weather vagaries of the propagation of sound are carefully noted with the atmospheric and other conditions, they will be most welcome. Meanwhile we hope in the near future to publish in this Journal such information as can be given of acoustics which will be useful to Marine Observers in proceeding with this investigation.

#### Instrumental Observations.

As already mentioned special observations of the barometer when pumping have been helpful. Special observations of temperature of the air carried out with experimental screens have also been the means of bringing about great improvement in work with the thermometer, and the old pattern fixed screens are being replaced by The Portable screen and The Modified screen. The thermometer is better protected both for the observation of the air temperature (wet and dry bulbs) and for obtaining the sea surface temperature from samples drawn in a ballasted canvas bucket by the protector, a suggestion of an Agent and the result of trial at sea.

The Gold slide for correcting the barometer is the invention of Lieutenant-Colonel E. GOLD who is a professional meteorologist and is not connected with the Sea Service and this accessory to the barometer which is the one improvement to which the Marine Division and Corps of Voluntary Marine Observers cannot claim a share is proving of very great value in that it reduces the work at sea.

Generally we now have standardised pattern:—

Marine Mercurial Barometer with Gold Slide.

The Portable Screen and the Modified Screen.

The Mark I Thermometer.

The Mahogany protector for wet and dry bulb thermometers.

The Mahogany protector for sea surface thermometers.

While investigation and invention should of course continue it is desirable as regards the above that there should not be further change for a time. The change over from old instruments is not yet complete. In introducing and standardising these instruments

it was hoped that not only would standardisation make things simpler for Marine Observers and the Agents and reduce the cost of upkeep to the State, but also that these might be taken as a pattern which shipowners could usefully have copied in the outfit of new ships.

The amount of work to maintain with instrumental equipment 150 regular observing ships which carry Meteorological Office Instruments is very great, for transfers and changes are frequent and the organisation involved includes not only work in the Ports of London and Liverpool, but also through Agencies in most of the larger ports in the British Isles and at Sydney, New South Wales, Fremantle, Western Australia, Hong Kong and Vancouver B.C. Were it not for the help and care of Marine Observers it would not be possible to keep at sea this nucleus, which is not only for the collection of reliable data, but which sets a standard for the whole sea service.

#### General.

Those who have read these notes month by month for the last few years will see that they are written with a definite purpose to give information and encouragement to those officers of the British Merchant Navy who are interested in Marine Meteorology to work upon a definite plan and with a definite object as a Corps, and by so doing not only to provide the data which the Marine Division has to collect, but also directly to benefit the whole of our great sea service and assist the development of the air service.

In drawing attention to the influence upon the work of special observations, tests and investigations, it is necessary that we should not lose sight of the great importance of routine observations as entered in the columns of the Meteorological Log and Form 911; this will now be obvious to the whole of our Corps. At this time the work of "Selected Ships" in making routine Wireless Weather reports to All Ships and certain shore stations is by far the most important, for not only do these reports enable ships to make their own weather charts and so see what changes are pending, but these charts will also enable seamen to carry out investigations of their own. Often when some phenomenon seems impossible to explain with isolated observation only, when we have before us the picture of the conditions over a great region of the Ocean which a weather chart gives, the cause is evident.

There is one thing that should always be remembered and that is that the reports broadcast by "Selected Ships" are picked up by ships and services of all nations. Therein the officers of "Selected Ships" have in their hands the honour of the British Service, and so we ask the Commanders and Officers of "Selected Ships" to be most exact in their reports, following the form of message given in WIRELESS AND WEATHER AN AID TO NAVIGATION and in the January MARINE OBSERVER. Only last week at Southampton Lord JELlicoe, the greatest authority of our time upon sea matters, said, "My definition of the term sea power is the ability to use the sea."

The Corps of Marine Observers in their work are therefore augmenting sea power, for by their efforts we are gaining information of the sea that we may be better able to use the sea for commerce.

MARINE SUPERINTENDENT.

London,

January 25th, 1929.

### 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.

##### West Coast Africa.

THE following remarks were received from Captain H. A. YARDLEY, who retired from the service of the ELDER DEMPSTER Co., LTD., in July, 1927:—

"During my service on the West Coast as Master extending over 28 years, I found the strength of the currents could not be foreseen, but in Harmattan weather the predominant E'ly set is diminished, usually nil, and may be running 1½ knots to the westward.

"Considering the large movement of sea water on the West Coast, particularly between Cape Palmas and Cap Three Points, where I have known the currents to range between 3½ knots E'ly and 1½ knots W'ly (this last during Harmattan only), one wonders if these changes precede or follow abnormal weather on the North Atlantic seaboard."

NOTE.—The currents off this part of the African Coast are said to be influenced by the wind and in particular by the tornadoes which may convert an easterly current to a westerly one for a few hours. The predominant easterly set is part of the Guinea current which



flows with its maximum strength in the summer months. During the Harmattan, which blows intermittently from the eastward during the months of December, January and February, the easterly current is weakest and is therefore most likely to be diminished or reversed by the wind.

### AVOIDANCE OF CURRENT IN ARABIAN SEA.

THE following is an extract from the Meteorological Report of S.S. *Domala*, Captain A. G. KITSON, Bombay to Plymouth. Observer, Mr. H. ROBERTSON, 2nd Officer:—

"Having consulted the Atlas of Indian Ocean Currents, course was set to reach a position in Latitude  $13^{\circ} 30' N.$ , Longitude  $54^{\circ} 00' E.$ , upon departure from Bombay on May 3rd. This position is 105 miles South of direct course to Ras Marshag and increases the total distance to Aden by 10 miles. However, during the run over, no adverse sets were experienced, the general trend of the current being  $190^{\circ}$  averaging about 4 miles daily. From Latitude  $13^{\circ} 30' N.$ , Longitude  $54^{\circ} 00' E.$ , to Aden, favourable sets were experienced amounting to 24 miles, and although total distance showed an increase of 10 miles, yet vessel avoided all adverse sets and in addition benefited considerably.

"Upon the corresponding voyage last year, when departure was taken from Bombay on May 12th, a direct course to Ras Marshag was followed and a total adverse current amounting to 73 miles was experienced."

### PHOSPHORESCENCE.

#### Arabian Sea.

THE following is an extract from the Meteorological Report of S.S. *Stockwell*, Captain W. SMITH, Calcutta to Suez. Observer, Mr. R. A. KNEEN, 3rd Officer:—

"May 10th, 1928, 10 p.m. A.T.S., 1800 G.M.T., in Latitude  $10^{\circ} 43' N.$ , Longitude  $59^{\circ} 24' E.$  Observed an interesting phenomenon in the form of brilliant phosphorescent patches. I record this mainly for the remarkable way in which they formed and spread. Originating apparently each from a small particle hardly visible, it spread rapidly from this as a centre, and on attaining a limited extent as quickly dispersed.

"It appeared as if the small particles had exploded and spread in the manner described. I was at first inclined to think that they were caused by shoals of small fish, but as the ship passed through a number of patches I was able to ascertain that this was not the case. They were remarkably brilliant and the water affected covered a wide area. This lasted from 5 to 7 minutes, when the sea surface resumed a normal appearance. The sky at the time was mainly clear; there was, however, a small amount of detached Cu. Cloud around the S. and W. horizon. Barometer 29.76 in. Steady. Air Temperature  $83^{\circ} F.$  Sea Temperature  $86^{\circ} F.$  There was excessive humidity."

#### North Pacific Ocean.

THE following is an extract from the Meteorological Report of S.S. *Tahiti*, Captain B. L. ALDWELL, Wellington, New Zealand, to San Francisco. Observer, Mr. C. R. CARLYON, 4th Officer:—

"May 10th, 1928, between 9 p.m. and 10 p.m. Wind N.W., force 4. Moderate N.W. sea and slight swell. Temperature, Air  $57^{\circ}$ , Sea  $58^{\circ}$ . Ship passed through frequent lines and patches of water which appeared white, as if there were phosphorescence under the surface, the glow being dull and undisturbed by the break of the sea.

"At first thought it was fish, but on approach of the ship no movement was noticeable. The night was very dark, sky being overcast with Nimbus, Stratus and St.-Cu. Clouds. In the distance it was very similar to breakers over shallow water. Ship's position at 8 p.m. was Latitude  $37^{\circ} 05' N.$ , Longitude  $123^{\circ} 36' W.$ "

### AURORAL LIGHT.

#### South Indian Ocean.

THE following is an extract from the Meteorological Log of S.S. *Wangaratta*, Captain W. SCUTT, Cape Town to Fremantle. Observer, Mr. S. R. MILLARD:—

"May 28th, 1928. From midnight till 3 a.m. at ship, the sky had been clouding and clearing at intervals with Cu-nb/nb. from the S.W. and occasional squalls with rain of moderate intensity and short duration had been experienced.

"Shortly after 3.0 a.m. at ship, the sky commenced clearing from the S.W., and at 3.20 a.m. the cloud proportion was 2-3, consisting of a dark bank of cloud on the southern horizon at an altitude of about 5 from the observer, and the clearing cloud in the N.N.E.

"A slight brightness was first noticed in the S.S.W. which gradually developed until the southern horizon and sky were quite appreciably illuminated, and the low lying cloud bank thrown out in bold outline. The first impression was that of daylight coming in, or the moon rising behind cloud.

"At 3.30 a.m. at ship, 2105 G.M.T., 27th, two bright rays were observed, extending almost vertically into the sky, radiating from the centre of the diffused light, which bore  $145^{\circ}$  from ship, and were shortly followed by two more rays, one on either side of our first two, but of considerable less brightness. The primary rays were very plain to an altitude of about  $20^{\circ}$ , after which they faded rapidly, and were not visible in the vicinity of a Pavonis, whose bearing was  $140^{\circ}$  and altitude about  $30^{\circ}$ , and in whose direction they were projected.

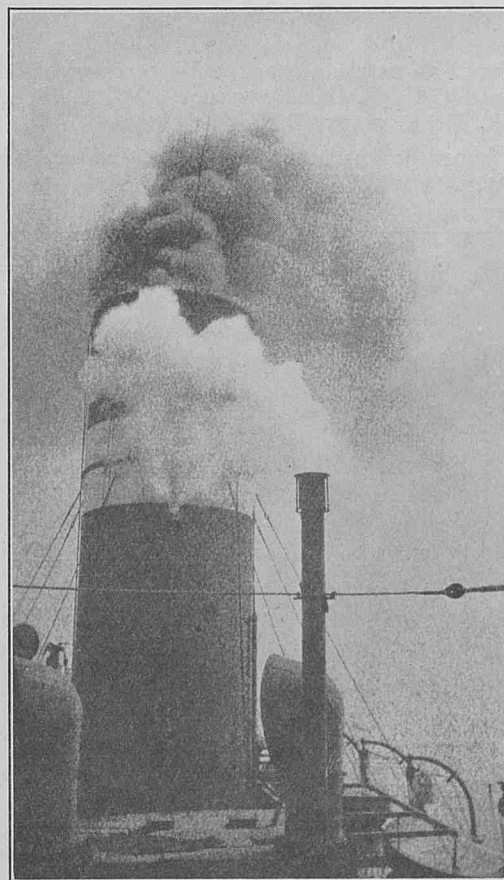
"For five minutes the phenomenon was in evidence, and gave the impression of four searchlight beams being projected vertically into the sky from some point behind the cloud bank, and after which a gradual fading was noticed, until only the diffused light remained.

"At 3.45 a.m. the cloud bank was seen to have advanced towards the observer, and was about  $10^{\circ}$  altitude, behind which the light effect was faintly perceptible, but fading rapidly, and at 4.0 a.m. was not visible at all.

"The barometer, wind, etc., were noted at 3.30 a.m., and were the same as logged for 4.0 a.m., viz., Wind S.W., force 4, Barometer 1015.1 mb., Air Temperature  $46.5^{\circ} F.$ , Sea  $49^{\circ} F.$  D.R. Position at 3.30 a.m. at ship was Latitude  $38^{\circ} 17' S.$ , Longitude  $93^{\circ} 03' E.$  Course  $N.78^{\circ} E.$ , speed 11 knots."

### SHIP'S FOG SIGNAL.

BELOW is a photograph of the funnel and steam whistle of S.S. *Nardana*, Captain F. L. MOTH, during fog in the English



Channel off the Shambles on 4th May, 1928, at 3 p.m. Barometer corrected 29.49 inches, wind S.W. force 1, sea smooth, dense fog (1 by scale).\*

\*NOTE:—See remarks on Ship's Sound Signal Trial, pp. 98-100, included in notes entitled "Special Observations, Tests and Investigations, and their Influence upon the Work."

## MAGNETIC DISTURBANCES

### Off Point Samson (Cossack) and Port Hedland.

THE following is an extract from the Meteorological Log, December, 1927—May, 1928, of S.S. *Gascoyne*, Captain L. JOHNSON, Singapore to Fremantle. Observer, Mr. S. L. R. SIMPSON, 2nd Officer.

"The abnormal local magnetic attraction at these places is mentioned in the Australia Pilot (Vol. V), and LECKY'S WRINKLES also makes cursory reference to it, but I thought that I should at least mention it in my log.

"On arriving from—and departing for—southerly ports at Cossack, we almost invariably pass Bezout Island at three miles distant, and on passing over a spot with the south end of the Island bearing about S.60° W. the compass card is suddenly deflected between 55 and 60 degrees in an anti-clockwise direction. The card remains at this position for at least five minutes as a rule and then gradually readjusts itself, showing that the patch of magnetic sand (presumably) on the sea floor is fairly extensive.

"We visit Cossack on our itinerary regularly every six weeks, and the phenomenon is observed unfailingly on every occasion.

"I have never heard of such a large deflection anywhere else in the world, though possibly there are spots with as large—or a larger—disturbing influence. I should like to hear of them.

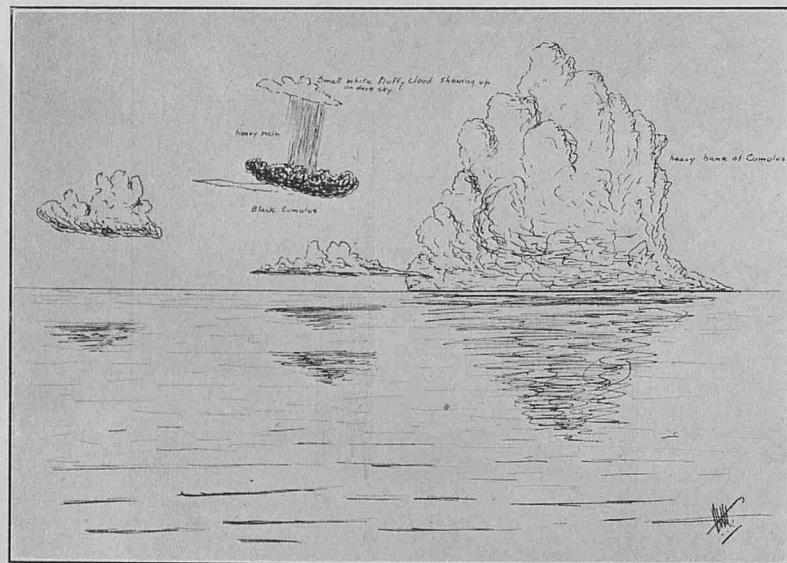
"Similarly, on leaving Port Hedland on the line of leads, the card is deflected, although not nearly as much as at Cossack (about 25 or 30 degrees) but the period is much longer.

## CLOUD PHENOMENON.

### South China Sea.

THE following is an extract from the Meteorological Log of H.M.S. *Herald*, Captain F. E. B. HASELFOOT, D.S.O., R.N. Observer, Lieutenant R. H. KENNEDY, R.N.

"At 1600 hours on the 10th May, 1928, in Latitude 4° 10' N., Longitude 112° 14' E. Wind S.W. force 2. Sky three parts



clouded with heavy Cumulus. Rain squalls round the horizon. Observed peculiar cloud formation to Eastward. Altitude about 35°. It appeared as if a heavy rainfall was taking place from one cloud to another. It was quite apparent that no rain was falling into the sea.

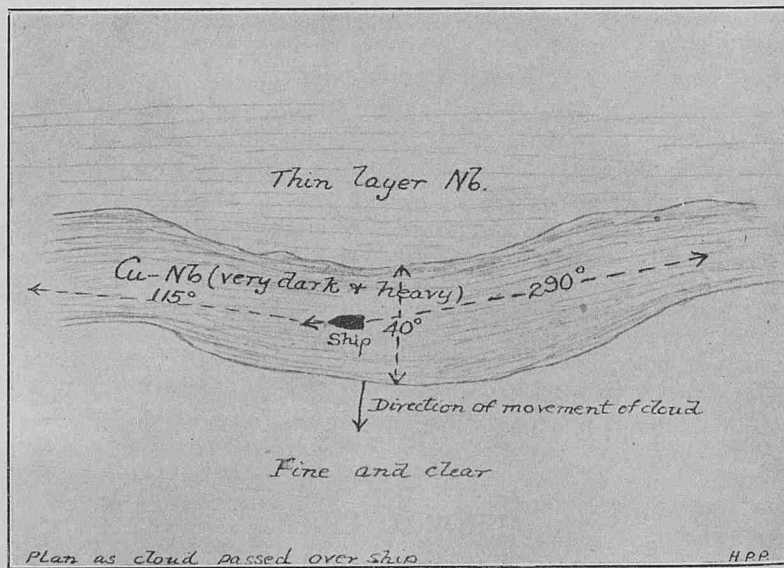
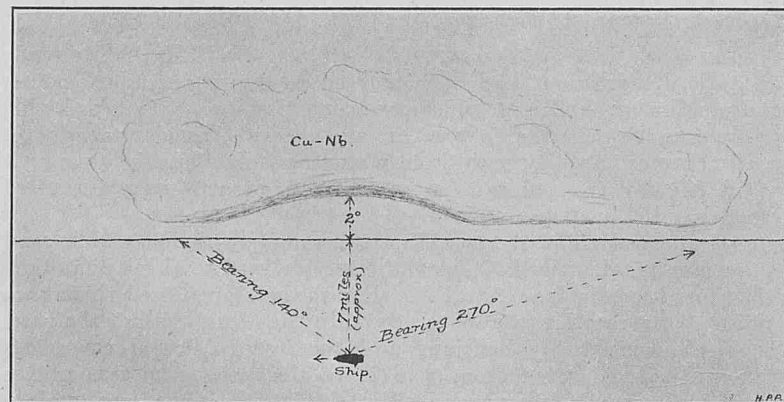
"This rain was 'funnel'-shaped, and it is considered that a small waterspout had formed in the sky and was sucking rain from a heavy cumulus cloud to another cloud (small, fluffy and whitish) above it."

## CLOUD FORMATION.

### Malacca Strait.

THE following is an extract from the Meteorological Log of H.M.S. *Ormonde*, Commander W. V. RICE, D.S.O., D.S.C., R.N. Observer, Lieutenant H. P. PRICE, R.N.

"31st May, 1928, at 0310 Ship's Time, Latitude 2° N., Longitude 102° E. Observed curious arch formation of Cu-Nb. clouds approaching from S.W. The accompanying sketch shows its appearance from ship at this time. The underside of the cloud appeared jet black and of a roll formation. Cloud passed over ship at 0324, the wind increasing to force 3-4, S by E—the cloud itself moving to N.N.E. A light drizzle set in at 0340 and lasted for 5 minutes and wind moderated. The shape of cloud passing over ship is shown in plan."





South Pacific.

[illegible]

## South African Waters.

INFERENCES:

CLOUDY AS YESTERDAY ANTICYCLONE MOVING EASTWARD'S SLOWLY SLIGHTLY FASTER THAN PREVIOUS 24 HOURS. PROBABLY 300-400 MILES PER DAY

SATURDAY May 19<sup>TH</sup> 1930 0630 GMT

FORECAST - (48 HOURS)

LIGHT S.W. TO WEST WINDS, TO LIGHT VARIABLE AND CALMS WITH TENDENCY TO VEER N.W. TO NORTHERLY, REMAINING LIGHT WEATHER GENERALLY FINE BUT CLOUDY, WITH PASSING SHOWERS AND POSSIBLE SHORT SQUALLS WHEN WIND VEERS WEST TO NW BAROMETER WILL REMAIN ALMOST STEADY, FALLING SLOWLY FOR NW WIND A STEADY RISE IN TEMPERATURE IS TO BE EXPECTED

3987

## MIRAGE.

## Red Sea.

THE following is an extract from the Meteorological Report of S.S. *Stockwell*, Captain W. SMITH, Calcutta to Suez. Observer, Mr. R. A. KNEEN, 3rd Officer.

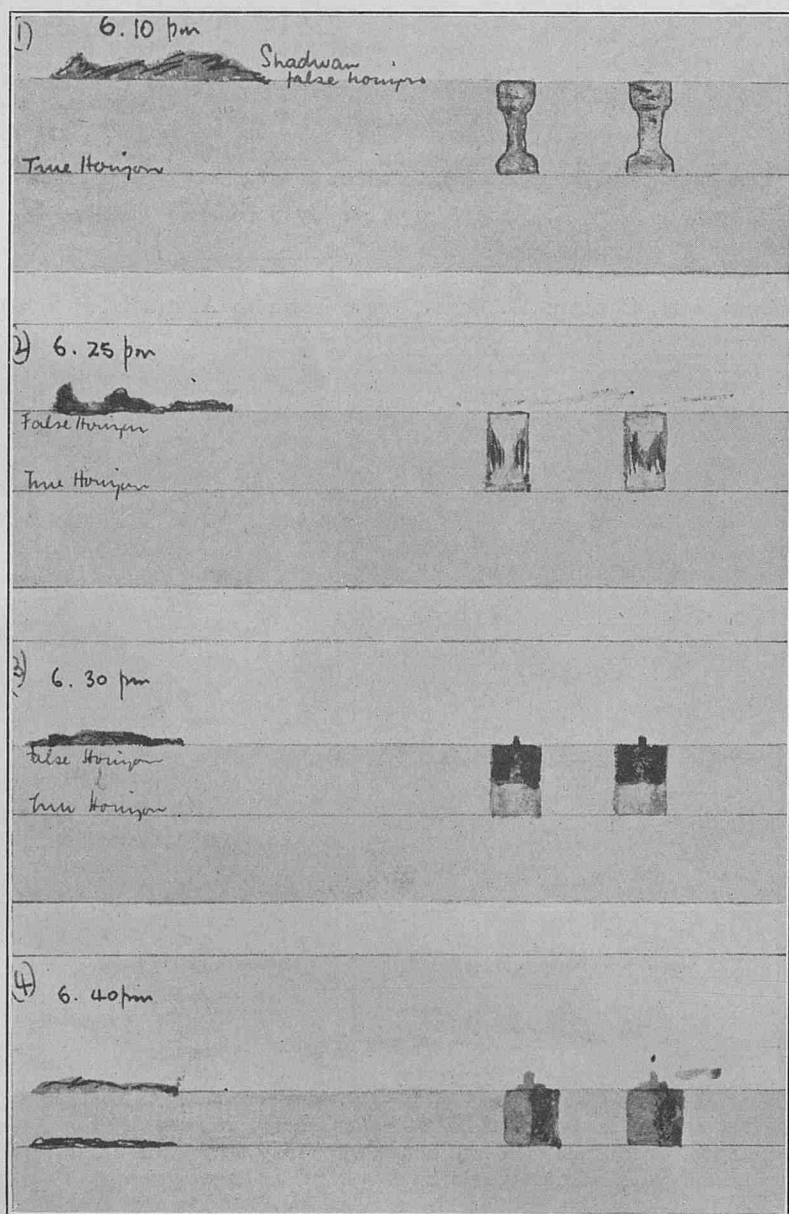
"The accompanying sketches are of refraction experienced on 18th May, 1928, immediately before sunset, approaching Shadwan from the Southward in Latitude  $26^{\circ} 58' N.$ , Longitude  $34^{\circ} 27' E.$  Shadwan Island distant 37 miles.

"6 p.m. We observed a belt of mirage above the true horizon and between the two horizons two objects were seen which appeared to be water tanks on tripods; in a few minutes they appeared as shown in FIGURE 1 with Shadwan very plain to the West.

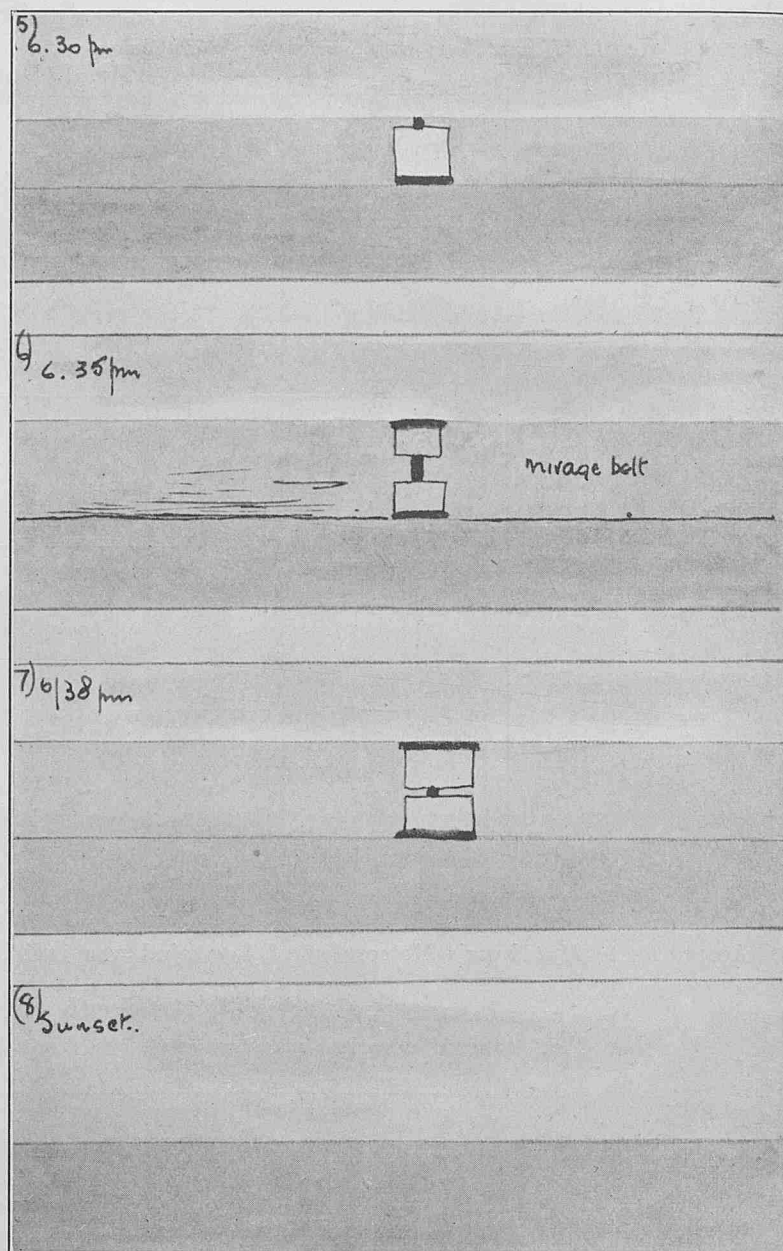
"At 6.25. The belt of mirage was decreasing and the land receding while the two objects above-mentioned appeared as in FIGURE 2. At 6.30 they resolved themselves into a semblance of steamers as their funnels were just visible above the false horizon. At 6.40 p.m. they appeared as shown in FIGURE 4, while a true and false Shadwan Island were visible. At sunset, 6.43, the horizon appeared normal and the distortion ceased.

"Whilst this was taking place, a large French passenger boat coming up astern appeared as shown in FIGURES 5, 6 and 7, and while the mirage belt was decreasing in the N.W. it was increasing

Lloyd Tristino Steamer and French Steamer  
approaching from NNW.



Messagerie Steamer approaching from SE.



to the Southward and East, until the steamer appeared as in FIGURES 6 and 7, and at sunset disappeared entirely.

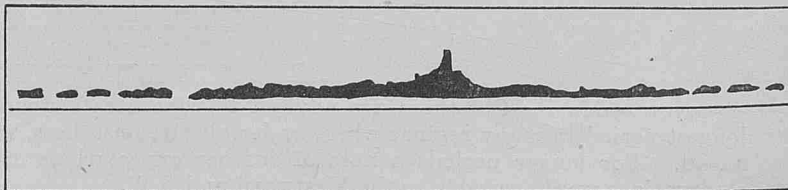
"At dark, lights seemed to be similarly affected, as Ashrafi Light which is visible for 17 miles was visible over 30 miles.

"This is without doubt the greatest mirage effect I have seen; they are certainly common in the Red Sea, but not often are they so great as this."

## Western Australia.

The following is an extract from the Meteorological Log of S.S. *Naldera*, Captain J. W. HARTLEY, Sydney, N.S.W., to London. Observer, Mr. H. M. ASKIN, 4th Officer.

"Observed Rottneest Island (Latitude  $32^{\circ} 00' S.$ , Longitude  $115^{\circ} 30' E.$ ) 14th May, 1928, at 6.15 a.m. Local time, bearing  $50^{\circ}$ , distance 23 miles.





"The island was observed about one degree above the horizon the base being a practically straight line. The mirage appeared as a single object, and was not reversed or distorted in any way. As the phenomenon took place a few minutes before sunrise the land presented a most unusual effect standing out in clear relief against a background of bright orange sky. Barometer 1029.0 mb. (Steady). Temperature, Dry Bulb  $65\frac{1}{2}^{\circ}$  F., Wet Bulb  $55^{\circ}$  F."

### East Coast of Australia.

THE following is an extract from the Meteorological Log of S.S. *Port Denison*, Captain J. FERRIS, Brisbane to Newcastle, N.S.W. Observer, Mr. J. ROWLAND-HILL, 3rd Officer:—

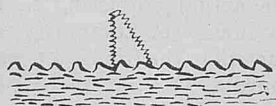
"During the early morning of 16th May, 1928, vessel bound to Newcastle N.S.W. from Brisbane, and approaching N. Solitary Id. the general condition of mirage was noted, distant land being sighted apparently raised above the horizon and distorted."

"At 9.40 a.m. when off N. Solitary Id. a distant object resembling a cutter's mainsail seen from a considerable distance was sighted and upon examination with binoculars the horizon in its vicinity appeared irregular as if seen through intense heat haze as is usually the case with mirage. The bearing of the object was  $209^{\circ}$  and a land fix showed S. Solitary Id. Lighthouse bearing  $209^{\circ}$  distant 21 miles."

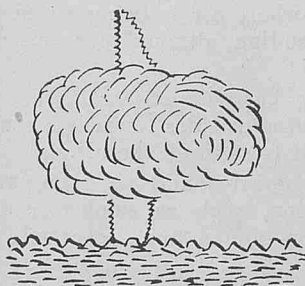
"By 9.55 a.m. both the Island and the lighthouse could be seen greatly distorted as in second sketch, the former appearing as a small dun coloured cloud slightly above the horizon, upon it the greatly magnified and distorted white image of the lighthouse, and below it the image apparently reversed."

"By 10.15 a.m. when bearing  $214\frac{1}{2}^{\circ}$  distant 14 miles, the whole had assumed its normal character."

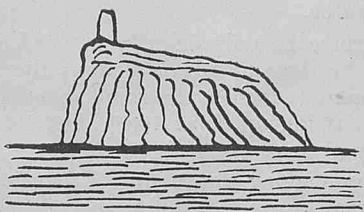
"The wind was W. by S., force 5. Barometer 29.91 in. Air Temperature  $64^{\circ}$  F. Sea surface temperature  $74^{\circ}$  F."



9.40 am. Lt. Ho. Bq.  $209^{\circ}$   
dist 21 mls.  
Visible as indistinct white  
object.



9.55 am Lt Ho Bq.  $210\frac{1}{2}^{\circ}$   
dist. 18 mls.



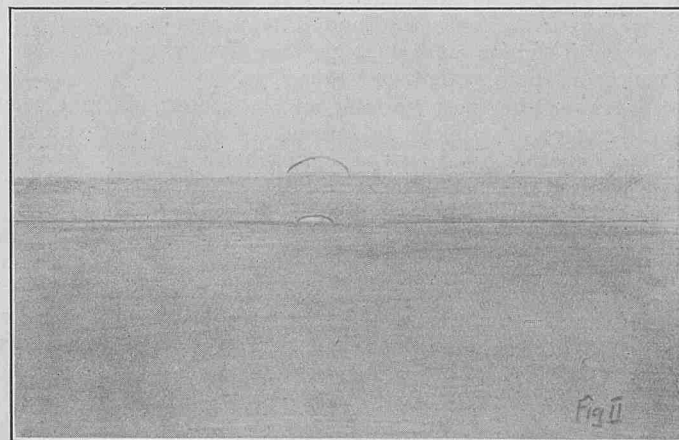
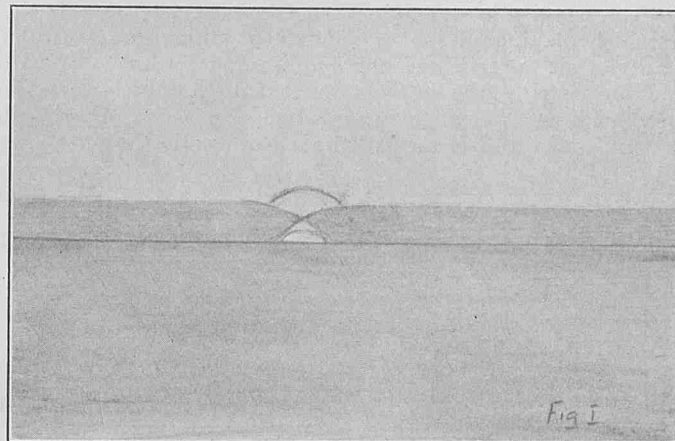
10.15 am Lt Ho Bq.  $214\frac{1}{2}^{\circ}$   
dist. 14 mls.

### REFRACTION.

#### South Atlantic Ocean.

THE following is an extract from the Meteorological Report of S.S. *Bendigo*, Captain R. N. C. NICHOLL, London to Cape Town. Observer, Mr. R. M. RICHARDSON, 2nd Officer:—

"Remarkable refraction was observed at sunset on 29th May, 1928, in Latitude  $31^{\circ} 38' S.$ , Longitude  $16^{\circ} 11' E.$  A low bank of



stratus was on the horizon behind which the sun appeared to be setting. In line with the sun the cloud almost separated, each part coming to a point over a second sun setting below the horizon see FIGURE I. As the lower sun set, the bank of cloud became uniform, the upper sun setting behind it as in FIGURE II."

### LUNAR RAINBOW

#### Off Queensland Coast.

THE following is an extract from the Meteorological Log of S.S. *Port Denison*, Captain J. FERRIS, Panama to Brisbane. Observer, Mr. J. ROWLAND-HILL, 3rd Officer.

"On the night of May 10th, 1928, when in Latitude  $27^{\circ} 12' S.$ , Longitude  $158^{\circ} 00' E.$  the rather rare phenomenon of a lunar rainbow reflecting some of the colours of the spectrum was observed. The night was clear, the upper air apparently cloudless, with Cumulus, Cu. Nb. amount 5, showers in the near vicinity and the moon nearing its last quarter."

"From 11.0 p.m. a heavy bank of Cu. Nb. had been forming ahead, and at midnight with startling suddenness the bow appeared, at first visible as a thin whitish band with an angular height of approximately  $10^{\circ}$ , centre bearing N.  $70^{\circ} W.$  (True) and the angular distance of the bow approximately  $40^{\circ}$ ."

"Gradually the band widened and the colours, orange, very pale yellow and green became visible, the green band relieving the maximum luminosity and also the widest. Thus it remained clearly defined for about ten minutes, when as could be expected with the passage of some cumulus cloud across the disc of the moon, it faded as suddenly as it had appeared."

### METEOR.

#### North Atlantic Ocean.

THE following is an extract from the Meteorological Report of S.S. *Loriga*, Captain E. C. CLAPHAM, London to Colon. Observer, Mr. D. P. MORGAN, 3rd Officer:—

"May 5th, 1928, 1.12 a.m. A.T.S. 5.36 a.m. G.M.T. in Latitude

18° 06' N., Longitude 68° 10' W. Observed exceptionally bright Meteor which originated in the vicinity of Spica and travelled in a S.W. direction towards the horizon, leaving behind it a brilliant tail and on nearing the horizon burst into a bluish-white flame. Time occupied by this phenomenon about six secs. Weather light S.S.E. winds, fine and clear with lightning to the N.W."

### Pacific Ocean.

The following is an extract from the Meteorological Report of

S.S. *Clan Alpine*, Captain A. B. LYALL, Apia, Samoa to Panama. Observer, Mr. K. BANKS, 3rd Officer:—

"May 7th, 1928, at 6.45 p.m. A.T.S. in Latitude 0° 46' S., Longitude 160° 26' W. Observed Meteor at an altitude of approximately 30°. It first appeared as a stationary green flare. It then fell rapidly at an angle of 30° travelling in a N.W.'ly direction leaving a long white tail in its wake. At an altitude of about 20° it again became stationary for a few seconds and then fell as before disappearing at an altitude of about 10°."

## FOG.

PREPARED IN THE MARINE DIVISION BY MR. H. KEETON.

Fog at sea consists of fine particles of water suspended in the atmosphere; over and near the land it may also be caused by the accumulation of smoke and dust in the atmosphere, but we are chiefly concerned here with true water fogs.

Fog is perhaps the most variable of the meteorological elements, and consequently very difficult to forecast. While there is a simple and definite relationship between atmospheric pressure and wind, there is a marked absence of *definite* rules to guide us in the prediction of fog. We know that when it is foggy, on land or sea, the pressure distribution is often anticyclonic; but when the pressure distribution is anticyclonic it is not by any means necessarily foggy. Fog requires something in addition to a suitable pressure distribution for its production, and it is proposed to describe below some of the physical conditions and processes under which it is formed.

**Humidity.**—The first of these conditions is humidity. Air, as we find it in nature, is always more or less moist; but it can only hold a certain amount of water vapour, the amount being dependent on its temperature. The higher the temperature of the air, the greater is its capacity for holding water vapour. When a mass of air contains the maximum amount possible at any given temperature, it is said to be saturated; and should the mass of air then be cooled below this temperature, called the *dew point*, condensation will take place. If at the surface, this will be in the form of either dew or fog, according to the process of cooling; or, if aloft, the water vapour will condense as cloud.

**Temperature.**—Next to the state of humidity of the air, changes in its temperature are the most important factor in the production of fog.

Changes in the temperature of the air may be brought about by two methods: (1) by taking up heat from, or giving up heat to other surrounding bodies; and (2) without any actual transference of heat, but simply on account of its changes of pressure. It is probably difficult to find in nature an illustration of one without complication by the other, but often the one cause or the other may be seen to be clearly predominant.

Air is warmed by taking up heat when it passes over warmer ground or warmer water; and conversely it is cooled when it passes over colder ground or colder water. There is a great difference, however, between the land and sea with regard to the manner and extent in which these changes take place.

Out at sea the surface temperature only changes very slowly by heat given to or taken from the atmosphere, and there is practically no daily range in the sea surface temperature. Fluctuations in the temperature of the air above it are consequently limited, and the air temperature seldom differs by more than a few degrees from that of the sea.

Ashore, however, the temperature of the ground surface may be subjected to very rapid and irregular changes through a large range, due amongst other causes to heating from the sun's rays by day, or cooling through radiation at night. The consequent changes in the temperature of the surface air above it are, therefore, large and irregular.

It will thus be seen that the conditions which determine the formation of fog at sea, though far from simple, are less complicated than those on land.

**Dynamical Cooling.**—The second process by which changes of temperature occur is that solely due to changes of pressure.

When air is compressed, for example, by pushing a piston into a cylinder, the compression itself will produce a warming of the air, without any transference of heat from outside. Similarly, expansion of air, without communication of heat, will produce cooling.

Thus, as atmospheric pressure decreases with height, an ascending mass of air will expand, and in so doing will be automatically or, as it is termed, dynamically cooled. Conversely, a descending current of air will be subjected to increasing pressure, and will automatically become warmer. Normally, therefore, the temperature of the air decreases with height above sea level, the amount of this decrease being called the "lapse rate."

This decrease of temperature, due to decrease of pressure, has been calculated and amounts to 5½° F. in 1,000 feet for *dry* air; it is less in moist air, dependent on the amount of moisture present.

It is rare, however, that the lapse rate actually existing in the atmosphere in any locality reaches this maximum (or adiabatic) rate of 5½° F. for each 1,000 feet, owing to the fact that the air is generally subjected to changes of heat from other sources.

**Convection.**—Convection may be simply described as the ascent of locally-warmed air or the descent of locally-cooled air. It must be remembered that for heated air to rise there must be cooler air to take its place, so that every place where air is being warmed is not *necessarily* a place where air is ascending, although generally this is the case.

Another effective cause of ascending currents of air is the convergence of surface air currents from different sides towards a centre, where there must be an upward current to take off the air.

At the surface when convection is operative and vigorous, water particles and any atmospheric pollution, such as smoke or dust, are rapidly dispersed and the formation of fog thus prevented.

**Lapse rate and Convection.**—The lapse rate of temperature has a most important influence on convection, for it is the lapse rate which decides how far warmed air will rise before finding its level. As an illustration, if we imagine a mass of thoroughly mixed air 10,000 feet high, with a *maximum* lapse rate, its temperature at 10,000 feet would be 55° F. less than the temperature at the surface (that is, 5½° F. for each 1,000 feet). Above this 10,000 feet mass, let there be layers of air with smaller lapse rates.

Now, if a part of the air at surface be only slightly warmed, say, 2° F., it will rise, and as it will be dynamically cooled at the rate of 5½° F. for each 1,000 feet of ascent (which is the same rate as the air it is displacing), it will go on rising until, at 10,000 feet, it will still be 2° F. warmer than its surroundings.

Above 10,000 feet, with a diminishing lapse rate, the fall of temperature with height of the mass of air is smaller, say, 3½° F. for each 1,000 feet. The warmed rising air will, however, still cool at the same rate as before (5½° F. for each 1,000 feet), so that the 2° difference of temperature will gradually get less and less, until the warmed air will eventually stop rising where its temperature coincides with that of the surrounding air mass, in this case 11,000 feet.

FIGURE 1 (a) illustrates such a lapse rate; the dotted line (b) denoting the change of temperature of the warmed air as it rises.

With a large lapse rate, therefore, convection is strong, and the formation of fog is prevented.



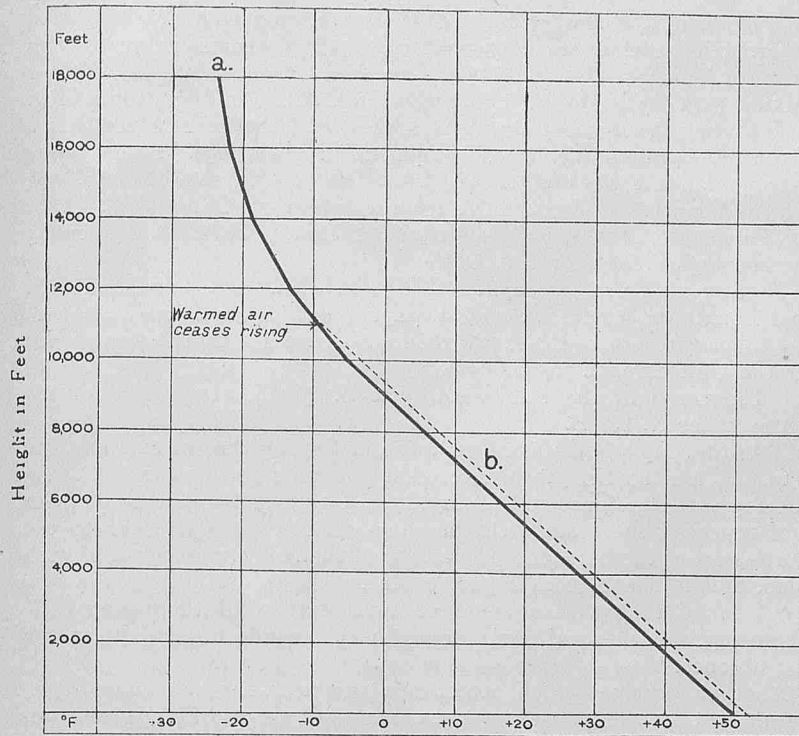


Fig. 1.—Scale of Temperature, Fahrenheit.

**Reversed Lapse Rate.**—From time to time there are formed in the atmosphere, especially near the earth's surface, layers of air in which the lapse rate is reversed, that is, the air is warmer up aloft than at the surface. These conditions effectually prevent convection, and are very favourable for the formation of fog. A familiar example of the absence of convection is when the smoke from the funnel remains in layers close to the sea surface; that is often regarded as a sign of fog.

Such an inversion of temperature occurs very frequently at sea in regions where a warm current of air passes over cold water.

FIGURE 2 illustrates this condition during a fog which extended to a height of 1,000 feet.

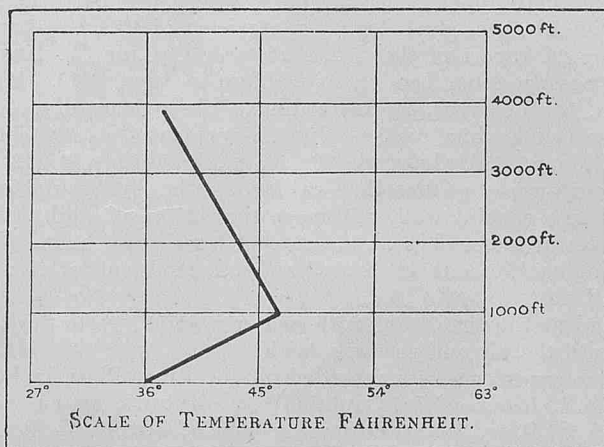


Fig. 2.

**Average Lapse Rates.**—The lapse rate in the atmosphere of a cyclone is, as a rule, very close to the limit, while in an anticyclone it is often far from it. Very little warming, therefore, is necessary to produce great convective motion in the air of a cyclone, but a great deal is required in an anticyclone.

FIGURE 3 represents a series of *average* lapse rates from observations made ashore in the British Isles. The plain lines from left to right show the *maximum* or adiabatic lapse rate for perfectly dry air, the average lapse rates for winter and summer, respectively. The pecked lines show the average lapse rates in a cyclone and an anticyclone.

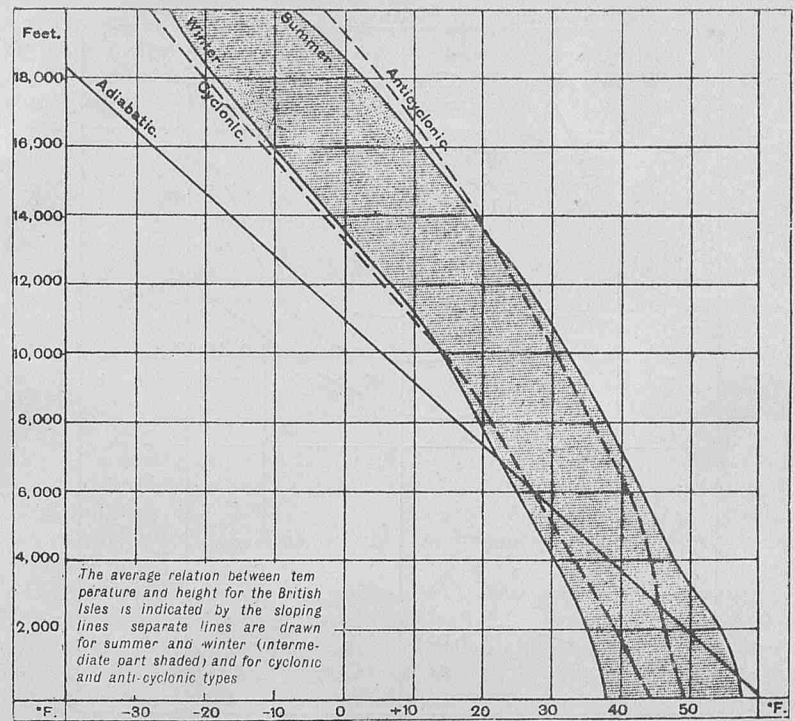


Fig. 3.

### Formation of Sea Fogs.

We will now examine the processes of cooling whereby fog is formed. As already stated, the causes of fog at sea are less difficult to trace than those ashore, owing to the fact that the changes of temperature of the sea surface at any one place are much smaller and more gradual than those of land surfaces. An additional reason is that the sea surface offers less obstruction to surface winds than do the irregular land masses.

Owing to the friction of the sea surface, the action of the wind, however light it may be, causes turbulence or eddy motion of a very irregular character in the lowest layers of the atmosphere. This eddy motion causes a mixing of the lowest layers of the atmosphere, and is an essential part of the process whereby 80 per cent. of sea fogs are formed, that is, by the passage of warm moist air over relatively cold water. The cold sea chills the surface layer of air; this chilled air is churned up and mixed with the warmer air above it, this process sometimes extending to a considerable height. If the sea can chill the air sufficiently so that its temperature falls below the dew point, condensation will take place in the air itself, and fog will result. If there were no churning, and therefore no mixing, the moisture in the air would be deposited on the cold sea surface like dew.

An example of fog formed in this way is illustrated in FIGURE 4, and was investigated by Mr. G. I. TAYLOR when on board the Ice Patrol *Scotia* during 1913.

On 3rd May, the *Scotia* was in a thick fog in Latitude 47° 36' N., Longitude 44° 25' W. The probable course of the air for the previous days was determined from the observations of ships and the maps of the American Service. It will be seen that the air on the 1st May was travelling North and, as shown by the sea surface isotherms was being slowly cooled. From 2nd to 3rd May, it was travelling N.N.W., and the cooling became much more rapid as the air crossed the boundary of the Gulf Stream, resulting in a dense fog on 3rd May.

Fogs of this type are frequently very shallow, but may extend to a height of 2,000 to 3,000 feet.

These fogs are sometimes very local in character, for instance, where offshoots from the cold Labrador current penetrate the region of the Gulf Stream, and form lanes of cold water between areas of warmer water. An example of this is given in the meteorological log of the S.S. *Port Augusta*, Captain G. W. HEARN, while on passage from London to New York. At midnight on 23rd April, 1923, in Latitude 41° 32' N., Longitude 47° 10' W., the wind was S.S.E. force 5; air temperature, 61° F.; sea temperature 60°·5 F.; weather, sky half clouded, misty and damp. At 2.5 a.m. of 24th, the "ship

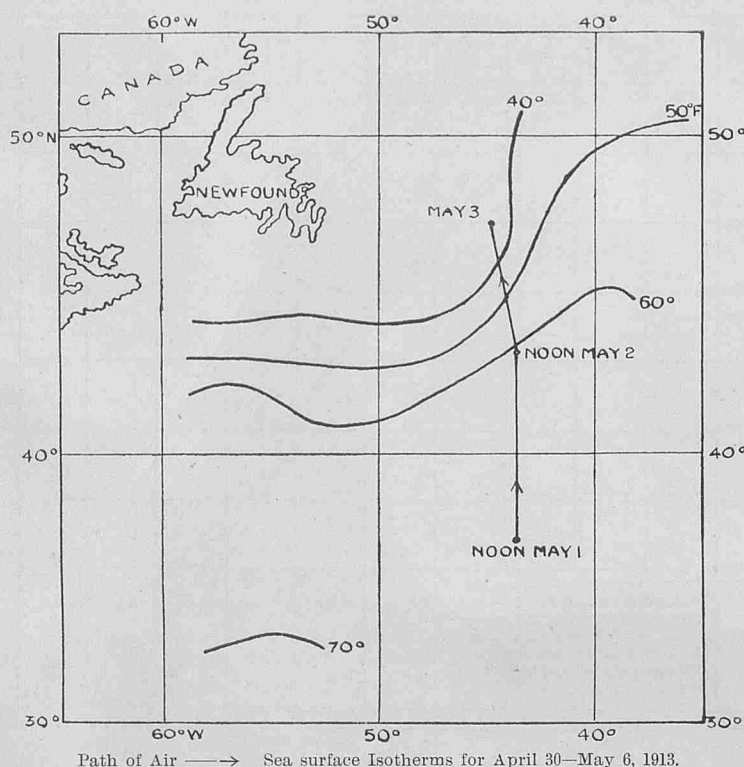


Fig. 4.—Probable path of Air previous to thick fog, May 3rd, 1913.

entered a thick fog bank; the temperature of the air and sea water commenced to fall rapidly. The lowest temperatures reached were at 3.30 a.m., when the air was 42° F. and the sea 35°. At 5.20 a.m., the fog suddenly cleared and temperatures quickly returned to normal (8 a.m.—air temperature, 63°; sea temperature, 60°; weather, bc). The fog was only low on the water, as blue sky was visible overhead."

A similar experience occurred between 3.15 p.m. and 4.30 p.m. of the same day, the temperatures at 4 p.m. being: air, 50°·1; sea, 40°·5.

A similar and more recent example is contained in the meteorological report of S.S. *Bengloe*, Captain C. M. CORQUODALE, while on passage from Hampton Roads to Lisbon, the observing officer being Mr. G. DAVIDSON. His report reads as follows:—

"In Latitude 40° 10' N., Longitude 53° 09' W., G.M.T. 0238, on 13th May, 1928 (11.00 p.m. Ship's Time 12th May), the S.S. *Bengloe* steaming 10 knots course 88° encountered the following weather. Temperature of air dropped from 68° F. to 56° F., wind backed from South to S.S.E. force 3 and mist spread over surface of sea to height of bulwark rail, then slowly developed into thick fog which however never seemed to rise higher than truck at masthead. Sky throughout was clear. Sea temperature which at 8.00 p.m. had been 73° F. was now found to be 54° F. and temperature of sea continued falling until 1.00 a.m. when it was 48° F. By 00.15 a.m. 13th May (G.M.T. 0353) temperature of air had dropped to 53° F., where it remained until 1.30 a.m., when both air and sea temperatures rose to 60° and 58° respectively and fog showed signs of clearing in exactly same way as it started, decreasing to mist on surface of sea, and finally by 2.00 a.m. clearing (G.M.T. 0538). Temperatures then, air 62° F., sea 60° F. Wind also hauled to South again force 3. Calm sea throughout. Weather previous to this had been cloudy and clear."

Fog is also observed at sea, but far less frequently, when the opposite conditions prevail—that is, when cold air flows over warm water. Here the physical process is not so obvious. The lowest layers of the air would be warmed by contact with the sea and mixed with the colder air above, partly by convection and partly by turbulence; but we should expect that this warming of the lower layers would result in the air affected rising by convection out of the reach of further warming and, when it had become sufficiently cooled by elevation, to condense and be observed as *cloud*.

The probable explanation is that, in the instances when fogs are formed under these conditions, the lapse rate of the air current is so small that the warmed air would not rise far before it had become dynamically cooled to the temperature of its surroundings; the effect

of the warming would be limited, therefore, to a comparatively thin layer. The surface layer would gradually become saturated by evaporation from the warm water surface, after which any further mixing with the colder air above would result in condensation as fog.

The meeting of the Labrador current and the Gulf Stream is a favourable ground for the development of such fogs. An example is given on the back of the U.S.A. Weather Bureau chart of the North Atlantic for April, 1913, from a report by Captain W. G. S. DE CARTERET, of the Cable Steamer *Minia*, who has kept many meteorological logs for this Office.

Captain DE CARTERET says: "I was in about Latitude 41° 30' N. and Longitude 48° 13' W. on 30th April, 1912, when I saw a wall of fog to leeward in a south-east direction. I realised that it was caused by the Gulf Stream.

"The trend of the cold water was S. 60° E. (true) and of the warm water N. 65° E.

"As the ship's bow was about to enter the fog the sea temperature was 35°, and as her stern entered it the temperature was 56°. As the fog was too dense to see anything, I returned to the cold water and repeated the tests with the same results. It was clear to the north-west of the Stream. The colour of the cold water was a greyish blue, and in the Stream a purple blue.

"I found that with a south or south-east wind there was little or no fog, but the cold north or north-west winds brought down the fog at once."

Another process which sometimes produces fog is condensation resulting from the mixture of two currents of air of different temperatures. The capacity of air for moisture increases numerically faster than its temperature, and thus it may occur that two masses of air of different temperatures, neither of which is saturated, will give a mixture at their mean temperature which is more than saturated. Part of the water vapour will therefore condense and if sufficient, produce fog. This mixing is a frequent cause of fog at the boundaries of contrary winds of different temperatures.

Of these three sources of fog over the open sea, the first-named is by far the most important, and accounts for 80 per cent. of the fogs observed at sea. The conditions of its formation, that is, warm air flowing over cold sea, are *most* frequent in the spring and summer, when the normal seasonal increase of sea temperature lags behind that of the air. Hence sea fogs may generally be regarded as summer fogs.

Banks of fog frequently drift bodily, under the influence of wind, for a considerable distance from the region of their formation; and thus make their appearance in places where the conditions would not of themselves produce fog. An instance of this is given in the meteorological report of the S.S. *Batsford*, Captain W. HENDERSON, while on passage from London to Halifax, in June, 1919. Mr. R. A. LEICESTER, the observer, in forwarding a photograph of a thick fog bank observed by him on 30th June, says that "it stretched from Cape St. Mary, N.F. (Latitude 46° 50' N., Longitude 54° 12' W.), in a west-south-westerly direction as far as the eye could see. It appeared like a solid wall, not more than 130 feet high, and came creeping towards the ship at the rate of 5 miles an hour. We were in this fog-bank about 12 hours, and steamed out of it at about 6.30 p.m."

The wind at the time was south-westerly, light, while the temperature of both the air and sea was 44° F.

A similar experience was recorded off the River Plate in February, 1925, by S.S. *Harmonides*, Captain W. J. HUGHES, on passage from New York to River Plate, Observing Officer, Mr. D. L. ROBERTS:—

"On February 3rd, 1925, at 2.0 a.m., off Cape Santa Maria. Dense fog until 2.35 a.m.

"The fog mentioned above can be seen approaching for about 15 minutes. The vessel enters it as if it were a solid block, even the fore deck becoming invisible within about one minute. The same applies to coming out of the fog. You come out of it most abruptly and can see the fog appearing like a white wall behind you."

### Formation of Land Fogs.

Over the land in middle latitudes the conditions most favourable for fog formation are usually associated with autumn and winter anticyclones, wherein the winds are generally light or calms prevail. Under these conditions, if the sky be clear, the cooling of the ground by radiation at night will chill the layer of air on the surface, and, if sufficient, will cause condensation whereby fog may be formed.



Another cause of fog over the land is the slow drift of cold air over moist and relatively warm ground; this cold air mixing with and chilling the air which has been warmed and moistened, perhaps saturated, by contact with the ground.

Under suitable conditions, land fogs, once formed, may persist for several days; for much of the sun's heat which would otherwise reach the ground and set up convection is reflected from the upper surface of the fog layer.

Generally speaking land fogs may be termed *winter fogs*.

### Fog in Coastal Waters.

Fogs are very frequently formed on coasts. The main cause of these fogs appears to be a warm humid light wind from seaward blowing over colder air on the coast; less frequently the reverse conditions are the cause, viz., a cold wind from seaward blowing over a warm coast line.

In FORECASTING WEATHER, Sir NAPIER SHAW says: "Any notable change in the air current is apt to produce fog over the coastal regions. If, after a spell of warm weather, the air supply becomes cold, fog is generally experienced at some point or other of the coast; and still more frequently the replacement of a cold current of air by a warm one, after a spell of cold weather, shows itself as coastal fog."

In narrow waters, the fogs experienced may be either sea fogs, coast fogs or land fogs, and may be met with at any time of the year. Those experienced off our coasts in spring and summer have their origin chiefly over the neighbouring seas and channels, their formation being mainly due to the causes which operate over the ocean; while the autumn and winter fogs are mainly land fogs which have spread seaward. There are, however, other causes which produce conditions favourable for the formation of coastal fogs, as, for instance, the mixing of warm and cold surface currents; the cold under-currents being forced to the surface in passing over shoals or approaching a coast; these conditions are common in many countries. Off the United States Atlantic Coast, a cold current creeps south-

ward between the coast and the Gulf Stream, the marked difference in temperature of these adjacent streams being a fruitful cause of fog. Similar fogs are also caused off the South African Coast by the Agulhas and the Antarctic currents.

### Prediction of Fog.

From what has been said, it will be seen that the formation of fog depends on the temperature of the air being reduced by cooling to below the dew point.

For the successful prediction of fog, therefore, it is desirable to know the humidity of the air in the first place, and the amount of cooling it is likely to undergo.

We may have the conditions which tend to produce fog, on land or sea, but the fog may not be there. The air may undergo considerable cooling, but, if it is too dry to start with, the saturation point may not be reached. The air may be moist to start with, but the cooling it undergoes may fall short of that necessary to produce condensation. These changes do not depend entirely on the atmospheric conditions at the time of the forecast, but to a large extent (especially over the land) on the conditions prevailing during the previous days.

Over the open ocean, fog, though still erratic in its occurrence, is more amenable to forecasting.

The humidity of the air is found by calculation from the difference between the temperatures observed by the dry bulb and wet bulb thermometers. A small error in reading, or a false temperature, even though slight, may result in an entirely erroneous and misleading humidity.

The introduction of Portable screens has done much to improve temperature observations, and ships making weather charts may add to their value by the use of their own carefully recorded observations of dry and wet bulb temperatures. An example was given in Chapter VII of WIRELESS AND WEATHER AN AID TO NAVIGATION, and the Tables for calculating Relative Humidity and Dew Point given therein are reproduced below.

Table for Finding the Relative Humidity (per cent.).

Dry Bulb.		Depression of Wet Bulb.											
°F.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°
90	100	96	92	88	84	81	77	74	70	67	63	60	57
88	100	96	92	88	84	80	77	73	69	66	63	59	56
86	100	96	92	88	84	80	76	72	69	65	62	58	55
84	100	96	92	87	83	79	76	72	68	64	61	57	54
82	100	96	91	87	83	79	75	71	67	64	60	57	53
80	100	96	91	87	83	79	74	70	66	63	59	55	52
78	100	95	91	86	82	78	74	70	66	62	58	54	50
76	100	95	91	86	82	78	73	69	65	61	57	53	49
74	100	95	90	86	81	77	72	68	64	60	56	52	48
72	100	95	90	85	80	76	71	67	63	58	54	50	46
70	100	95	90	85	80	75	71	66	62	57	53	49	44
68	100	95	90	84	79	75	70	65	60	56	51	47	43
66	100	95	89	84	79	74	69	64	59	54	50	45	41
64	100	94	89	83	78	73	68	63	58	53	48	43	39
62	100	94	88	83	77	72	67	61	56	51	46	41	37
60	100	94	88	82	77	71	65	60	55	50	44	39	34
58	100	94	88	82	76	70	64	59	53	48	42	37	31
56	100	94	87	81	75	69	63	57	51	46	40	35	29
54	100	93	87	80	74	68	61	55	49	43	38	32	26
52	100	93	86	79	73	66	60	54	47	41	35	29	23
50	100	93	86	79	72	65	59	52	45	38	32	26	20
48	100	92	85	77	70	63	56	49	42	36	29	22	16
46	100	92	84	77	69	62	54	47	40	33	26	19	—
44	100	92	84	75	68	60	52	45	37	29	22	—	—
42	100	91	83	74	66	58	50	42	34	26	18	16	—
40	100	91	82	73	65	56	47	39	30	27	—	—	—
38	100	91	81	72	63	54	44	39	31	22	—	—	—
36	100	90	80	70	60	54	44	35	26	18	—	—	—
34	100	90	79	70	60	50	41	31	21	—	—	—	—
32	100	89	79	68	57	47	36	27	17	—	—	—	—
30	100	88	76	65	53	43	33	22	—	—	—	—	—

Table for Finding the Dew Point (°F.).

Dry Bulb.		Depression of Wet Bulb.											
°F.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°
90	90	89	87	86	85	83	82	80	79	77	76	74	73
88	88	87	85	84	83	81	80	78	77	75	74	72	70
86	86	85	83	82	80	79	78	76	75	73	71	70	68
84	84	83	81	80	78	77	75	74	72	71	69	67	66
82	82	81	79	78	76	75	73	72	70	68	67	65	63
80	80	79	77	76	74	73	71	69	68	66	64	62	61
78	78	77	75	74	72	71	69	67	66	64	62	60	58
76	76	75	73	72	70	68	67	65	63	61	60	58	55
74	74	72	71	69	68	66	64	63	61	59	57	55	53
72	72	71	69	67	66	64	62	61	59	57	55	52	50
70	70	69	67	65	63	62	60	58	56	54	52	50	47
68	68	66	65	63	61	60	58	56	54	52	49	47	45
66	66	64	63	61	59	57	56	53	51	49	47	44	42
64	64	62	61	59	57	55	53	51	49	47	44	41	38
62	62	60	59	57	55	53	51	49	46	44	41	38	35
60	60	58	56	55	53	51	48	46	44	41	38	35	32
58	58	56	54	52	50	48	46	43	41	38	35	32	28
56	56	54	52	50	48	46	43	41	38	35	32	29	25
54	54	52	50	48	46	43	41	38	35	32	29	25	20
52	52	50	48	46	43	41	38	36	32	29	25	20	16
50	50	48	46	43	41	39	36	33	29	25	21	16	10
48	48	46	44	41	39	36	33	30	26	22	17	12	4
46	46	44	42	39	36	34	30	27	23	19	13	6	—
44	44	42	39	37	34	31	28	23	19	15	8	—	—
42	42	40	37	34	32	28	25	20	16	9	—	—	—
40	40	38	35	32	29	26	22	17	11	8	—	—	—
38	38	35	33	30	26	22	18	15	10	3	—	—	—
36	36	33	30	27	23	21	16	11	5	—	—	—	—
34	34	31	28	25	22	17	13	7	—	—	—	—	—
32	32	29	26	22	19	14	8	—	—	—	—	—	—
30	30	27	23	20	15	10	4	—	—	—	—	—	—

## LOCAL WINDS, MEDITERRANEAN AND BLACK SEAS.

## II.—Eastern Mediterranean.

**Adriatic.**—In the Adriatic, which is bordered on its eastern shores by high mountain ranges, the most prevalent winds are those from between North East and E.N.E. and from between South East and South.

In summer light variable winds and calms are frequent, with squalls, mostly from a northerly direction; while close inshore light land and sea breezes prevail.

In winter the Adriatic is very stormy, the storms being more frequent in the northern part of the sea than in the southern part. In the north the winds blow almost exclusively from northerly directions, while further south they blow more frequently from southerly directions.

The winds from between North and North East are known as the "Bora." They are frequently dangerous owing to the suddenness of their onset and their violence, the wind rushing down in heavy gusts from the mountains similarly to the "Mistral" of the Gulf of Lions. The occurrence of the "Bora" is not associated with any particular season, but it blows with gale force more frequently and persistently in winter than in summer. It is most violent and persistent on the eastern shores, and is generally strongest after a south-easterly gale.

The "Bora" ordinarily lasts from 15 to 20 hours, with heavy squalls, thunder, lightning and rain at intervals, but in winter it may last for nine to fifteen days, with short intervals of calm.

Indications of the near approach of a "Bora" are given by small dark clouds rising from the mountains on the eastern shore of the Adriatic, and by large white isolated clouds forming on the tops of the high mountains of Dalmatia. The barometer alone is no positive guide, for though it generally falls slightly with the approach of a "Bora," it usually rises during the gale, and, moreover, the "Bora" very frequently occurs when pressure is high.

The south-easterly winds of the Adriatic are known as the "Scirocco." In summer these winds are never strong, but in winter they frequently reach gale force, and are dangerous on account of the heavy seas and very thick weather which accompany them. They are more frequent in winter than in any other season, commonly lasting three days; and they are associated with the eastward passage of depressions across the Mediterranean.

Their approach is indicated by a marked mildness of the atmosphere, even in winter, and dark clouds settling on the summits of the islands and high mountains of the eastern coast, with a falling barometer. Should the barometer continue to fall, with the other indications described, the "Scirocco" may be expected to blow with great force.

Besides the "Bora" and "Scirocco," the two principal winds of the Adriatic, the "Libeccio" or South West winds prevail occasionally, but though frequently violent, they do not last long, and sometimes back suddenly to South East.

A North West wind, known as the "Maestro" or "Maestrale," is also of rather frequent occurrence in summer on the north-western shores of the Adriatic, being always followed by South Easterly winds.

**Ionian Sea.**—On the west coast of Greece, winds from between North West and W.S.W. predominate during summer, and south easterly winds during winter. Strong winds or gales are infrequent and of short duration in summer, but in the eastern part of the Ionian Sea a strong west wind, known as the "Tarantata," blows at times, lasting about 24 hours. In winter north-westerly gales are more frequent, lasting from three to four days.

In settled weather in summer, and often in winter, land and sea breezes prevail. The land breeze, which is generally light and seldom extends beyond 10 miles off shore commences from two to three hours after sunset, its direction varying from North to North East, or in the Gulfs of Patras and Corinth, from East. It increases in force until after midnight, thence dies away to a calm at sunrise, after which it freshens again, finally dying away about 9 a.m. It is followed about 10 a.m. by the sea breeze or "Imbatto" from between North West and W.S.W. which attains its maximum force about 3 p.m. when it blows a fresh breeze, after which it gradually decreases in force, falling calm an hour or two after sunset.

## Grecian Archipelago.

Owing to the numerous islands, gulfs, and bays in the Archipelago, the prevailing winds are considerably modified close to the land, their direction varying widely according to the local conditions.

The predominant winds in the Archipelago, especially in the northern part, are from a northerly direction, varying from North West to North East. From the end of September to April, these winds alternate with Southerly and South-Westerly winds; while from May to August they are interrupted by light breezes and calms, with frequent land and sea breezes and are accompanied by fine clear weather. Land and sea breezes also occur in winter, when the weather is fine. The Northerly to North-Easterly winds, called the "Meltem," sometimes blow quite strongly, even in summer, and in such cases, though the sky is clear, the horizon is obscured.

From the middle of October to the end of March there is unsettled weather, with frequent gales, which usually commence from South East, backing through East to North East and North; but occasionally these gales veer through South West to West and North. They are frequently accompanied by thunder and lightning, and at times the wind direction changes quite suddenly to North in a squall with rain, hail or snow.

The Archipelago is subject to the sudden squalls known as "White Squalls," which, with a cloudless sky, frequently come down from the lee side of high land near the coasts, and striking the sea at an angle give it a characteristic white appearance. These squalls are sometimes very violent but are of short duration.

## Asia Minor, Syria, Egypt and Libia.

The predominating winds over this part of the Mediterranean for the year as a whole are from North West to North, though their frequency is less in winter than in summer. During the winter months, the winds are influenced by the passage of depressions from west to east, and winds mainly from South West are prevalent on the African coast, while in the north they are from South East and North East.

On the south coast of Asia Minor during the summer months, winds are mainly North Westerly, but land and sea breezes are very prevalent, blowing from various directions according to the trend of the coast. The land breezes are generally light and the sea breezes fresh.

In winter South-Easterly to North-Easterly winds predominate, the North-Easterly winds sometimes reaching gale force near the Archipelago, being associated with the high pressure area over the Balkans.

In Cyprus the prevailing winds are Westerly in summer, while in winter, owing to the passage of depressions both north and south of the island, the winds are variable, with a preponderance of Easterly winds. Land and sea breezes are regular in summer, the sea breeze lasting from about 8 a.m. to between 3 p.m. and 6 p.m., after which a calm usually persists until 1 a.m. or 2 a.m., when the land breeze commences and continues until about sunrise.

In the Gulf of Iskanderun the winds are extremely variable and often squally. Strong Easterly gales, known as "Raghiehs," occasionally occur in winter in the neighbourhood of Alexandretta. They are of short duration, and do not extend far off shore. An indication of their approach is given by the ragged appearance of the clouds on the summits of the mountains at the head of the Gulf.

Off the coasts of Syria and Palestine, from April to October, the season of the prevailing North-Westerly winds, land and sea breezes predominate; the direction of the sea breeze, which lasts from about 10 a.m. to sunset, varying from between North West and South West. During July and August, the land breeze sometimes fails, and the nights are calm.

In October the change to winter conditions takes place, and in that season winds on this coast are variable, depressions becoming more frequent, with consequent increase in the number of strong winds. Gales are not frequent, but occur mostly in January and February, generally commencing at South East or South, with a falling barometer, and veering to South West in heavy squalls.



On the coast of Egypt steady moderate Northerly to North-Westerly winds predominate during the summer, and owing to the marked pressure gradient for these Northerly winds, land breezes seldom develop, and the nights and early mornings are calm. The sea breeze usually commences about 10 a.m. blowing fresh during the afternoon, and dying away towards evening.

South-Easterly winds known as the "Khamsin" blow at times throughout the year, but are most frequent during March, April and May, when on the average they blow for five days during the month. The "Khamsin," like the Scirocco, is sand or dust laden, remarkable for its extreme dryness and high temperature, and is usually associated with a depression approaching the Levant from the westward while pressure is high east of the Nile. It usually commences soon after sunrise, and reaches its greatest intensity about 1 p.m., and ceases towards the evening.

From October to March, South-Westerly to Westerly winds prevail on the Egyptian coast, and gales are experienced during this season, accompanied by heavy rain.

On the Libian coast the prevailing winds during the summer are from North West to North East, the highest percentage being those from between North and North East. Land and sea breezes are common. The light Southerly land breeze sets in about 8 p.m. or 9 p.m. and continues light all night, veering to West at sunrise. After an interval of calm, the North-Easterly sea breeze sets in, freshening about Noon, and failing at about sunset.

In winter winds are variable, but with a preponderance of those from a South-Westerly direction. From January to March inclusive, hard North-Easterly squalls, known as "Gharra" are experienced; they come on suddenly, and are accompanied by heavy rain, thunder, and lightning. The "Khamsin" or Scirocco type of wind is also experienced, being known in Libia as the "Gibli" and in Tunis as the "Chili." The latter blows on the average 50 days a year.

#### Dardanelles, Sea of Marmara and Bosphorus.

In these narrow waters the prevailing winds for most months of the year are those from between North and North-East. They are, however, frequently interrupted by winds from between South and South-West, especially during the winter months. In the summer the North and North-East winds are more constant; they are moderate in strength with fine clear weather, but generally die away at sunset, and are followed by calm or light shore breezes.

In winter the North-Easterly winds often blow hard for several days, and are frequently accompanied by snow.

South-Westerly winds may occur in any month, but they are most frequent in winter, when they sometimes reach gale force, and are accompanied by rain. When they are light, they generally bring fine clear weather; and when these light south-westerly winds are experienced in the Dardanelles, they are usually found to back to South-East on entering the Sea of Marmara.

North-Westerly winds occur occasionally in the Dardanelles, at any time of the year, and in winter are accompanied by heavy squalls. While clouds rising above the European coast are a sure sign of these North-Westerly winds.

#### Black Sea.

On the western shore of the Black Sea during summer, northerly winds blow almost without intermission. At other times of the year the winds are from varied directions. The most dangerous are those from South to South-East, which blow strongly at the time of the equinoxes, and produce the so called "hacking" waves, due to the three great rivers Danube, Dniestr, and Bug, bringing large masses of water to the sea from an opposite direction. North-Westerly and Westerly winds are often accompanied by fog and damp weather. Between May and August land and sea breezes are fairly regular. At Constantza the sea breeze sets in from North-East to South-East about 9 a.m. and lasts until sunset; the land breeze from between North-West and South-West commences at about 3 a.m. and dies away at about 8 a.m.

On the northern shore of the Black Sea, the winds are very variable, but the most prevalent are those from between North and North-East, with a large percentage of calms. At Novorissk on the North-East coast, a north-east wind similar to the "Bora" rushes down from the mountains with great violence, when pressure is high to the northward during the passage of a depression across the Black Sea. It is characterized by violent gusts and a low temperature, and is preceded by clear weather and small white flaky clouds above the mountains.

On the southern shore the most prevalent winds are those from North-East and North-West, but southerly winds are also experienced, and at Batum in the extreme south-east, the proportion of calms is very high, being above 30 per cent. in all months of the year.

### SOUTHERN ICE REPORTS.

During the Years 1917 to 1928.

May.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1917	21	From 55° —' S. to 54° —' S.	110° —' E. 113° —' E.	Several bergs .. .. .	Maximum 150 feet by ½ mile .. .. .	S.S. <i>Medway</i> .
1922	27	47° 30' S. 47° 10' S. 53° 42' S. 49° 46' S. 48° 45' S. 46° 56' S. 45° 35' S.	47° 00' W. 47° 00' W. 35° 57' W. 33° 14' W. 30° 40' W. 28° 13' W. 25° 14' W.	Very large berg .. .. . Berg .. .. . 2 bergs .. .. . 2 bergs .. .. . 3 bergs .. .. . 2 bergs .. .. . 2 bergs .. .. .	About 1 mile long, 300 feet high. .. .. . About 400 feet long, 200 feet high .. .. . .. .. . .. .. . .. .. . .. .. . .. .. .	Barque <i>Bellands</i> . do. R.Y.S. <i>Quest</i> . do. do. do. do.
1924	3 20	51° 25' S. 51° 53' S.	124° 01' W. 118° 24' W.	1 large berg .. .. . Berg .. .. .	.. .. . About 50 feet long by 20 feet high, with 5 small bits within a radius of 4 miles, the largest being about 20 feet long, 10 feet high with jagged tops.	S.S. <i>Waivera</i> . S.S. <i>Port Pirie</i> .
1926	18	53° 50' S.	63° 03' W.	Berg .. .. .	Estimated height 60 feet, length 300 feet .. .. .	S.S. <i>Kaikoura</i> .
1927	19 13	49° 19' S. 52° 32' S. 52° 41' S. 52° 39' S. 52° 41' S. 52° 45' S. 52° 56' S.	53° 24' W. 51° 15' W. 50° 14' W. 50° 13' W. 49° 54' W. 49° 22' W. 47° 53' W.	Berg .. .. . Medium tabular berg .. .. . Small berg .. .. . 2 growlers .. .. . Medium tabular berg .. .. . Large peaked berg .. .. . Medium irregular berg .. .. .	Height (by sextant) 310 feet one end, about 350 feet other end. Length estimated at about quarter of a mile. .. .. . .. .. . .. .. . .. .. . .. .. . .. .. . .. .. .	S.S. <i>Port Hacking</i> R.S.S. <i>William Scoresby</i> . do. do. do. do. do.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1927	14	52° 26' S.	46° 36' W.	Large tabular berg .. .. .	.. .. .	R.S.S. <i>William Scoresby</i> .
		52° 26' S.	46° 33' W.	Large growler .. .. .	.. .. .	do.
		52° 36' S.	45° 00' W.	Small berg .. .. .	.. .. .	do.
		52° 39' S.	44° 39' W.	Berg and growler .. .. .	.. .. .	do.
		52° 40' S.	44° 25' W.	Berg and growler .. .. .	.. .. .	do.
		52° 41' S.	44° 15' W.	Large berg .. .. .	.. .. .	do.
		52° 44' S.	43° 51' W.	2 medium bergs .. .. .	.. .. .	do.
		52° 51' S.	43° 14' W.	Large high peaked berg and small low flat berg.	.. .. .	do.
		52° 57' S.	42° 43' W.	Small flat topped berg .. .. .	.. .. .	do.
		53° 05' S.	42° 08' W.	Growler .. .. .	.. .. .	do.
		53° 08' S.	41° 52' W.	2 growlers .. .. .	.. .. .	do.
		53° 09' S.	41° 45' W.	Small weathered berg .. .. .	.. .. .	do.
		53° 11' S.	41° 12' W.	Medium berg .. .. .	.. .. .	do.
		53° 13' S.	41° 04' W.	2 growlers .. .. .	.. .. .	do.
	15	53° 17' S.	40° 37' W.	5 bergs .. .. .	.. .. .	do.
		53° 29' S.	40° 11' W.	Small berg .. .. .	.. .. .	do.
		53° 33' S.	39° 47' W.	2 medium bergs .. .. .	.. .. .	do.
		53° 35' S.	39° 38' W.	Small berg .. .. .	.. .. .	do.
		53° 42' S.	39° 07' W.	Growler .. .. .	.. .. .	do.
		53° 44' S.	38° 56' W.	Large berg .. .. .	.. .. .	do.
		53° 45' S.	38° 51' W.	Large berg .. .. .	.. .. .	do.
		53° 48' S.	38° 35' W.	3 small bergs and 1 growler .. .. .	.. .. .	do.
		53° 49' S.	38° 27' W.	3 bergs and 1 growler .. .. .	.. .. .	do.
		53° 49' S.	38° 22' W.	1 berg and 2 growlers .. .. .	.. .. .	do.
		50° 07' S.	37° 10' W.	Growlers .. .. .	.. .. .	do.
		52° 56' S.	37° 09' W.	Large irregular berg .. .. .	.. .. .	do.
		52° 41' S.	37° 09' W.	Berg .. .. .	.. .. .	do.
		50° 03' S.	37° 09' W.	Small berg .. .. .	.. .. .	do.
	30	52° 59' S.	37° 08' W.	Medium tabular berg .. .. .	.. .. .	do.
		52° 47' S.	37° 08' W.	Berg .. .. .	.. .. .	do.
		52° 42' S.	37° 08' W.	Berg .. .. .	.. .. .	do.
		53° 55' S.	37° 06' W.	Small berg .. .. .	.. .. .	do.
		53° 54' S.	37° 06' W.	2 very small bergs .. .. .	.. .. .	do.
		53° 47' S.	37° 06' W.	Growler and small ice.. .. .	.. .. .	do.
		53° 41' S.	37° 06' W.	Large berg .. .. .	.. .. .	do.
		53° 15' S.	37° 06' W.	3 irregular bergs .. .. .	.. .. .	do.
		49° 54' S.	37° 06' W.	Large weathered tabular berg .. .. .	.. .. .	do.
		54° 00' S.	37° 05' W.	Growler .. .. .	.. .. .	do.
		49° 54' S.	37° 05' W.	Medium weathered tabular berg .. .. .	.. .. .	do.
		54° 01' S.	37° 04' W.	Small berg .. .. .	.. .. .	do.
		53° 44' S.	37° 04' W.	Growler .. .. .	.. .. .	do.
		52° 59' S.	37° 04' W.	Small berg .. .. .	.. .. .	do.
	31	52° 40' S.	37° 04' W.	Berg .. .. .	.. .. .	do.
		53° 50' S.	37° 03' W.	Medium berg and a quantity of berg debris in the vicinity.	.. .. .	do.
		53° 01' S.	37° 03' W.	Small berg .. .. .	.. .. .	do.
		49° 34' S.	36° 53' W.	Medium irregular berg.. .. .	.. .. .	do.
		Approaching Grytviken .. .. .	.. .. .	Several scattered bergs, bergy bits and growlers.	.. .. .	do.
		54° 07' S.	36° 24' W.	Ice .. .. .	.. .. .	do.
		54° 00' S.	36° 12' W.	Ice .. .. .	.. .. .	do.
		From Prince Olaf to .. .. .	36° 12' W.	6 bergs .. .. .	.. .. .	do.
		53° 54' S.	36° 06' W.	6 bergs .. .. .	.. .. .	do.
		53° 55' S.	36° 03' W.	6 large tabular and irregular bergs .. .. .	.. .. .	do.
		49° 19' S.	35° 59' W.	Large sloping tabular berg .. .. .	.. .. .	do.
		49° 18' S.	35° 57' W.	Growler .. .. .	.. .. .	do.
		53° 42' S.	35° 46' W.	Ice .. .. .	.. .. .	do.
				Same group as referred to on 26th and 27th—apparently still in the same place.	.. .. .	do.
				Same 6 as referred to on 26th—apparently still aground. Bunched together and apparently aground.	.. .. .	do.

Reports of ice previous to May, 1917, will be found on the back of the Monthly Meteorological Chart of the East Indian Seas, April 1917, No. 132.

## WEATHER SIGNALS.

### II.—WIRELESS WEATHER SIGNALS.

#### WIRELESS WEATHER BULLETINS.

The Key and Decode Tables of the International Weather Telegraphy Code will be found on pages 21 to 25 of Volume VI No. 61. (The January, 1929, Number.)

The method of decoding station weather reports made in code was described in the British "Weather Shipping" Bulletin, on pages 45 to 47 of Volume VI No. 62. (The February, 1929, Number.)

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

The letters given in the descriptions which follow give the key to the tables for decoding the figures.

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

#### SPAIN.

##### C.W. Issues.

Madrid (Carabanchel) W/T Station, approximate position Latitude 40° 24' N., Longitude 3° 50' W., call sign **EGC**, broadcasts weather bulletins at 0820, 1420 and 1920 G.M.T. on a wavelength of 2,650 metres (C.W.).

The bulletin broadcast at 0820 G.M.T. contains observations of 0700 G.M.T.; that broadcast at 1420 G.M.T., observations at 1300 G.M.T.; and that broadcast at 1920 G.M.T., observations of 1800 G.M.T., taken at the following stations:—

Index Number.	Station.	Position (approx.).	
		Latitude.	Longitude.
50	San Sebastian	43° 09' N.	01° 34' W.
51	Gijon	43° 33' N.	05° 39' W.
52	Vigo	42° 14' N.	08° 43' W.
53	Madrid	40° 24' N.	03° 41' W.
54	Seville	37° 23' N.	05° 59' W.
55	Almeria	36° 51' N.	02° 28' W.
56	Alicante	38° 21' N.	00° 29' W.
57	Mahon	39° 53' N.	04° 16' E.
58	Barcelona	41° 23' N.	02° 10' E.
59	Valencia	39° 28' N.	00° 23' W.



Index Number.	Station.	Position (approx.). Latitude. Longitude.
60	Zaragossa ... ..	41° 39' N. 00° 53' W.
61	Santander ... ..	43° 29' N. 03° 47' W.
62	Corunna ... ..	43° 23' N. 08° 22' W.
63	Burgos ... ..	42° 20' N. 03° 42' W.
64	Valladolid ... ..	41° 38' N. 04° 44' W.
65	Badajoz ... ..	38° 54' N. 06° 58' W.
66	Cordoba ... ..	37° 53' N. 04° 49' W.
67	Malaga ... ..	36° 43' N. 04° 23' W.
68	Los Alcázares ... ..	37° 44' N. 00° 51' W.
69	San Fernando ... ..	36° 26' N. 06° 12' W.
70	Tenerife ... ..	26° 19' N. 16° 30' W.
71	Izaña ... ..	26° 15' N. 16° 40' W.
72	Guadalajara ... ..	40° 38' N. 03° 10' W.
73	Granada ... ..	37° 11' N. 03° 36' W.

MOROCCO, etc.:—

20	Tangier ... ..	35° 47' N. 05° 49' W.
21	Melilla ... ..	35° 17' N. 02° 59' W.
22	Tetuán ... ..	35° 32' N. 05° 24' W.
23	Larache ... ..	35° 03' N. 06° 05' W.
24	C. Juby ... ..	27° 56' N. 13° 00' W.
25	Rio de Oro ... ..	23° 40' N. 15° 54' W.

The bulletins commence with the letters "SME" and are in two parts. They are broadcast in International Code.

### 0820 G.M.T. Bulletin.

**Part I.**—Land stations' observations represented by key letters as follows:—  $I_n I_n$  BBBDD FwwTT cbWVH followed by two groups of figures which refer to observations of cloud and rainfall.

**Part II** contains groups of figures giving observations of upper winds.

### 1420 G.M.T. Bulletin.

**Part I.**—Land stations' observations represented by key letters as follows:—  $I_n I_n$  BBBDD FwwTT cbWVH followed by one group of figures relating to observations of cloud.

**Part II.**—Same form as Part II of 0820 G.M.T. bulletin.

### 1920 G.M.T. Bulletin.

**Parts I and II.**—Same form as 0820 G.M.T. bulletin.

**NOTE.**—Barometric pressure is given in millibars and tenths (to convert to inches, *see* Table XXX). Air temperature in degrees Centigrade (to convert to Fahrenheit, *see* Table XXXI).

## AZORES.

### C.W. Issues.

**Sao Miguel W/T Station**, approximate position 37° 45' N., 25° 42' W., call sign **CUA**, broadcasts weather bulletins at 1332 G.M.T. and 1832 G.M.T. on a wavelength of 2,200 metres (C.W.).

The bulletin broadcast at 1332 G.M.T. contains observations of 1300 G.M.T. and that broadcast at 1832 G.M.T., observations of 1800 G.M.T. taken at the following stations:—

Index Number.	Stations.	Position (approximate). Latitude. Longitude.
96	Ponta Delgada ... ..	37° 44' N. 25° 40' W.
97	Angra ... ..	38° 39' N. 27° 14' W.
98	Horta ... ..	38° 32' N. 28° 38' W.
99	Flores ... ..	39° 27' N. 31° 08' W.

The bulletins are broadcast in International code, represented by Key letters as follows:—

1332 G.M.T. bulletin,

$I_n I_n$  BBBDD FwwTT cbWVH, followed by groups of figures relating to cloud and upper wind observations.

1832 G.M.T. bulletin,

$I_n I_n$  BBBDD FwwTT cbWVH, followed by groups of figures relating to observations of cloud, rainfall, upper wind and swell.

## Spark Issues.

**Terceira W/T Station**, approximate Latitude 38° 40' N., Longitude 27° 08' W., call sign **PQT**, broadcasts weather bulletins at 1325 G.M.T. and at 1825 G.M.T., on a wavelength of 1,000 metres (Spark).

The bulletin broadcast at 1325 G.M.T., contains observations of 1300 G.M.T., and that broadcast at 1825 G.M.T. observations of 1800 G.M.T., taken at the stations given in the list above.

The bulletins are broadcast in International code, the key letters and form of message being the same as given above for the broadcast from Sao Miguel W/T Station.

**NOTE.**—Barometric pressure is given in millibars and tenths and air temperature in degrees Centigrade. (To convert millibars to inches, *see* Table XXX, and Centigrade degrees to Fahrenheit, Table XXXI.)

## PORTUGAL.

Containing observations from Madeira and Azores.

### C.W. Issues.

**Monsanto W/T Station**, approximate Latitude 38° 44' N., Longitude 9° 11' W., call sign **CTV**, broadcasts weather bulletins in International code at the following times:—

0845 and 0855 G.M.T. (containing observations of 0700 G.M.T., taken at the undermentioned stations, and also ships' observations). The observations broadcast in this bulletin from stations in the Azores are taken at 0800 G.M.T.

1445 and 1455 G.M.T. (containing observations of 1300 G.M.T., taken at the undermentioned stations, and also ships' observations).

1945 and 1955 G.M.T. (containing observations of 1800 G.M.T., taken at the undermentioned stations, and also ships' observations).

Wavelengths { 0845, 1445 and 1945 G.M.T. 2,500 m. C.W.  
0855, 1455 and 1955 G.M.T. 31 m. C.W.

Index Number.	Stations.	Position (approximate). Latitude. Longitude.
81	Oporto ... ..	41° 12' N. 8° 43' W.
82	Coimbra ... ..	40° 12' N. 8° 25' W.
83	Berlenga Lt. ... ..	39° 25' N. 9° 30' W.
84	Lisbon ... ..	38° 44' N. 9° 11' W.
85	St. Vincent Lt. ... ..	37° 01' N. 9° 00' W.
86	Faro ... ..	37° 01' N. 7° 56' W.
87	Alverca ... ..	38° 54' N. 9° 01' W.
95	Pargo Madeira ... ..	32° 48' N. 17° 16' W.
96	P. Delgada ... ..	37° 44' N. 25° 40' W.
97	Angra ... ..	38° 39' N. 27° 14' W.
98	Horta ... ..	38° 32' N. 28° 38' W.
99	Flores ... ..	39° 27' N. 30° 08' W.

The bulletins commence with the words "Météo Portugal" and are in three parts.

### 0845 and 0855 G.M.T. Bulletins.

**Part I.**—Land stations' observations represented by Key letters as follows:—

$I_n I_n$  BBBDD FwwTT cbWVH followed by three groups of figures which refer to observations of cloud, rainfall and swell.

**Part II.**—Contains groups of figures giving observations of upper winds from station 87 in the list above.

**Part III.**—Ships' observations, preceded by the word "Navires," represented by Key letters as follows:—

PQLLL 111GG BBDDF wvwKd

It will be noted that the Key letters in this part are similar to, and have the same meanings as those given on the "Decode Form" (in the part named "International Weather"), p. 20, Vol. VI, No. 61, of this Journal.

## 1445 and 1455 G.M.T. Bulletins.

**Part I.**—Land stations' observations, represented by Key letters as follows:—

$1_n 1_n$  BBBDD FwwTT cbWVH followed by two groups of figures which refer to observations of cloud and swell.

**Part II.**—Upper wind observations from station 87 as in the 0845 G.M.T. bulletin.

**Part III.**—Ships' observations, in the same form as in the 0845 G.M.T. bulletin.

## 1945 and 1955 G.M.T. Bulletins.

**Parts I, II and III** are in the same form as in the 0845 G.M.T. bulletin.

**NOTE.**—Barometric pressure is given in millibars and tenths and air temperature in degrees Centigrade. (To convert millibars to inches, *see* Table XXX, and degrees Centigrade to Fahrenheit Table XXXI.)

**Monsanto W/T Station** also transmits a weather message at 1120 and 2300 G.M.T. en clair, in Portuguese and English, on a wavelength of 1,000 metres (Spark) and 1,000 metres (R/T), giving:—

A statement of weather conditions and also a forecast for the next 24 hours for the coast of Portugal, Azores, Madeira, Straits of Gibraltar and the Bay of Biscay.

## MALTA.

Special attention is directed to the "Very Important" Notice appearing on the reverse side of the North Atlantic Ice Chart in this number. The particulars given are for trial and not being permanent yet are not included in "Weather Signals" printed in these permanent pages of Volume VI.

## ITALY.

## C.W. Issues.

**Rome (S. Paolo) W/T Station**, approximate Latitude  $41^{\circ} 52' N.$ , Longitude  $12^{\circ} 31' E.$ , call sign **IDO**, broadcasts weather bulletins at 0835 and 1435 G.M.T. on a wavelength of 4,800 metres (C.W.), and at 1935 G.M.T. on wavelengths of 4,800 metres (C.W.) and 32 metres (C.W.).

The bulletin broadcast at 0835 G.M.T. contains observations of 0700 G.M.T., that at 1435 G.M.T. observations of 1300 G.M.T., and that broadcast at 1950 G.M.T. observations of 1800 G.M.T., taken at the following stations:—

Index Number or Letters.	Stations.	Position (approximate).	
		Latitude.	Longitude.
01	Turin ...	$45^{\circ} 04' N.$	$7^{\circ} 41' E.$
02	Milan ...	$45^{\circ} 28' N.$	$9^{\circ} 11' E.$
04	Padua ...	$45^{\circ} 24' N.$	$11^{\circ} 52' E.$
05	Trieste ...	$45^{\circ} 39' N.$	$13^{\circ} 45' E.$
06	Genoa ...	$44^{\circ} 23' N.$	$8^{\circ} 55' E.$
07	Florence ...	$43^{\circ} 47' N.$	$11^{\circ} 14' E.$
08	Leghorn ...	$43^{\circ} 33' N.$	$10^{\circ} 18' E.$
09	Ancona ...	$43^{\circ} 37' N.$	$13^{\circ} 31' E.$
11	Rome ...	$41^{\circ} 54' N.$	$12^{\circ} 27' E.$
12	Maddalena ...	$41^{\circ} 15' N.$	$9^{\circ} 25' E.$
13	Naples ...	$40^{\circ} 52' N.$	$14^{\circ} 08' E.$
15	Cagliari ...	$39^{\circ} 13' N.$	$9^{\circ} 05' E.$
16	Messina ...	$38^{\circ} 12' N.$	$15^{\circ} 33' E.$
17	Palermo ...	$38^{\circ} 07' N.$	$13^{\circ} 20' E.$
19	Taranto ...	$40^{\circ} 28' N.$	$17^{\circ} 15' E.$
22	Zara ...	$44^{\circ} 07' N.$	$15^{\circ} 13' E.$
30	Tripoli ...	$32^{\circ} 54' N.$	$13^{\circ} 20' E.$
31	Benghasi ...	$32^{\circ} 05' N.$	$20^{\circ} 06' E.$
TO	Tobruk ...	$32^{\circ} 04' N.$	$24^{\circ} 00' E.$

The bulletins are broadcast in International code and are in two parts.

## 0835, 1435 and 1935 G.M.T. Bulletins.

**Part I.**—Expressed by Key letters as follows:—

$1_n 1_n$  BBBDD FwwTT cbWVH followed by two groups of figures which refer to observations of cloud and rainfall.

**Part II.**—Preceded by the word "Pilots," contains groups of figures which refer to observations of upper winds.

**NOTE.**—Barometric readings are given in millimetres and tenths. (To convert to millibars and inches, *see* Table XXXII.)

Air temperature readings are given in degrees Centigrade. (To convert to Fahrenheit, *see* Table XXXI.)

## EGYPT.

## C.W. Issue.

**Ismalia W/T Station**, approximate Latitude  $30^{\circ} 35' N.$ , Longitude  $32^{\circ} 16' E.$ , Call Sign **GHK**, broadcasts a weather bulletin at 1100 G.M.T., containing observations from stations in the List below.

Wavelength 5,400 metres (C.W.).

Index Number.	Station.	Position (approximate).	
		Latitude.	Longitude.
683	Sollum ...	$31^{\circ} 34' N.$	$25^{\circ} 12' E.$
684	Mersa Matruh ...	$31^{\circ} 22' N.$	$27^{\circ} 14' E.$
686	Siwa ...	$29^{\circ} 12' N.$	$25^{\circ} 29' E.$
688	Tor ...	$28^{\circ} 13' N.$	$33^{\circ} 37' E.$
690	Assiut ...	$27^{\circ} 11' N.$	$31^{\circ} 13' E.$
691	Aswan ...	$24^{\circ} 02' N.$	$32^{\circ} 53' E.$
695	Limassol ...	$34^{\circ} 41' N.$	$33^{\circ} 04' E.$
696	Aboukir ...	$31^{\circ} 18' N.$	$30^{\circ} 06' E.$
697	Heliopolis ...	$30^{\circ} 05' N.$	$31^{\circ} 22' E.$
698	Ismalia ...	$30^{\circ} 36' N.$	$32^{\circ} 14' E.$
739	Candia ...	$35^{\circ} 20' N.$	$25^{\circ} 08' E.$
760	Haifa ...	$32^{\circ} 48' N.$	$34^{\circ} 59' E.$
762	Ramleh ...	$31^{\circ} 53' N.$	$34^{\circ} 53' E.$
763	Amman ...	$31^{\circ} 57' N.$	$35^{\circ} 57' E.$
764	Ma'an ...	$30^{\circ} 11' N.$	$35^{\circ} 39' E.$
770	Mosul ...	$36^{\circ} 20' N.$	$43^{\circ} 08' E.$
771	Kirkuk ...	$35^{\circ} 28' N.$	$44^{\circ} 22' E.$
772	Baiji ...	$34^{\circ} 55' N.$	$43^{\circ} 34' E.$
773	Palkanah ...	$34^{\circ} 49' N.$	$44^{\circ} 44' E.$
774	Hinaidi ...	—	—
775	Diwaniya ...	$31^{\circ} 58' N.$	$44^{\circ} 51' E.$
776	Rutbah ...	$33^{\circ} 00' N.$	$40^{\circ} 00' E.$
777	Shaibah ...	$30^{\circ} 26' N.$	$47^{\circ} 41' E.$

The observations of the stations in the list above are taken at 0600 G.M.T.

Observations from selected stations in the List published on pp. 92–94 of Vol. VI, No. 64 are also broadcast:—

The bulletin is transmitted in International Code represented by Key letters as follows:—  $1_n 1_n 1_n$  BBDDF  $w_1$ TTK $w$ .

**NOTE.**—Barometric pressure is given in millibars and tenths (to convert to inches, *see* Table XXX) and temperatures in degrees C. (To convert to Fahrenheit, *see* Table XXXI.)

## ISMALIA.

Special attention is directed to the "Very Important" Notice appearing on the reverse side of the North Atlantic Ice Chart in this number. The particulars given are for trial and not being permanent yet are not included in "Weather Signals" printed in these permanent pages of Volume VI.



# SPECIAL WEATHER TELEGRAPHY TABLES, NOT INTERNATIONAL CODE.

Table XXX.

## Conversion of Millibars to Inches.

Equivalent in Mercury Inches at 32°, and Latitude 45° of Millibars.

Mb.	In.	Mb.	In.	Mb.	In.	Mb.	In.	Mb.	In.	Mb.	In.	Mb.	In.
925	27.32	940	27.76	960	28.35	980	28.94	1000	29.53	1020	30.12	1040	30.71
926	27.35	941	27.79	961	28.38	981	28.97	1001	29.56	1021	30.15	1041	30.74
927	27.38	942	27.82	962	28.41	982	29.00	1002	29.59	1022	30.18	1042	30.77
928	27.41	943	27.85	963	28.44	983	29.03	1003	29.62	1023	30.21	1043	30.80
929	27.44	944	27.88	964	28.47	984	29.06	1004	29.65	1024	30.24	1044	30.83
930	27.46	945	27.91	965	28.50	985	29.09	1005	29.68	1025	30.27	1045	30.86
931	27.49	946	27.94	966	28.53	986	29.12	1006	29.71	1026	30.30	1046	30.89
932	27.52	947	27.97	967	28.56	987	29.15	1007	29.74	1027	30.33	1047	30.92
933	27.55	948	28.00	968	28.59	988	29.18	1008	29.77	1028	30.36	1048	30.95
934	27.58	949	28.03	969	28.62	989	29.21	1009	29.80	1029	30.39	1049	30.98
935	27.61	950	28.05	970	28.65	990	29.24	1010	29.83	1030	30.42	1050	31.01
936	27.64	951	28.08	971	28.67	991	29.26	1011	29.86	1031	30.45	1051	31.04
937	27.67	952	28.11	972	28.70	992	29.29	1012	29.89	1032	30.48	1052	31.07
938	27.70	953	28.14	973	28.73	993	29.32	1013	29.92	1033	30.51	1053	31.10
939	27.73	954	28.17	974	28.76	994	29.35	1014	29.94	1034	30.53	1054	31.13
		955	28.20	975	28.79	995	29.38	1015	29.97	1035	30.56		
		956	28.23	976	28.82	996	29.41	1016	30.00	1036	30.59		
		957	28.26	977	28.85	997	29.44	1017	30.03	1037	30.62		
		958	28.29	978	28.88	998	29.47	1018	30.06	1038	30.65		
		959	28.32	979	28.91	999	29.50	1019	30.09	1039	30.68		

Table XXXI.

## Conversion of Centigrade Temperatures to Fahrenheit.

Cent.* Trans- mitted.	Fahr.	Cent. Trans- mitted.	Fahr.	Cent. Trans- mitted.	Fahr.	Cent. Trans- mitted.	Fahr.
—	—	00	32	10	50	21	70
51	30	01	34	11	52	22	72
52	28	02	36	12	54	23	73
53	27	03	37	13	55	24	75
54	25	04	39	14	57	25	77
55	23	05	41	15	59	26	79
56	21	06	43	16	61	27	81
57	19	07	45	17	63	28	82
58	18	08	46	18	64	29	84
59	16	09	48	19	66	30	86
				20	68		

\* 50 is added to the amounts to indicate minus temperatures Centigrade.

Table XXXII.

## Conversion of Millimetres into Millibars and Inches.

Mm.	Mb.	In.	Mm.	Mb.	In.	Mm.	Mb.	In.
695	926.6	27.37	743	990.6	29.25	759	1011.9	29.88
700	933.2	27.56	744	991.9	29.29	760	1013.2	29.92
705	939.9	27.76	745	993.2	29.33	761	1014.6	29.96
710	946.6	27.95	746	994.6	29.37	762	1015.9	30.00
715	953.2	28.15	747	995.9	29.41	763	1017.2	30.04
720	959.9	28.35	748	997.2	29.45	764	1018.6	30.08
725	966.6	28.54	749	998.6	29.49	765	1019.9	30.12
730	973.2	28.74	750	999.9	29.53	766	1021.2	30.16
735	979.9	28.94	751	1001.2	29.57	767	1022.6	30.20
736	981.2	28.98	752	1002.6	29.61	768	1023.9	30.24
737	982.6	29.02	753	1003.9	29.65	769	1025.2	30.28
738	983.9	29.06	754	1005.2	29.69	770	1026.6	30.32
739	985.2	29.10	755	1006.6	29.73	775	1033.2	30.51
740	986.6	29.13	756	1007.9	29.76	780	1039.9	30.71
741	987.9	29.17	757	1009.2	29.80	785	1046.6	30.91
742	989.2	29.21	758	1010.6	29.84			

## III. WIRELESS TIME SIGNALS.

### SPAIN.

#### C.W. Issue.

San Fernando W/T Station, Latitude 36° 28' N., Longitude 6° 12' W. (approx.), call sign **EBY**, broadcasts a time signal daily, except Sundays, according to the International (Onogo) system as follows:—

Wavelength 2,000 metres (C.W.).

G.M.T.						Signal.	
h	m	s	h	m	s		
12	56	00	12	56	55	— — — — —	etc.
	57	00		57	50	— • — • —	etc.
	57	55		58	00	— — — — —	Time signal.
	58	08		58	50	— • — • —	etc.
	58	55		59	00	— — — — —	Time signal.
	59	06		59	50	— • — • —	etc.
12	59	55	13	00	00	— — — — —	Time signal.

The time signal is followed by the general call CQ and call signal EBY.

The end of the final dash of each time signal represents the exact even minute.

The final dots of the signals N and G coincide with the 10th, 20th, 30th, 40th and 50th seconds of each minute respectively.

### PORTUGAL.

#### Spark and C.W. Issues.

Monsanto W/T Station, Latitude 38° 43' 47" N., Longitude 9° 11' 17" W., call sign **CTV**, broadcasts time signals three times daily according to the following procedure:—

#### (1) Wavelength 600 metres (spk.).

G.M.T.						Signal.	
h	m	s	h	m	s		
9.28.00	to	9.28.39				— — — — —	(MST) repeated 12 times.
9.29.32	,,	9.29.37				— — — — —	
9.29.40	,,	9.29.46				— — — — —	
9.29.50	,,	9.29.57				— — — — —	
9.30.00						— — — — —	(Time signal).

#### (2) Wavelength 3,070 metres (C.W.).

G.M.T.						Signal.	
h	m	s	h	m	s		
9.38.00	to	9.38.39				— — — — —	(MST) repeated 12 times.
9.39.32	,,	9.39.37				— — — — —	
9.39.40	,,	9.39.46				— — — — —	
9.39.50	,,	9.39.57				— — — — —	
9.40.00						— — — — —	(Time signal).

#### (3) Wavelength 3,000 metres (C.W.).

G.M.T.						Signal.	
h	m	s	h	m	s		
9.59.00	to	9.59.49				— — — — —	(MST) (repeated 15 times).
10.00.00	,,	10.04.59				— — — — —	A series of continuous dots at every second, omitting the 60th.
10.05.00						— — — — —	(Time signal).
10.06.00	,,	10.10.59				— — — — —	A series of continuous dots at every second, omitting the 60th.
10.11.00						— — — — —	(Time signal).
10.12.00	,,	10.16.59				— — — — —	A series of continuous dots at every second, omitting the 60th.
10.17.00						— — — — —	(Time signal).

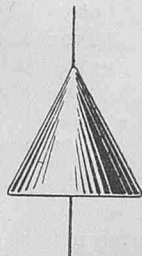
The above time signal is not broadcast without previous warning.  
NOTE.—The time signals are controlled from **Lisbon Observatory** (Latitude 38° 42' 30.5" N., Longitude 9° 11' 10.2" W.). The duration of a dot = 1/7 sec. and that of a dash 3/7 sec.

#### IV. VISUAL GALE WARNINGS. SPAIN.

The system of Visual Gale Warnings explained on p. 96 of Vol. VI, No. 64 (the April, 1929, Number of this Journal) for France is also in operation at a number of Spanish ports. It should be noted that according to the latest available information there is no system in general use.

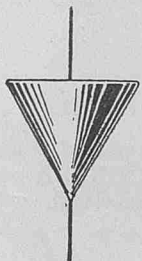
#### PORTUGAL, WEST AND SOUTH COASTS.

The following system of storm signals is in use at semaphore stations and port offices on the coast of Portugal:—



**West Coast  
Signification.**

Gale probable  
from W. to N.



**South Coast  
Signification.**

Gale probable  
from E. to S.

By night, at the port offices, the cone is replaced by three *red* lights in the form of a triangle.

#### MALTA.

##### SOUTH CONE.

By Day.



By Night.



**Hoisted for Gales.**

From S.E., veering to S.W., W.,  
or N.W.  
„ S.W., veering to W. or  
N.W.  
„ W., veering to N.W.  
And also from E., veering to S.  
or S.W.

##### NORTH CONE.

By Day.



By Night.



**Hoisted for Gales.**

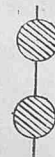
From S.E., backing to E.  
„ N.W., veering to N.

#### MODERATE "GREGALE."

By Day.



By Night.



#### STRONG "GREGALE."

By Day.



By Night.



Hoisted when the wind is expected  
from between N. and E., of  
force 5, 6 or 7 (Beaufort Scale).

Hoisted when the wind is expected  
from between N. and E., of  
force 8 and above (Beaufort  
Scale).

When one of these signals is hoisted it indicates that information  
has been received by the station exhibiting the signal, that a gale or  
"gregale" is expected in the vicinity of Malta.

Station:—Castille Signal Station.

**Black.**



**Red.**



**Green.**



#### ITALY.

The following system of storm signals is in use on the coasts  
of Italy:—

By Day.

**Signification.**

By Night.



Gale probable, commencing  
from N.W'd.



Gale probable, commencing  
from N.E'd.



Gale probable, commencing  
from S.E'd.



Gale probable, commencing  
from S.W'd.



Gale probable, direction of  
wind uncertain.



Red White

#### Special Notices Regarding Personnel.

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

#### Obituary.

The death of Captain WILLIAM SMITH MAIN, O.B.E., late commander in the Canadian Pacific Lines, which occurred at his home in Ibroxholm on February 5th last is noted with deep regret.

Captain MAIN commenced his sea career at the age of 14 when in 1865 he was apprenticed in the Ship *Wentworth* voyaging to Quebec.

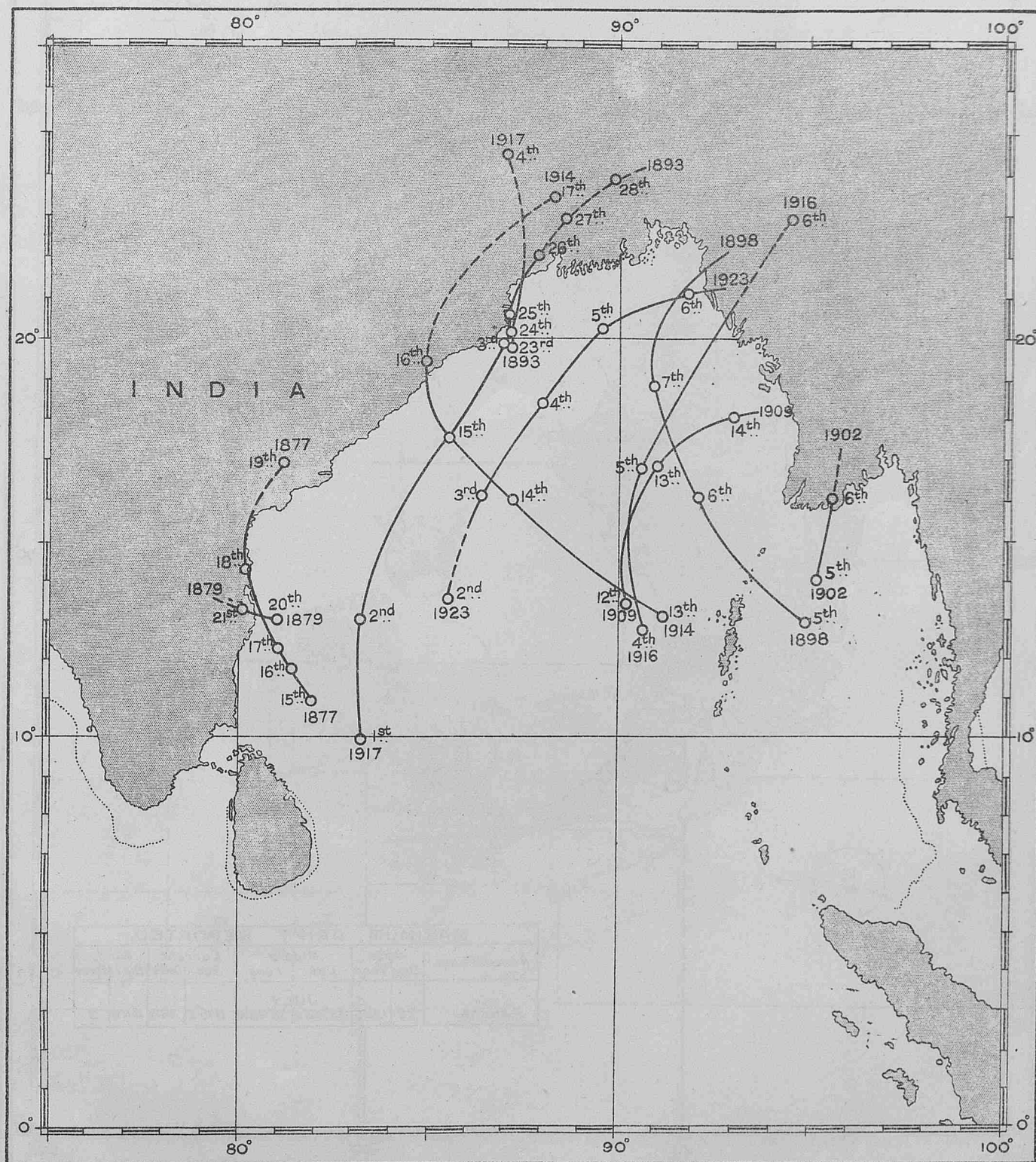
On completing his apprenticeship he continued to serve in sail for a further seven years when he joined the Allen Line as a Junior Officer. Passing through the different grades he obtained his first command in 1883.

Captain MAIN commanded many of the finest vessels in the Allen

Line Fleet and when that Company was taken over by the Canadian Pacific Railway in 1915 he was appointed to command the *Empress of Britain*. In this ship, during the war, he carried over 150,000 troops to and from the different theatres of war for which service HIS MAJESTY THE KING conferred on him the honour of O.B.E., retiring in 1919 after an active career of 54 years afloat. Captain MAIN had been a keen member of the Voluntary Corps of Marine Observers keeping no less than 25 Meteorological Logs. He was a member of the Local Marine Board, Glasgow, and a Nautical Assessor for Edinburgh and Glasgow.



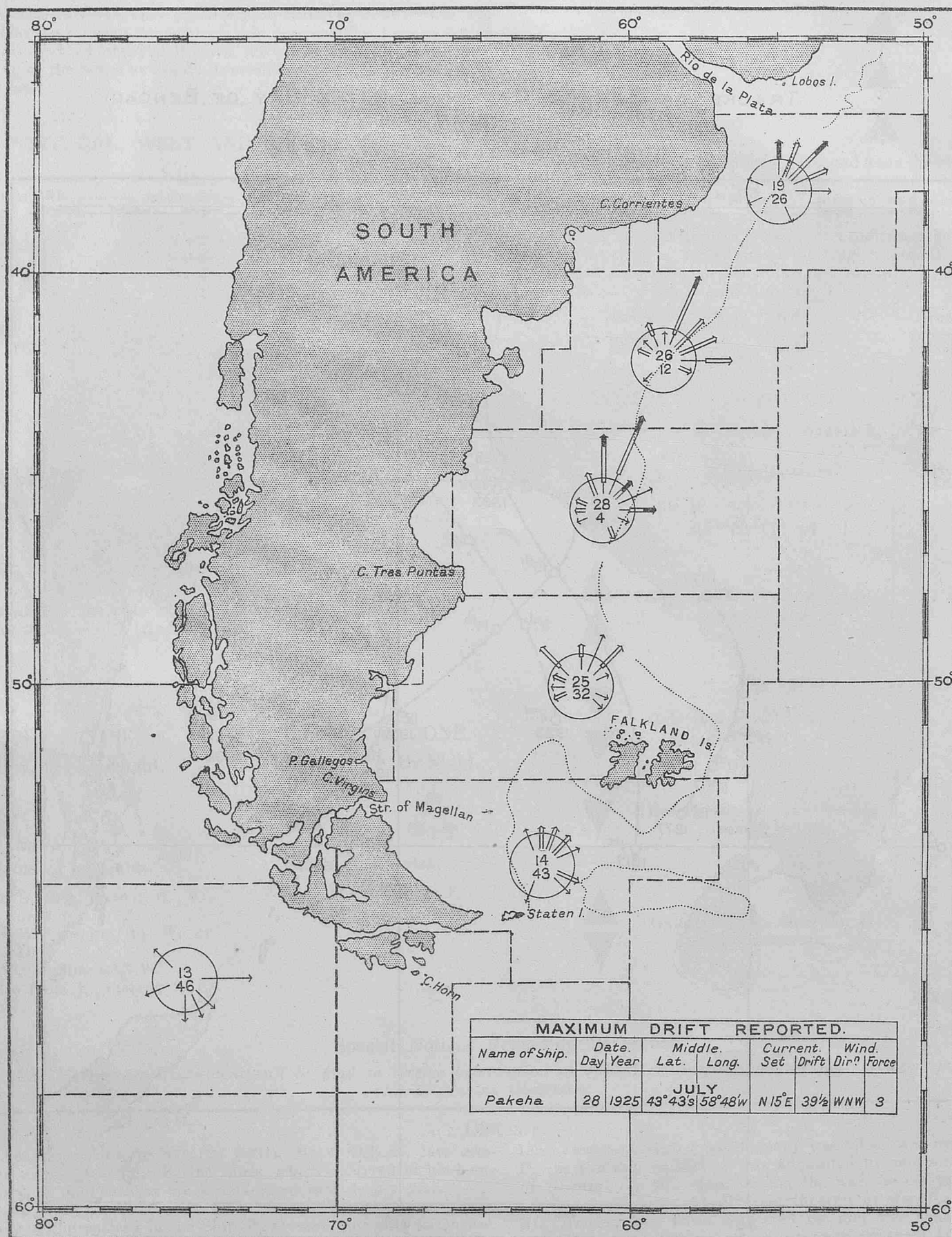
TRACKS OF SEVERE CYCLONES IN THE BAY OF BENGAL  
MAY,  
DURING THE YEARS 1877-1923.



The above are tracks of severe storms taken from "Storm Tracks in the Bay of Bengal" compiled by Dr. C.W.B. Normand and published by the India Meteorological Department.

# CURRENTS ON THE TRACKS FROM THE LATITUDE OF THE PLATE TO MAGELLAN STRAITS AND CAPE HORN, MAY, JUNE AND JULY.

Observations of ships regularly observing for the British Meteorological Office 1910-1927



## EXPLANATION OF CURRENT ROSES.

The current roses are drawn from observations within the pecked lines.

Arrows flow with the current, length represents frequency, thickness strength.

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

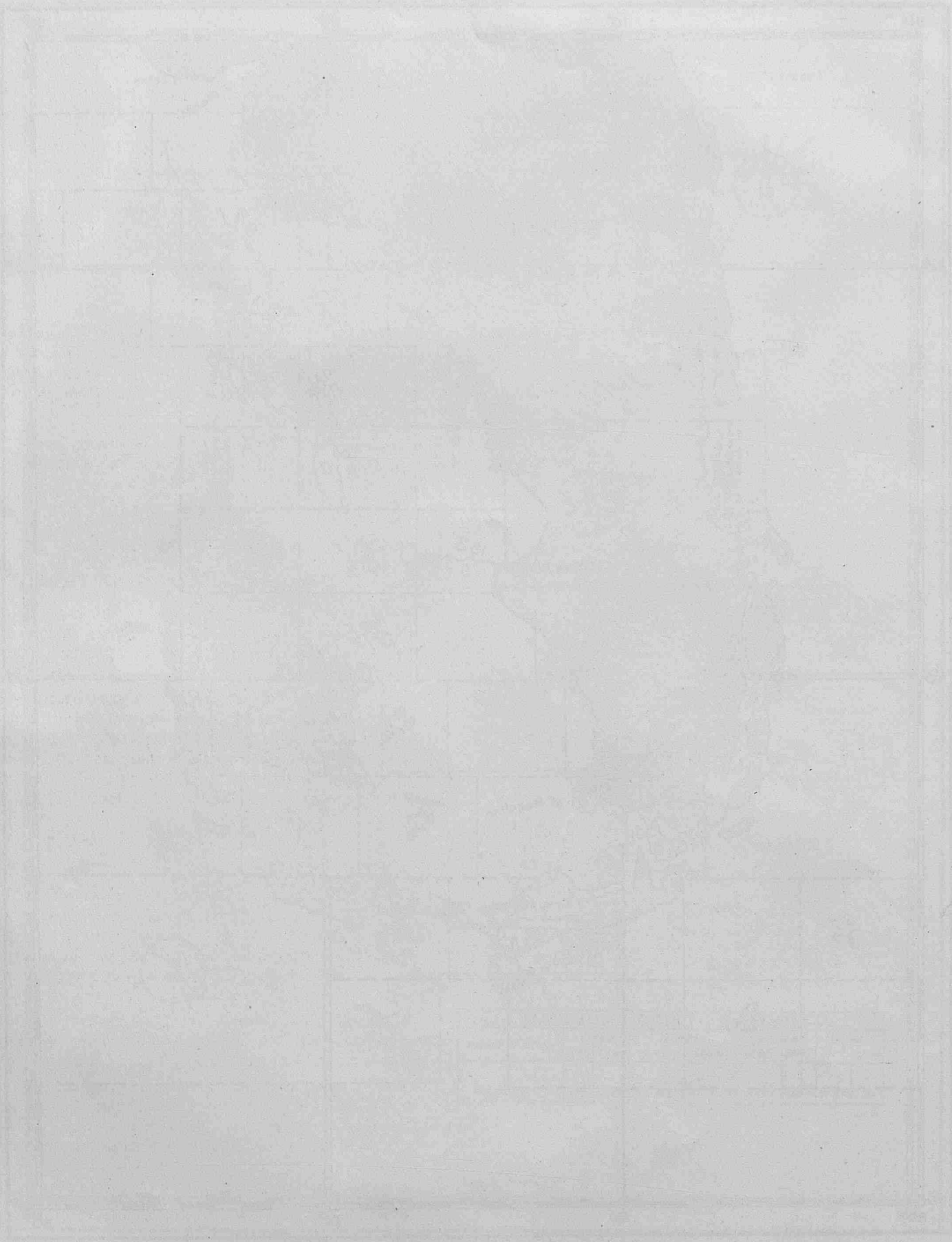
Distance from tail of arrow to circle represents 5%. Scale 0 10 20 30 40 50%

The upper figure in centre of rose gives total number of observations, the lower figure the percentage frequency of currents less than 6 miles per day



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.

COAST OF THE STRAITS AND GULF OF BENGAL  
FROM THE STRAITS AND GULF OF BENGAL  
MAY, JUNE AND JULY  
BY THE SURVEYOR GENERAL OF THE STRAITS SETTLEMENTS



THE STRAITS SETTLEMENTS  
BY THE SURVEYOR GENERAL OF THE STRAITS SETTLEMENTS  
MAY, JUNE AND JULY  
BY THE SURVEYOR GENERAL OF THE STRAITS SETTLEMENTS



## VERY IMPORTANT.

TEMPORARY ARRANGEMENTS FOR WIRELESS WEATHER  
REPORTS BY SELECTED SHIPSIN THE  
MEDITERRANEAN AND RED SEAS.

When in the Mediterranean and Red Sea, westward of longitude 40° E., the following are the temporary arrangements for selected ships to report weather by wireless:—

From the Straits of Gibraltar to longitude 20° E. the observation times are:—

0700 and 1800 G.M.T.

In this area ships should address their reports as usual to "all ships" C.Q. and also to

GHA. Malta (Calafrana W/T)

These reports should be transmitted on:—

600 m. Spark from 0730 to 0745 G.M.T.  
and from 1830 to 1845 G.M.T.  
and on

2400 m. C.W. from 0748 to 0800 G.M.T.  
and from 1848 to 1900 G.M.T.

From longitude 20° E. to 40° E. at sea the observation time is—  
0600 G.M.T.

In this area reports should be made as usual to "all ships" CQ and also to—

GHK Ismalia W/T

These reports should be made on

600 m. Spark from 0630 to 0645 G.M.T.  
and on

2400 m. C.W. from 0618 to 0630 G.M.T.

The form of report is the same as for all parts of the World and is given in Appendix I, page VI of WIRELESS AND WEATHER AN AID TO NAVIGATION and on page 19 of the January, 1929, MARINE OBSERVER.

These arrangements are temporary and selected ships within range of Malta and Ismalia are asked to do all in their power to ensure that the messages are received at the stations by obviating jamming each other in making the transmission.

Usually the greater the range from the station within these limits, the greater the value of the report. Selected ships fitted for C.W. transmission are especially asked to use 2400 m. C.W.

These shore stations receive these reports only and do not answer. It is therefore most important that the times and wave lengths given should be strictly adhered to.

## 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		

Copy of Notice received from The

## ROYAL SOCIETY OF ARTS

JOHN STREET, ADELPHI, LONDON, W.C. 2.

FOUNDED IN 1754. INCORPORATED IN 1847.

Patron: HIS MAJESTY THE KING

Vice-Patron: H.R.H. THE PRINCE OF WALES, K.G.

President: H.R.H. THE DUKE OF CONNAUGHT AND STRATHEARN, K.G.

Chairman of the Council: SIR GEORGE SUTTON, BT.

THOMAS GRAY MEMORIAL TRUST  
PRIZES FOR THE IMPROVEMENT AND  
ENCOURAGEMENT OF NAVIGATION.

Under the will of the late Thomas L. Gray, the Royal Society of Arts has been appointed residuary legatee of his estate for the purpose of founding a memorial to his father the late Thomas Gray, C.B., who was for many years Assistant Secretary to the Board of Trade (Marine Department).

The objects of the Trust are "The advancement of the Science of Navigation and the Scientific and educational interests of the British Mercantile Marine."

The Council now offer the following Prizes:—

## PRIZE FOR AN INVENTION

- (i) A Prize of £150 to any person who may bring to their notice a valuable improvement in the Science or Practice of Navigation proposed or invented by himself in the years 1928 and 1929.

In the event of more than one such improvement being approved, the Council reserve the right of dividing the amount into two or more prizes at their discretion.

Competitors must forward their proofs of claim on or before December 31st, 1929, to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C. 2.

## PRIZE FOR AN ESSAY

- (ii) A Prize of £50 for an essay on the following subject:—

"You are overtaken by a revolving storm. Discuss the handling of a low-powered steamer from the time of the first indication of the approach of the storm until the storm has passed, supposing the ship to be in (a) the safe semicircle, (b) the dangerous semicircle, and (c) the direct path of the storm's centre."

Competitors must send in their essays not later than December 31st, 1929, to the Secretary, Royal Society of Arts, at the above address.

The essays must be typed or clearly written. They must be sent in under a motto, accompanied by a sealed envelope enclosing the author's name, which must on no account be written on the essay. A breach of this regulation will result in disqualification.

The Judges will be appointed by the Council.

The Council reserve the right of withholding the Prize or of awarding a smaller Prize or Prizes, if in the opinion of the Judges no suitable invention or essay is submitted.

The Council also reserve an option on the copyright of the successful essay.

G. K. MENZIES,

Secretary.

February, 1929.



# ICE CHART. WESTERN NORTH ATLANTIC.

## LETTERS OF TRANSATLANTIC TRACKS INDICATE.

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

- (B) From 1st February to 31st August, inclusive.
  - (E) From 11th April to 15th May, or until the Cape Race route clear of ice.
  - (F) From 16th May to Opening of Belle Isle route.
- Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race.  
Eastbound, steer from position 25 miles S. of Cape Race.

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 88-9, of Vol. VI, No. 64, April 1929, Number

## SYMBOLS USED ON THE CHART.

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

## PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position. Lat. Long.	Remarks.
May 20, 1907	S.S. Lord Landsdowne.	31°00' N. 38°00' W.	2 small pieces, 6 ft. by 6 ft. and 12 ft. by 4 ft. out of water.
" 6, 1908	S.S. Oceano ...	150-200 miles N. of Bermuda.	Pieces.
" 27, 1909	S.S. Reventazon ...	32°28' N. 144°10' W.	60 ft. long, 10 ft. high.
" 15, 1911	S.S. Camillo ...	10 miles E. of Nantucket Shoal L.V.	Small berg.
" 11, 1914	S.S. Indradeo ...	42°18' N. 62°43' W.	Large slabs of field ice and growlers 100-150 ft. long, 5 ft. out of water.
" 17, 1915	S.S. Pola ...	38°16' N. 61°50' W.	Some field ice.
" 15, 1920	U.S. Hydrographic Bulletin.	45°11' N. 36°42' W.	Berg.

Reports of Ice sighted between which have been received by the by the Symbols plotted in the indicating the day of the month.

March 1st and March 31st 1929, Meteorological Office, are shown position reported, the figures

Limit of ice reported to Meteorological Office May 1st-1929



**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 Chapter I. of "Wireless and Weather an Aid to Navigation," page 6, and page 19 of Vol. VI. No. 61.

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.	
<b>NORTH SEA.</b>			
1.3.29	51°30'N.	2°13'E.	Drifting buoy painted red marked <i>N.R.W. No. 1</i> , dangerous to navigation.
1.3.29	53°33'N.	4°54'E.	Spherical buoy with black and red bands and small structure on top.
2.3.29	54°20'N.	3°40'E.	Drifting conical buoy.
6.3.29	54°26'N.	6°31'E.	Large red light buoy.
9.3.29	53°36'N.	5°22'E.	Black spherical buoy marked <i>KABEL</i> in white letters.
10.3.29	55°00'N.	1°30'E.	Large log, dangerous to navigation.
12.3.29	10 miles S. by E. of Longstone.		Two lifeboats, one bottom up, one full of water.
14.3.29	N.N.W. $\frac{1}{4}$ W., 5 miles from Flamborough Head.		Ships boat (possibly from Auxiliary Vessel <i>Lydia Cardell</i> which sank after collision).
15.3.29	7 Miles N. 31° W. of Middensteen Bank Buoy.		Large conical buoy, red with white band, marked <i>B. No. 1</i> , dangerous to navigation.
18.3.29	51°15'N.	1°37'E.	Two large baulks of timber bolted together, each about 18 ft. long.
<b>ENGLISH CHANNEL.</b>			
3.3.29	50°14'N.	0°47'W.	Red conical buoy, dangerous to navigation.
<b>BRISTOL CHANNEL.</b>			
15.3.29	E. of Lundy Island.		Black buoy adrift, marked <i>Telegraph G.I.</i> , surmounted by staff supporting beacon flag and two fixed white lights.
<b>NORTH ATLANTIC</b>			
2.3.29	26°34'N.	79°54'W.	32 ft. cabin-cruiser abandoned.
3.3.29	24°29'N.	81°01'W.	Heavy log 20 ft. long.
11.3.29	46°15'N.	16°56'W.	Red gas buoy, raised light on framework, no marks, no light, dangerous to navigation.
12.3.29	47°43'N.	7°04'W.	Small boat painted red, bottom awash.
15.3.29	49°22'N.	14°18'W.	About 100 empty iron oil drums.
<b>RED SEA.</b>			
3.3.29	23°36'N.	35°24'E.	Five large wooden structures, dangerous to navigation.
<b>GULF OF MEXICO.</b>			
2.3.29	23°02'N.	85°52'W.	Large buoy.
<b>CARIBBEAN SEA.</b>			
6.3.29	17°11'N.	73°48'W.	Can buoy with 15 ft. staff with black ball and four lanterns painted red with letter <i>P</i> on side.

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

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

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

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

**CARDIFF** ... Captain T. JOHNSTON, Technical College, Cathays  
Park.  
(Telephone No.: *Cardiff 6813*).

**GLYDE** ... Captain M. C. CORRANCE, Board of Trade Sur-  
veyor's Office, 73, Robertson Street, Glasgow.  
(Telephone No.: *Central 2283-4*).

**FREMANTLE**,  
W. Australia. Captain J. J. AIREY, Deputy Director of Naviga-  
tion, Customs House.  
(Telephone No.: *B 1391*).

**Agents (contd.).**

**HONG KONG**,  
China. Lieut. Commander J. H. DRUMMOND, D.S.C.,  
R.N., Superintendent, Admiralty, Chart and  
Chronometer Depot, H.M. Dockyard.  
(Telephone No.: *108 Dockyard*).

**HULL** ... Captain A. M. BROWN, Ellerman Wilson Line.  
Office. (Telephone No.: *Central 2180*).

**LEITH** ... Captains G. BLACK and C. G. BONNER, V.C.,  
D.S.C., Leith Salvage and Towage Co., Ltd.,  
2, Commercial Street.

**SOUTHAMPTON** Captain D. FORBES, Nautical Academy, 1, Albion  
Place.

**SYDNEY**,  
New South Wales. Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R.,  
Deputy Director of Navigation.  
Captain C. LINDBERGH:  
Customs House.  
(Telephone No.: *B 6421*).

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

**VANCOUVER**,  
British Columbia. Mr. T. S. H. SHEARMAN, 61, Exchange Building,  
553, Granville Street.  
(Telephone No.: *Seymour 3309*).



## LIST OF VOLUNTARY OBSERVING SHIPS

i

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

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

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

Only in special cases will individual letters be sent.

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

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

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

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

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

## Explanation of Abbreviations.

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

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

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

No. = No Meteorological Office instrumental equipment on board.

M = Ship's barometer *mercurial*.

A = Ship's barometer *aneroid*.

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

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

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

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

\*\* = Short range transmission and reception.

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

## Selected Ships.

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

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
<i>Abinsi</i> ...	Allen, E. E. ...	L. B. Silvester ...	No. A.	Elder Dempster ...	Form 911 27.12.28 to 3.2.29 ...	13.2.29
†† <i>Accra</i> ...	Wright, J. B. ...	R. Jones, R. B. Ellis, J. R. Radley, B. C. Haigh, S. H. Griffiths.	M.L.	" "	Met. Log. 26.9.28 to 5.2.29 ...	12.2.29
*† <i>Achilles</i> ...	Williams, D. T. ...	A. G. Phillips, N. Anderson, F. W. Hilton.	"	A. Holt ...	" 17.6.28 to 29.10.28 ...	29.11.28
*† <i>Actor</i> ...	Haylett, E. ...	E. Pearce, F. M. Eales, G. Morrice.	"	Harrison ...	" 27.8.28 to 9.11.28 ...	22.11.28
†† <i>Adda</i> , M.V. ...	Toft, J. T. ...	A. E. Lovgreen, J. B. Wright, A. J. Kennedy.	M.L.	Elder Dempster ...	Form 911 6.6.28 to 20.10.28 ...	1.2.29
††50 <i>Adriatic</i> ...	Hickson, V. W., R.D., Lt.-Commr. R.N.R.	O. V. Lucas, H. R. Wilkinson, D. W. Chamberlain.	W.T.	White Star ...	W.T. Reg. 30.12.28 to 18.1.29 ...	24.1.29
<i>Aeneas</i> ...	Wallace, W. K. ...	D. R. Bannerman ...	No. A.	A. Holt ...	Form 911 29.12.28 to 19.1.29 ...	24.1.29
<i>Agapenor</i> ...	Ramsay, J. ...	B. Bell ...	" A.	" "	" 18.12.28 to 28.2.29 ...	5.3.29
<i>Aidan</i> ...	Evans, L. ...	R. A. Broad ...	" A.	Booth ...	" 18.1.29 to 4.2.29 ...	13.2.29
<i>Aiban</i> ...	Buck, R. H. ...	G. M. Duff ...	" A.	" "	" 20.11.28 to 4.12.28 ...	28.12.28
*† <i>Alipore</i> ...	Dawson, E. E. N. ...	G. H. Stokes ...	" M.	P. and O. ...	" 20.8.28 to 2.10.29 ...	12.10.28
<i>Almanzora</i> ...	Huff, G. F. ...	G. K. Elliott, K. H. Whitaker	" M.S.P.	R.M.S.P. ...	" 1.12.28 to 14.1.29 ...	16.1.29
††63 <i>Alberville</i> ...	Summers, F. F., R.D., Commr. R.N.R.	R. H. Shaw, W. F. Dennison, W. Hill.	W.T.	White Star ...	W.T. Reg. 4.2.29 to 24.2.29 ...	27.2.29
<i>Alexa</i> , Barquentine ...	G. H. Heyen ...	" "	No. A.	On Chong & Co. ...	Form 911 11.7.28 to 27.10.28 ...	28.12.28
<i>Alondra</i> ...	Scott, L. S. ...	H. Peters ...	No. A.	Yeoward ...	Form 911 9.2.29 to 2.3.29 ...	8.3.29
<i>Alynbank</i> ...	Clayton, W. E. ...	R. H. B. Ardley ...	" A.	A. Weir & Co. ...	" 18.11.28 to 5.12.28 ...	28.12.28
†† <i>Andalucia</i> ...	Thomas, R. J. ...	H. Austen ...	No. M.	Blue Star ...	Form 911 28.11.28 to 8.1.29 ...	14.1.29
<i>Anchises</i> ...	Woodgett, R. J. ...	R. Fountain, T. Coyne ...	" A.	A. Holt ...	" 18.1.29 to 4.2.29 ...	13.2.29
†† <i>Andes</i> ...	Smith, W. E., D.S.O., R.D., Capt. R.N.R.	H. Whittle, H. Sang, A. Nicholls, R. N. Mayo.	M.L.	R.M.S.P. Co. ...	Met. Log. 27.10.28 to 6.2.29 ...	18.2.29
<i>Antillian</i> ...	Hannaford, W. T. ...	" "	No. A.	Leyland ...	Form 911 11.5.28 to 24.7.28 ...	26.7.28
<i>Antiochus</i> ...	Salter, G. H. ...	A. C. Abbott ...	" A.	A. Holt ...	" 19.12.28 to 15.1.29 ...	7.2.29
*† <i>Aorangi</i> ...	Crawford, R. ...	E. V. Bilger, R. Kendall, W. J. Weber.	M.L.	Canadian-Australasian ...	Met. Log. 27.6.28 to 10.10.28 ...	19.11.28
††30 <i>Aquitania</i> ...	Diggle, E. G., R.D., Capt. R.N.R.	R. W. Bee, J. Locke, G. Duguid.	W.T.	Cunard ...	W.T. Reg. 25.1.29 to 7.2.29 ...	13.2.29
††62 <i>Arabic</i> ...	Bulman, J. B. ...	W. Hesketh, T. W. Wills, W. N. Jenkins.	"	White Star ...	" 30.12.28 to 19.1.29 ...	21.1.29
** <i>Arafura</i> ...	Gordon, A. S. ...	F. R. Miller, B. W. Dun, C. Stratford.	M.L.	Eastern and Australian ...	Met. Log. 4.5.28 to 2.11.28 ...	21.12.28
*† <i>Argyllshire</i> ...	Wallace, J. ...	R. W. Cook, C. Reeder ...	No. M.	Federal ...	Form 911 9.12.28 to 24.12.28 ...	28.1.29
*† <i>Ariguani</i> ...	Scudamore, J. H. H., D.S.O., R.D., Commr. R.N.R.	G. McKee, J. W. Dodd, W. Ireland, A. Crone.	M.L.	Elders & Fyfes ...	Met. Log. 30.7.28 to 25.11.28 ...	13.12.28
<i>Ariosto</i> ...	Biggins, R. L. ...	" "	No. A.	Ellerman Wilson ...	Form 911 17.12.28 to 29.12.28 ...	4.2.29
†† <i>Armada Castle</i> ...	Imiah, C. B., Stuart, C. E., R.D., Capt. R.N.R.	" "	M.L.	Union Castle ...	Met. Log. 16.3.28 to 8.7.28 ...	11.9.28
*† <i>Arracan</i> ...	Duncan, S. S. ...	J. Summers, J. Henderson, C. C. Weir, E. W. Stubbs, J. Morrison.	"	P. Henderson ...	" 28.3.28 to 6.10.28 ...	29.10.28
<i>Arundel</i> ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 24.2.29 ...	24.2.29
<i>Arundel Castle</i> ...	Owen, S. H. ...	S. E. Aldam ...	No. A.	Union Castle ...	Form 911 7.12.28 to 27.1.29 ...	1.2.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
*† Astronomer ...	Richards, J. ...	A. Frew, E. B. Stephens, W. B. Littlechild.	M.L.	Harrison ...	Met. Log. 5.9.28 to 31.1.29...	14.2.29
*† Ascanius ...	Wilson, C. A. ...	T. Robb, W. F. Cook E. M. Robb.	"	A. Holt ...	" 13.5.28 to 16.9.28	27.9.28
Atrous ...	Rundie, G. G. ...	H. Nicholas ...	No. A.	A. Holt ...	Form 911 19.7.28 to 28.9.28	2.10.28
*† Auditor ...	Owen, W. T. ...	D. O. Percy ...	" M.	Harrison ...	" 23.12.28 to 9.2.29	19.2.29
Autolyceus ...	Dunlop, J. K. ...	" ...	" A.	A. Holt ...	" 25.10.28 to 11.11.28	28.11.28
*† Avon ...	Spriddell, F. G., R.D., Commr., R.N.R.	R. H. East ...	" M.	R.M.S.P. ...	" 17.2.28 to 28.3.28	29.3.28
Balmoral Castle ...	J. H. Kerbey ...	H. A. Deller ...	" A.	Union Castle ...	" 2.11.28 to 23.12.28	5.1.29
*† Balranald ...	Townshend, W. P., Capt., R.N.R.	H. Stinn, G. Owen, F. Ward, L. Bailey.	M.L.	P. & O. Branch	Met. Log. 13.9.28 to 10.1.29	23.1.29
*†51 Baltic ...	Warner, G. E., R.D., Capt., R.N.R.	A. C. F'Anson, W. F. Dennison, H. Phillips.	W.T.	White Star ...	W.T. Reg. 27.11.28 to 17.12.28	19.12.28
Bampton Castle ...	Hutchings, A. H. ...	E. Hamlyn ...	No. A.	Union Castle ...	Form 911 24.12.28 to 14.1.29	16.1.29
*† Banffshire ...	Westropp, T. G. ...	A. Mc L. Pilcher ...	" M.	Turnbull Martin	" 27.11.28 to 14.1.29	16.1.29
*† Baradine ...	Rollo, W. ...	C. B. Roche, B. H. Pollitt, P. Haworth, J. H. Anderson.	M.L.	P. & O. Branch	Met. Log. 28.4.28 to 4.8.28	23.8.28
*† Barpeta ...	Chandler, H. V. ...	N. Apps ...	No. M.	British India ...	Form 911 21.1.29 to 4.1.29	29.1.29
*† Barrabool ...	Rhodes, H. R. ...	T. G. Davies ...	" M.	P. & O. Branch	" 11.1.29 to 28.1.29	5.3.29
Baychimo ...	Cornwall, S. A. ...	" ...	" A.	Hudson's Bay Co.	" 5.10.28 to 19.11.28	3.12.28
*†59 Belgenland ...	Morehouse, W. A. ...	F. Good, C. H. Ottersen, F. Clitty.	W.T.	Red Star ...	W.T. Reg. 7.12.28 to 13.12.28	8.1.29
*† Beltana ...	Allin, C. H. C. ...	D. M. Stafford ...	No. M.	P. & O. Branch	Form 911 24.6.28 to 9.8.28	13.8.28
Benalder ...	Fairweather, J. J. ...	D. T. McCullum ...	" A.	Ben Line ...	" 10.11.28 to 28.12.28	1.1.29
*† Benalla ...	Sheepwash, J. H. ...	D. E. C. Otter ...	" M.	P. & O. Branch	" 15.12.28 to 2.1.29	4.2.29
*† Bendigo ...	Nicholl, R. N. C. ...	G. G. Mason ...	" M.	" ...	" 23.1.29 to 14.2.29	5.3.29
*† Benefactor ...	Jones, C. W. ...	" ...	" M.	Harrison ...	" 9.8.28 to 28.9.28	3.10.28
Bengloe ...	McCorquodale, A. ...	G. Davidson ...	" A.	Ben Line ...	" 25.4.28 to 26.5.28	14.6.28
*†31 Berengaria ...	Rostron, Sir A. H., K.B.E., R.D., Capt. R.N.R.	J. A. Myles, S. A. T. Bullock	W.T.	Cunard ...	W.T. Reg. 11.4.28 to 21.5.28	8.6.28
*† Berrima ...	Short, C. E. ...	G. H. Durrant ...	No. M.	P. & O. Branch	" 6.12.28 to 20.12.28	27.12.28
Brenda ...	Lamont, A. ...	N. Ross ...	" A.	Scottish Fishery Brd.	" 28.12.28 to 12.1.29	14.1.29
Brighton ...	Hill, A. ...	Mr. Munton ...	C.C.	Southern Railway ...	Form 911 25.5.28 to 3.6.28	27.8.28
*† British Colonel	Taylor, R. J. ...	F. W. Sherlock ...	No. M.	British Tankers	" 11.2.29 to 26.2.29	4.3.29
Bronte ...	Crapper, J. S. ...	J. B. Scott ...	" A.	Lampert & Holt	Telegraphic Report 5.3.29	5.3.29
Bruyere ...	Birch, A. ...	" ...	" A.	" ...	Form 911 13.10.28 to 26.12.28	14.1.29
*† Bullyses M.V. ...	Head, B. P. ...	A. J. Clatworthy, J. S. Pike.	" M.	Anglo-Saxon Petroleum Co.	" 25.3.28 to 26.4.28	8.6.28
*†55 Calgairie ...	Western, W. ...	C. Cochrane, A. Thompson, E. Hughes.	W.T.	White Star ...	" 27.11.28 to 24.2.29	4.3.29
Cambria ...	Copland, C. P. ...	O. W. Ll. Jones ...	C.C.	L.M. & S. Rly ...	" 1.1.29 to 20.1.29	8.3.29
*† Cambridge ...	Williams, R. ...	" ...	M.L.	Federal ...	W.T. Reg. 14.2.29 to 4.3.29	8.3.29
*† Cameronia ...	Gemmell, W. ...	D. Chamberlain ...	M.L.	Anchor ...	Telegraphic Report 8.3.29	8.3.29
*† Camito ...	Forrester, W. T., O.B.E.	H. H. Dunning, W. E. Grant, G. M. Roberts.	"	Elders & Fyffes	Met. Log. 28.4.28 to 15.9.28	6.11.28
Canadian Importer	Forson, A. ...	E. Hamilton ...	No. A.	Canadian Gov. Mercantile Marine.	" 5.6.28 to 3.10.28	9.10.28
** Canadian Winner	McConchy, W. G. ...	J. M. Lang ...	" M.	" ...	Form 911 6.10.28 to 31.10.28	22.11.28
*† Canonesa ...	Brodie, W. H. ...	T. Wetherall ...	" M.	Furness Houlder ...	" 17.9.28 to 13.10.28	27.11.28
Cape of Good Hope	Lamont, J. ...	W. S. Bartlett ...	No. A.	Lyle S.S. Co. ...	" 12.1.29 to 10.2.29	5.3.29
*†55 Carmania ...	Brown, F. G., R.D., Capt., R.N.R.	W. M. Stewart, E. R. Taylor, E. Gleave.	W.T.	Cunard ...	" 21.12.28 to 29.1.29	4.3.29
*† Carnarvon Castle	Stanley, W. F., R.D., Commr., R.N.R.	W. G. Smith, T. C. Goldstone, S. S. Smith.	M.L.	Union Castle ...	W.T. Reg. 29.10.28 to 17.11.28	20.11.28
*†34 Caronia ...	Hossack, W. H., R.D., Capt., R.N.R.	H. G. Hayward, T. Parry, J. Chapman.	W.T.	Cunard ...	Met. Log. 14.7.28 to 4.11.28	26.11.28
Casanare ...	Browne, S. ...	" ...	No. A.	Elders & Fyffes	W.T. Reg. 15.10.28 to 2.11.28	7.11.28
*† Cathay ...	Griffin, R. H., O.B.E., R.D., Capt. R.N.R.	" ...	" M.	P. & O. ...	Form 911 15.10.28 to 2.11.28	7.11.28
Cavina ...	Riseley, A. D. ...	R. L. Stevenson ...	" A.	Elders & Fyffes	" 26.1.29 to 3.3.29	5.3.29
*†52 Cedric ...	Smith R. G. ...	W. Walker, S. Fieldwood, W. Nicoll.	W.T.	White Star ...	" ...	...
*† Centaur ...	Ward Hughes, J. ...	N. L. Thompson, J. Cockburn, B. L. Brind.	M.L.	A. Holt & Co. ...	Form 911 13.1.29 to 16.2.29	22.2.29
Ceramic ...	Musgrave, T. ...	H. A. R. Daman ...	No. A.	White Star ...	W.T. Reg. 21.1.29 to 10.2.29	15.2.29
*† Change ...	Gambrill, F. C. ...	J. Thomas, T. Tyer, W. Allan, D. H. O'Hulton.	M.L.	Yull & Co. ...	Form 911 21.1.29 to 10.2.29	13.2.29
Changuinola ...	Thorburn, R. A., R.D., Commr., R.N.R.	W. G. Chanter ...	No. A.	Elders & Fyffes	Met. Log. 16.7.28 to 14.12.28	18.2.29
Chindwin ...	Paterson, G. ...	" ...	" A.	Henderson ...	Form 911 16.11.28 to 18.12.28	28.12.28
*† Chinkiang ...	Stringer, C. B. L. ...	G. Parker ...	M.L.	China Navigation Co.	" 26.11.28 to 7.2.29	8.3.29
*† Chirripo ...	McColm, F. ...	S. J. Jackson ...	No. A.	Elders & Fyffes	Met. Log. 2.8.28 to 31.12.28	5.3.29
*† City of Baroda ...	McMillan, J. ...	J. E. Jenkins, W. Faichney, F. T. Mallett.	M.L.	Ellerman ...	Form 911 24.1.29 to 23.2.29	5.3.29
City of Benares ...	Anderson, W. W. ...	P. C. Wilson ...	No. A.	" ...	Met. Log. 20.7.28 to 31.12.28	2.2.29
*† City of Bombay ...	Brown, O. C. ...	E. H. Roberts ...	" M.	" ...	Form 911 28.8.28 to 27.9.28	26.11.28
City of Brisbane ...	Seaborne, F. O., D.S.C.	R. Jones ...	" A.	" ...	" 24.12.28 to 13.1.29	29.1.29
*† City of Bristol ...	Jenkins, D. ...	K. G. Crockett ...	" M.	" ...	Form 911 3.2.28 to 1.4.28	10.4.28
City of Canterbury ...	Bremner, D. M. ...	R. H. Hodgson ...	" A.	Ellerman ...	" 11.11.28 to 1.12.28	7.1.29
City of Carlisle ...	Mordue, J. A. ...	" ...	" A.	" ...	" 30.12.28 to 9.1.29	22.1.29
*† City of Chester ...	Letton, F. W. ...	C. C. Duncan, P. C. Arthur, M. J. Mc Nicol.	M.L.	" ...	" 11.1.29 to 12.2.29	18.2.29
*† City of Edinburgh	Wyper, J. ...	G. H. Hummell ...	No. M.	" ...	Met. Log. 7.10.28 to 13.2.29	25.2.29
City of Hong Kong	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	H. Saunders ...	" A.	" ...	Form 911 24.12.28 to 25.1.29	18.2.29
City of Khios ...	Reay, A. S. ...	R. E. Thornton ...	" A.	" ...	" 10.1.29 to 3.2.29	9.2.29
City of London ...	Parker, F. W., R.D., Commr., R.N.R.	" ...	No. A.	" ...	Form 911 30.1.29 to 16.2.29	7.3.29
*† City of Osaka ...	Smith, W. H. ...	R. K. Walker ...	No. M.	" ...	" 28.9.28 to 4.12.28	7.1.29
*† City of Rangoon ...	Jones, P. ...	E. R. Wildermuth, R. H. Stewart, F. E. Broadbent.	M.L.	" ...	Met. Log. 4.11.28 to 8.1.29	25.2.29
City of Venice ...	Lee, A. ...	" ...	No. A.	" ...	" 28.3.28 to 9.7.28	1.8.28
City of Yokohama	Singleton, J. G. ...	" ...	" A.	Ellerman ...	Form 911 18.2.28 to 1.3.28	12.3.28
Clan Alpine ...	Lyall, A. B. ...	P. Sargent ...	" A.	Clan ...	" 5.12.28 to 15.1.29	11.2.29
Clan Kenneth ...	Young, A. H., Commr., R.D., R.N.R.	" ...	" A.	" ...	" 21.12.28 to 14.2.29	18.2.29
Clan Lindsay ...	Giles, H. J., R.D., Commr., R.N.R.	J. P. Dunkley ...	" A.	" ...	" 3.11.28 to 28.11.28	1.1.29
Clan MacBean	Worthington, J. H. ...	W. A. Nicholas ...	" A.	" ...	" 25.1.29 to 24.2.29	5.3.29
Clan Macbeth ...	Hannay, L. G. ...	J. C. Robertson ...	" A.	" ...	" 11.12.28 to 13.1.29	9.2.29
					" 20.1.29 to 1.2.29	20.2.29

## LIST OF VOLUNTARY OBSERVING SHIPS

iii

Name of Vessel.	Captain.	Observing Officers.	Meteoro- logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
<i>Clan Macfadyn</i> ...	Laird, C. ...	R. L. Smallbone ...	No. A.	Clan ...	Form 911 3.11.28 to 30.11.28 ...	23.12.28
<i>Clan Macfarlane</i> ...	Redford, L. F. ...	T. A. Pearson ...	" A.	" ...	" 28.10.28 to 14.12.28 ...	21.1.29
<i>Clan Macgillivray</i> ...	Mackinlay, A. ...	F. H. Thornton ...	" A.	" ...	" 11.1.29 to 30.1.29 ...	26.2.29
<i>Clan Macindoe</i> ...	Holman, W. G. ...	" ...	" A.	" ...	" 17.8.28 to 19.9.28 ...	26.9.28
<i>Clan Macellar</i> ...	Smith, W. P. ...	E. Crowther ...	" A.	" ...	" 1.12.28 to 14.12.28 ...	28.12.28
<i>Clan Macphee</i> ...	Gourlay, J. B. ...	E. H. Stone, K. C. Simpson, L. R. Legg.	M.L.	" ...	Met. Log. 11.6.28 to 12.12.28 ...	28.1.29
<i>Clan Macnaughton</i> ...	Simpson, A. W. ...	A. H. Hersee ...	No. A.	" ...	Form 911 9.11.28 to 7.12.28 ...	8.12.28
<i>Clan Macquarrie</i> ...	West, W. F. ...	T. P. Cranwill ...	" A.	" ...	" 5.1.29 to 7.2.29 ...	12.2.29
<i>Clan Mactaggart</i> ...	Higgins C. J. ...	E. A. Hewson ...	" A.	" ...	" 19.10.28 to 8.1.29 ...	18.1.29
<i>Clan Macwhirter</i> ...	Low, A. ...	F. B. Barker, H. M. Watkins	M.L.	" ...	Met. Log. 16.6.28 to 16.1.29 ...	11.2.29
<i>Clan Malcolm</i> ...	George, L. S. ...	J. Masters, R. L. Ranford, J. F. Hubbard, R. L. Martin.	"	" ...	" 7.7.28 to 21.10.28 ...	19.11.28
<i>Clan Morrison</i> ...	Porterfield, W. M. ...	L. C. Cuthbert ...	No. A.	" ...	Form 911 2.12.28 to 28.12.28 ...	21.1.29
<i>Clan Murdoch</i> ...	Calderwood, W. ...	J. B. Davies ...	" A.	" ...	" 11.1.29 to 10.2.29 ...	23.2.29
<i>Clan Ranald</i> ...	Fraser, R. K. ...	K. G. Tucker ...	" A.	" ...	" 13.10.28 to 24.12.28 ...	3.1.29
<i>Clan Ross</i> ...	Neill, G. A. ...	" ...	" A.	" ...	" 1.1.29 to 20.1.29 ...	18.2.29
<i>Clan Sinclair</i> ...	Taylor, P. V. ...	J. H. Dennis ...	" A.	" ...	" 7.1.29 to 20.1.29 ...	11.2.29
<i>Colonial</i> ...	Worthington, B. ...	" ...	" M.	T. & J. Harrison ...	" ...	"
<i>Comorin</i> ...	Borland, J. McL., C.B., D.S.O., R.D., Capt., R.N.R.	E. C. White ...	" M.	P. & O. ...	" 26.12.28 to 7.2.29 ...	22.2.29
<i>Corinthic</i> ...	Freeman, C. P. ...	E. M. Burt, M. Bennett, I. A. Macnaughton.	M.L.	White Star ...	Met. Log. 21.7.28 to 2.10.28 ...	12.11.28
<i>Cornwall</i> ...	Wilde, H. J. ...	H. M. Knight ...	No. A.	Federal ...	Form 911 27.3.28 to 9.5.28 ...	15.5.28
<i>Culebra</i> ...	Goble, C. J., R.D., Commr., R.N.R.	K. Paterson, R. N. Fletcher, W. S. Thomas.	M.L.	R.M.S.P. Co. ...	Met. Log. 12.10.28 to 19.12.28 ...	2.1.29
<i>Cumberland</i> ...	Macmillan, D. ...	G. C. Saul, P. Shakespear, J. Marks.	"	Federal... ...	Form 911 29.4.28 to 30.8.28 ...	24.9.28
<i>Cyclops</i> ...	Cosker, W. ...	K. A. Owens ...	No. A.	A. Holt ...	" 4.12.28 to 30.1.29 ...	6.2.29
<i>Daga</i> ...	Wiles, N. ...	A. Olding... ...	No. M.	P. Henderson... ...	" 16.11.28 to 9.12.28 ...	22.12.28
<i>Dakotian</i> ...	Robb, J. ...	W. R. Atkinson ...	" A.	Leyland ...	" 9.11.28 to 30.12.28 ...	6.2.29
<i>Dardanus</i> ...	Glossop, S. ...	R. W. Ellis ...	" A.	A. Holt ...	" 18.1.29 to 5.2.29 ...	16.2.29
<i>Darro</i> ...	Matthews, G. P. ...	" ...	" M.	R.M.S.P. Co. ...	" 26.1.29 to 11.2.29 ...	15.2.29
<i>Delphic</i> ...	Evans, W. ...	H. Williams ...	" M.	White Star ...	" 31.12.28 to 17.1.29 ...	29.1.29
<i>Delta</i> ...	Townshend, W. P., R.D., Capt., R.N.R.	" ...	" M.	P. & O. ...	" ...	"
<i>Demerara</i> ...	Willan, F. G. L., R.D., Capt., R.N.R.	J. C. Blake ...	" M.	R.M.S.P. Co. ...	" 29.11.28 to 15.12.28 ...	19.1.29
<i>Demosthenes</i> ...	Ogilvy, A. ...	H. Phillips ...	" M.	Aberdeen Common- wealth ...	" 25.9.28 to 11.11.28 ...	14.11.28
<i>Denis</i> ...	Harris, F. C. P. ...	J. H. Stokes ...	" A.	Booth ...	" 15.10.28 to 22.11.28 ...	7.12.28
<i>Deseado</i> ...	F. S. Hannam ...	G. H. Jordan, A. Barff ...	" M.	R.M.S.P. Co. ...	" 6.1.29 to 1.3.29 ...	7.3.29
<i>Desna</i> ...	Green, J. ...	L. T. Peterson ...	" M.	" ...	" 3.9.28 to 24.10.28 ...	12.11.28
<i>Deucalion</i> ...	Melling, C. F. ...	R. F. Dryden ...	" A.	A. Holt ...	" 16.1.29 to 18.2.29 ...	21.2.29
<i>Devon</i> ...	Kinnell, G. ...	D. Clegg... ...	" M.	Federal ...	" 8.11.28 to 29.12.28 ...	3.1.29
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	" C.O.	Southern Railway ...	Telegraphic Report 16.1.29 ...	16.1.29
<i>Dimboola</i> ...	Dawson, J. ...	S. J. Griffith ...	No. A.	Melbourne S.S. Co. ...	Form 911 21.12.28 to 5.1.29 ...	18.2.29
<i>Domala, M.V.</i> ...	Kitson, A. G. ...	H. Robertson ...	" M.	British India ...	" 21.10.28 to 29.12.28 ...	14.1.29
<i>Domitia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr., R.N.R.	S. A. Garnham, A. S. Muir, Lt.-Commr., R.N.R.	M.L.	Telegraph Construc- tion & Maintenance.	Met. Log. 8.8.28 to 5.12.28... ...	27.12.28
<i>Dominic</i> ...	Saxton, C. ...	G. H. Clark ...	No. A.	Booth ...	Form 911 9.7.28 to 9.11.28 ...	12.12.28
<i>61Doric</i> ...	Binks, J. W., R.D., Lt.-Commr., R.N.R.	F. E. Patchett, J. Farrell, W. E. Smith.	W.T.	White Star ...	" 28.1.29 to 17.2.29 ...	21.2.29
<i>Dorington Court</i> ...	Clarke, E. J. ...	P. Jones ...	No. A.	Haldin & Co. ...	W.T. Reg. 28.1.29 to 17.2.29 ...	21.2.29
<i>Dromore Castle</i> ...	MacMahon, J. R.D., Commr., R.N.R.	J. A. Sowden ...	" A.	Union Castle ...	Form 911 3.10.28 to 7.12.28 ...	7.1.29
<i>Dryden</i> ...	Major, T. W. ...	" ...	" M.	Lampport & Holt ...	" 3.11.28 to 1.12.28 ...	1.1.29
<i>Dunaff Head</i> ...	Butt, H. L., R.D., Lt.- Commr., R.N.R.	D. Martin ...	" A.	Ulster S.S. Co. ...	" 21.10.28 to 14.1.29 ...	7.2.29
<i>Dundrum Castle</i> ...	Goodacre, R.W., R.D., Commr., R.N.R.	A. R. J. Tilston ...	" A.	Union Castle ...	" 22.1.29 to 6.2.29 ...	18.2.29
<i>Dunluce Castle</i> ...	Morgan, A. O., R.D., Commr., R.N.R.	W. M. Mulhall ...	" A.	" ...	" 13.4.28 to 11.5.28 ...	21.5.28
<i>Dunrobin</i> ...	Ramsay, J. D. ...	C. H. Kendall ...	" A.	" ...	" 19.10.28 to 27.12.28 ...	28.12.28
<i>Duquesa</i> ...	Owen, R. ...	W. E. Morriss ...	" M.	Glen & Co. ...	" 27.12.28 to 12.2.29 ...	5.3.29
<i>Durenda, M.V.</i> ...	Beeching, P. H. ...	F. E. Liles ...	" M.	Furness Withy ...	" 10.10.28 to 15.12.28 ...	28.12.28
				British India ...	" 8.12.28 to 17.12.28 ...	21.1.29
<i>Edinburgh Castle</i> ...	Gardner, G. F., O.B.E., Lt.-Commr., R.N.R.	C. P. Goode ...	" A.	Union Castle ...	" 23.11.28 to 13.1.29 ...	17.1.29
<i>Egori</i> ...	Sola, P., D.S.O. ...	R. W. Pattinson ...	" A.	Elder Dempster ...	" 26.11.28 to 22.1.29 ...	1.2.29
<i>Eldon Park</i> ...	Burns, R. ...	D. Rankine ...	" M.	Denholm S.S. Co. ...	" 5.11.28 to 9.2.29 ...	20.2.29
<i>Ellora</i> ...	Baird, S. K. ...	W. M. Bain ...	" M.	British India... ...	" 9.1.29 to 28.1.29 ...	18.2.29
<i>Elpenor</i> ...	Gordon, A. L. ...	C. Kavanagh, J. E. Iliff ...	M.L.	A. Holt ...	Met. Log. 7.7.28 to 2.11.28... ...	7.11.28
<i>Elstree Grange</i> ...	St. Pierre, P. ...	" ...	No. M.	Houlder ...	" ...	"
<i>Elysia</i> ...	Duncan, A. R. ...	D. Blair, G. S. Sinclair, W. Black.	M.L.	Anchor ...	Met. Log. 9.11.28 to 16.1.29 ...	25.1.29
<i>Empress of Asia</i> ...	Hailey, A. J., Lt.- Commr., R.N.R.	L. M. Goddard, J. F. Patrick, R. J. Hickey, E. Newell, R. K. Baker.	"	Canadian Pacific ...	" 22.6.28 to 28.9.28 ...	7.1.29
<i>Empress of France</i> ...	Griffiths, E. ...	O. F. Pennington, E. Roberts, L. Outram.	"	" ...	" 31.10.28 to 21.12.28 ...	27.12.28
<i>Empress of Russia</i> ...	Hosken, A. J. ...	R. A. Leicester, J. G. McQuarrie, A. C. Jones.	"	" ...	" 2.8.28 to 10.11.28 ...	10.12.28
<i>Endeavour</i> ...	Law, E. F. B., Commr., R.N.	C. S. E. Lansdown, P. Barlow, W. H. Dickinson.	"	His Majesty's Ship ...	" 14.3.28 to 11.7.28 ...	16.7.28
<i>Enterprise</i> ...	Pridham-Wippell, H.D., Capt., R.N.	" ...	"	" ...	" ...	"
<i>Essequibo</i> ...	Kirkwood, J. H. ...	J. H. E. Evans ...	No. M.	R.M.S.P. Co. ...	Form 911 12.7.28 to 26.9.28 ...	16.11.28
<i>Eumæus</i> ...	Read, J. W. ...	" ...	" A.	A. Holt ...	" 6.1.29 to 15.2.29 ...	27.2.29
<i>Euryades</i> ...	Findlay, J. ...	W. K. Hole ...	No. A.	A. Holt ...	" 10.1.29 to 25.1.29 ...	4.2.29
<i>Explorer</i> ...	Ling, J. T. ...	H. W. Gostage ...	" M.	Harrison ...	" 14.10.28 to 4.1.29 ...	9.1.29
<i>Explorer</i> ...	Allan, J. ...	A. Stout, F. O. Sheehy ...	" A.	Scottish Fishery Board.	" 4.12.28 to 20.12.28 ...	28.12.28
<i>Ferndale</i> ...	Thompson, W. ...	R. S. Hartrick ...	No. M.	Aberdeen Common- wealth.	" 7.7.28 to 5.8.28 ...	23.8.28
<i>Fordsdale</i> ...	Richardson, A. V. ...	F. Vaughan ...	" M.	Aberdeen Common- wealth.	" 1.1.29 to 17.1.29 ...	25.2.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
<i>Francisco</i> ...	Scales, H. ...	J. C. Hammond ...	No. A.	Ellerman Wilson ...	Form 911 21.12.28 to 28.1.29 ...	4.2.29
<i>Freya</i> ...	Angus, W. ...	W. Pirrie ...	" A.	Scottish Fishery Board.	" 1.2.29 to 27.2.29... ..	4.3.29
<i>Garth Castle</i> ...	Linklater, H. ...	T. H. Whitley ...	" A.	Union Castle ...	" 1.11.28 to 29.12.28 ...	3.1.29
<i>Gascoyne</i> ...	Johnson, L. ...	W. J. Macphedran, C. Melson, J. S. Macbride.	M.L.	A. Holt & Co....	Met. Log. 21.5.28 to 6.9.28... ..	29.10.28
<i>Glamorganshire</i> ...	Purvis, A. ...	E. A. E. Littlewood ...	No. M.	R.M.S.P. Co. ...	Form 911 17.9.28 to 19.10.28 ...	25.10.28
<i>Glenamoy, M.V.</i> ...	Homan, C. E....	R. W. Emerson, R. W. Brooks, J. R. Taylor.	M.L.	Glen Line ...	Met. Log. 25.6.28 to 7.11.28 ...	6.12.28
<i>Glenapp</i> ...	Ingram, T. F....	" ...	No. A.	" ...	Form 911 1.11.28 to 8.12.28 ...	28.12.28
<i>Glenbeg</i> ...	Newing, L. ...	A. D. Brown ...	No. A.	" ...	27.10.29 to 18.1.29 ...	22.1.29
<i>Glenegarray</i> ...	Angier, J. ...	F. C. White ...	" M.	" ...	Form 911 18.1.29 to 29.1.29 ...	5.3.29
<i>Glenluce</i> ...	Kennett, W. H. ...	H. B. Porter ...	" A.	" ...	" 10.1.29 to 29.1.29 ...	25.2.29
<i>Glenishane</i> ...	Kersley, L. W. ...	A. C. Radley ...	" A.	" ...	" 21.8.28 to 23.9.28 ...	29.10.28
<i>Glenworth</i> ...	Kilgour, H. A. ...	J. S. Armstrong... ..	No. A.	R. S. Dalgleish ...	" 26.12.28 to 5.2.29 ...	14.2.29
<i>Gloucestershire</i> ...	Robin, E. ...	W. Moore ...	" A.	Bibby ...	" 1.12.28 to 8.2.29... ..	12.2.29
<i>Gloxinia</i> ...	Pool, F. G. ...	" ...	" A.	Stag Line ...	" 4.1.29 to 26.1.29... ..	30.1.29
<i>Halestus</i> ...	Samuels, C. ...	N. MacLeod ...	" A.	R. P. Houston ...	" 6.1.29 to 4.2.29 ...	25.2.29
<i>Hallartius</i> ...	Felton, W. J. ...	F. D. Bonney ...	" A.	" ...	" 13.11.28 to 8.2.29 ...	28.2.29
<i>Hardwicke Grange</i> ...	Fowler, W. H. ...	" ...	No. M.	"Houlder" ...	" ... ..	...
<i>Harmonides</i> ...	Elwell, F. R. ...	R. H. Pape ...	" A.	R. P. Houston ...	" 11.1.29 to 4.2.29 ...	5.3.29
<i>Hatimura</i> ...	Parkin, J. W. ...	L. E. Heath ...	" M.	British India ...	" 1.1.29 to 20.1.29 ...	25.2.29
<i>Hauraki, M.V.</i> ...	Norton, A. T. ...	D. M. McLeish, C. H. George, F. C. Cochran.	M.L.	Union S.S. Co., N.Z. ...	Met. Log. 17.4.28 to 25.10.28 ...	4.1.29
<i>Henry C.S.</i> ...	Bicker Caarten, A. ...	M. A. Green ...	No. M.	W. I. & Panama Tele-graph Co.	Form 911 13.10.28 to 31.10.28 ...	3.12.28
<i>Herald</i> ...	Turner, H. E., Lieut-Commr.	W. H. Martin ...	M.L.	His Majesty's Ship ...	Met. Log. 31.10.28 to 28.11.28 ...	9.1.29
<i>Herefordshire</i> ...	Griffiths, C. H. ...	M. D. Louttill ...	No. A.	Bibby ...	Form 911 17.11.28 to 24.1.29 ...	2.2.29
<i>Herminius</i> ...	Roberts, T. V. ...	D. W. MacGregor ...	" A.	Aberdeen Common-wealth.	" 24.10.28 to 6.12.28 ...	18.12.28
<i>Herschel</i> ...	Watson, W. W. ...	" ...	" A.	Lampart & Holt ...	" 13.11.28 to 2.12.28 ...	8.12.28
<i>Hibernia</i> ...	Roberts, W. Ivor, M.B.E.	R. Woodall, A. Marsh ...	C.C.	L.M. & S. Railway ...	Telegraphic Report 2.3.29 ...	2.3.29
<i>Highland Laddie</i> ...	Jones, T. J. ...	E. F. Smart ...	No. A.	Nelson ...	Form 911 22.4.28 to 12.6.28 ...	9.7.28
<i>" Piper</i> ...	Collings, D. ...	R. G. Owen, A. Southgate, W. Stephen.	M.L.	" ...	Met. Log. 23.6.28 to 10.1.29 ...	21.1.29
<i>" Pride</i> ...	Robinson, R. H. ...	F. Quelch ...	No. A.	" ...	Form 911 8.9.28 to 3.11.28 ...	7.11.28
<i>" Prince</i> ...	Taylor, F. ...	W. A. Hall ...	" A.	" Prince ...	" 15.11.28 to 30.11.28 ...	7.12.28
<i>" Rover</i> ...	McKinnon, H. ...	N. F. Seaton ...	" A.	Nelson ...	" 24.9.28 to 10.11.28 ...	3.12.28
<i>Hildebrand</i> ...	Peregrine, D. ...	" ...	" A.	Booth ...	" 11.1.29 to 26.2.29 ...	28.2.29
<i>Hobson's Bay</i> ...	Kydd, O. J. ...	R. Pearce, J. Worrall, D. Horn, R. S. Winnall.	M.L.	Aberdeen Common-wealth.	Met. Log. 30.10.28 to 11.2.29 ...	5.3.29
<i>Holbein</i> ...	Gough, W. A. ...	F. Delaney ...	No. A.	Lampart & Holt ...	Form 911 30.9.28 to 16.12.28 ...	4.1.29
<i>†54 Homeric</i> ...	White, E. R., R.D., Commr. R.N.R.	H. G. Morgan, S. B. Morfee, W. T. Poustie.	W.T.	White Star ...	W.T. Reg. 17.1.29 to 31.1.29 ...	13.2.29
<i>Hororata</i> ...	Barnett, H. ...	E. A. Quick ...	No. A.	New Zealand S.S. Co.	Form 911 24.12.28 to 8.1.29 ...	18.1.29
<i>Hubert</i> ...	Briscoe, W. ...	" ...	" A.	Booth ...	" 9.9.28 to 28.11.28 ...	17.12.28
<i>Huntingdon</i> ...	Ashworth, W. ...	H. G. Letts ...	" A.	Federal... ..	" 11.11.28 to 17.12.28 ...	20.12.28
<i>† Huntsman</i> ...	Russell, H. ...	J. Richardson ...	" M.	Harrison ...	" 13.4.28 to 15.8.28 ...	3.9.28
<i>† Hydaspes</i> ...	Williams, P. E. ...	P. McMillan ...	No. M.	R. P. Houston ...	" 8.12.28 to 28.12.28 ...	21.1.29
<i>† Ingoma</i> ...	Gibbings, W. ...	W. P. Baker, R. J. Mackinnon	" M.	Harrison ...	Form 911 2.12.28 to 15.1.29 ...	21.1.29
<i>Inkum</i> ...	Meethan, J. T. ...	" ...	" A.	J. H. Welsford ...	" 10.10.28 to 24.10.28 ...	3.11.28
<i>† Iris, C.S.</i> ...	Hughes, H. R. ...	L. V. Vicker, D. MacDonald	M.L.	Pacific Cable Board...	Met. Log. 25.8.27 to 3.10.27 ...	21.3.28
<i>† Iroquois</i> ...	Nares, J. D., D.S.O., Capt. R.N.	A. B. Foulston... ..	"	His Majesty's Ship ...	" 1.9.28 to 30.11.28 ...	8.1.29
<i>† Ixion</i> ...	Collins, H. M....	" ...	"	A. Holt ...	Form 911 9.10.28 to 26.10.28 ...	19.12.28
<i>Japanese Prince</i> ...	Marshall, F. ...	J. B. Morrison ...	No. A.	Prince ...	" 28.12.28 to 15.1.29 ...	6.2.29
<i>† Jervis Bay</i> ...	Chaplin, W. R. ...	R. W. Laycock ...	" M.	Aberdeen Common-wealth.	" 20.12.27 to 23.4.28 ...	14.5.28
<i>† Jeypore</i> ...	Cooper, C. P., O.B.E., R.D. Capt. R.N.R.	" ...	" M.	P. & O. ...	" ... ..	...
<i>Justin</i> ...	Bush, H. ...	L. G. McMillan ...	" A.	Booth ...	" 28.12.28 to 10.1.29 ...	8.2.29
<i>†† Katsar-i-Hind</i> ...	Manley, G. ...	R. H. Hand ...	" M.	P. & O. ...	" 16.11.28 to 17.1.29 ...	19.1.29
<i>† Kalyan</i> ...	Cornwall Jones, B. ...	W. R. B. Noal ...	" M.	P. & O. ...	" 10.12.28 to 22.2.29 ...	5.3.29
<i>† Kangaroo</i> ...	Norris, H. C. ...	E. Hutchinson, J. Edward, H. Reynolds.	M.L.	State Service Aus-tralia.	Met. Log. 2.4.28 to 1.8.28 ...	29.10.28
<i>† Karamea</i> ...	McIntosh, A. ...	" ...	"	Shaw, Savill & Albion	" 15.9.28 to 17.1.29 ...	23.1.29
<i>† Karapara</i> ...	Miller, A. C. ...	J. Smail ...	No. M.	British India... ..	Form 911 14.1.29 to 2.2.29 ...	25.2.29
<i>† Kashgar</i> ...	" ...	R. P. Eddy ...	" M.	P. & O. ...	" ... ..	...
<i>† Kashmir</i> ...	Bent, E. ...	" ...	" M.	P. & O. ...	Form 911 19.10.28 to 4.1.29 ...	17.1.29
<i>† Khiva</i> ...	Britten, P. O. ...	C. E. Arundel, J. A. Ridley, H. V. Williamson.	M.L.	P. & O. ...	Met. Log. 23.8.28 to 2.12.28 ...	7.12.28
<i>† Knight Companion</i> ...	Davis, A. L. ...	J. H. Isherwood ...	No. M.	A. Holt... ..	Form 911 27.1.29 to 16.2.29 ...	8.3.29
<i>† Koolinda, M.V.</i> ...	Buckeridge, J. ...	" ...	" M.	State Service, Aus-tralia.	" 24.7.28 to 6.9.28... ..	15.10.28
<i>† Kovno</i> ...	Dossor, W. A. ...	N. H. Hewetson ...	No.	Ellerman Wilson ...	Met. Log. 27.7.28 to 7.1.29... ..	21.1.29
<i>††37 Laconia...</i> ...	Doyle, M. ...	E. W. Connell, A. B. Fasting, F. G. Russell ...	W.T.	Cunard ...	W.T. Reg. 21.1.29 to 26.2.29 ...	28.2.29
<i>Laguna</i> ...	Dunn, R. E., O.B.E....	" ...	No. A.	Pacific S.N. Co. ...	Form 911 20.1.29 to 26.2.29 ...	28.2.29
<i>† Lahore</i> ...	Gordon, L. M., R.D., Commr. R.N.R.	E. B. Elcoate ...	" M.	P. & O. ...	" 5.12.28 to 23.12.28 ...	16.1.29
<i>Lalande</i> ...	Hamill, H. ...	" ...	No. A.	Lampart & Holt ...	" 30.10.28 to 27.1.29 ...	7.2.29
<i>Lancashire</i> ...	Crumplin, W. E. ...	R. Allen ...	" A.	Bibby ...	" 23.9.28 to 29.11.28 ...	5.12.28
<i>††36 Lancastria</i> ...	Townley, J. C. R.D., Commr. R.N.R.	G. Overton, P. L. Williams, J. W. Caunce.	W.T.	Cunard ...	W.T. Reg. 11.2.29 to 17.2.29 ...	7.3.29
<i>Laomedon</i> ...	Hatfield, F. ...	O. P. H. Wynne... ..	No. A.	A. Holt... ..	Form 911 10.2.29 to 18.2.29 ...	7.3.29
<i>† La Paz, M.V.</i> ...	Benson, C. W. ...	J. D. Richards ...	" M.	Pacific S.N. Co. ...	Form 911 16.2.29 to 26.2.29 ...	7.3.29
<i>††55 Layland</i> ...	Harvey, H. ...	B. Harries, L. A. Williams J. C. Flett, J. A. Mackie.	W.T.	Red Star ...	W.T. Reg. 24.11.28 to 12.12.28 ...	31.12.28
					Form 911 26.11.28 to 15.12.28 ...	19.12.28
					" 19.1.29 to 26.1.29 ...	8.3.29

## LIST OF VOLUNTARY OBSERVING SHIPS

v

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
*† Largs Bay ...	Beighton, J. N. ...	... ..	No. M.	Aberdeen Common-wealth.	Form 911 19.9.28 to 28.12.28 ...	12.2.29
††64 Laurentic ...	Trant, E. L., R.D., Commr. R.N.R.	J. W. Peters, R. Hawkyns ...	"	White Star ...	W.T. Reg. 8.1.29 to 28.1.29... Form 911 7.1.29 to 28.1.29... ..	5.2.29 5.2.29
*† Lautaro, M.V. ...	Leyne, R. W. ...	J. T. Denley ...	No. M.	Pacific S.N. Co. ...	Met. Log. 27.11.28 to 12.1.29 ...	22.1.29
*† Leicestershire ...	English, G. L. ...	R. S. Evans, H. G. Walton, E. D. Brand, A. Thomson.	M.L.	Bibby ...	Met. Log. 27.10.28 to 9.1.29 ...	30.1.29
Leighton, M.V. ...	Lindesay, J. M. ...	... ..	No. A.	Lampont & Holt ...	Form 911 15.2.28 to 20.5.28 ...	19.6.28
Leitrim ...	Robertson, A. ...	S. J. Woodhouse ...	" A.	Dowie, J., & Co. ...	" 13.12.28 to 3.1.29 ...	4.2.29
*† Limerick ...	Molyneux, P. L. ...	H. F. C. Wilkinson ...	" M.	Federal... ..	" 25.10.28 to 26.11.28 ...	17.12.28
Llandaff Castle ...	Gilbert, E. F. ...	W. A. Cooke ...	" A.	Union Castle ...	" 28.12.28 to 16.1.29 ...	12.2.29
*† Llandoverly Castle ...	Stuart, C. E., Capt. R.N.R.	C. H. Williams, G. Moon, P. Clissold.	M.L.	" ...	Met. Log. 15.11.28 to 21.1.29 ...	1.2.29
*† Lobos, M. V. ...	Pape, E. E. ...	S. E. Aylard ...	No. M.	Pacific S.N. Co. ...	Form 911 17.12.28 to 5.1.29 ...	15.1.29
Loch Katrine ...	Schlanbusch, O. V. ...	D. A. Mallinson ...	No. A.	R.M.S.P. Co. ...	" 8.10.28 to 4.1.29 ...	9.1.29
*† Logician ...	Gibblings, W. ...	A. G. S. Madrell ...	No. M.	Harrison ...	" 22.6.28 to 15.10.28 ...	19.10.28
*† London Importer ...	Fowler, W. H. ...	F. F. Feint, J. H. Metcalfe, J. G. Freeman.	M.L.	Furness Withy ...	Met. Log. 8.1.28 to 31.3.28 ...	14.4.28
Lord Antrim ...	Jarvis, F. E. ...	... ..	No. A.	Ulster S.S. Co. ...	Form 911 4.1.29 to 19.1.29... ..	23.1.29
Loriga, M.V. ...	Clapham, E. C. ...	D. P. Morgan ...	" A.	Pacific S.N. Co. ...	" 20.11.28 to 14.12.28 ...	3.1.29
*† Losada, M.V. ...	Ross, J. ...	D. Beamer ...	" M.	" ...	" 12.1.29 to 28.1.29 ...	16.2.29
†† Macedonia ...	Harrison, R. ...	C. J. L. Hayward ...	" M.	P. & O. ...	" 10.1.29 to 19.1.29 ...	11.2.29
*† Macharda ...	Hanna, R. G. ...	T. Johnston, H. M. Russell ...	" M.	Brocklebank ...	" 12.11.28 to 26.1.29 ...	11.2.29
*† Mahronada ...	Addy, M. J. ...	J. Kettlewell ...	No. M.	" ...	" 4.10.28 to 14.12.28 ...	17.12.28
*† Mahsud ...	Kershaw, R. W. ...	J. D. Paisley ...	" M.	" ...	" 12.2.29 to 21.2.29 ...	28.2.29
*† Maiden ...	Rowe, J. P. ...	... ..	" M.	" ...	" ... ..	...
*† Maihar ...	Charlton, W. L. ...	J. W. B. Robertson, C. Cadwallader, S. S. Slade.	M.L.	" ...	Met. Log. 27.1.28 to 21.4.28 ...	7.6.28
*† Maimoa ...	Johnson, J. W. ...	... ..	No. A.	Shaw, Savill & Albion	Form 911 18.8.28 to 14.11.28 ...	29.11.28
Maimyo ...	Smith, G. G. ...	H. M. Drummond ...	W.T.	Brocklebank ...	W.T. Reg. 1.2.29 to 14.2.29 ...	18.2.29
††58 Majestic ...	Marshall, W. C.B., D. S. O., R.D., Commr. R.N.R.	W. W. Pearson, A. E. Dyer, W. T. Fitz Gerald, A. H. Young.	No. M.	White Star ...	Form 911 22.11.28 to 22.12.28 ...	28.12.28
*† Makalla ...	Mangham, J. W. ...	J. B. Newman ...	M.L.	Burns Philp ...	Met. Log. 30.6.28 to 20.11.28 ...	4.1.29
*† Makambo ...	Williams, D. J. ...	R. Perry, R. A. Williams S. Sandison.	"	" ...	" 17.5.28 to 27.9.28 ...	2.1.29
*† Makura ...	McLean, J. ...	J. Hood, J. Billingham, G. Edwards.	"	Canadian-Australasian	" 5.5.28 to 14.10.28 ...	2.1.29
*† Malabar, M.V. ...	Donaldson, A. ...	L. Millar ...	No. M.	Burns, Philp & Co. ...	Form 911 18.9.28 to 28.11.28 ...	6.12.28
*† Malakuta ...	Adamson, F. L. ...	N. Grayson ...	" M.	Brocklebank ...	" 4.8.28 to 14.10.28 ...	3.12.28
*† Malancha ...	Whitham, F. ...	... ..	" M.	British India ...	" 23.12.28 to 30.1.29 ...	5.3.29
*† Malda ...	Gray, T. N. ...	E. H. Lidstone ...	" M.	P. & O. ...	" 12.1.29 to 2.2.29 ...	26.2.29
*† Maloja ...	Browning, J. B., R.D., Commr. R.N.R.	A. D. Dennis ...	" M.	" ...	" ... ..	...
†† Malua ...	Norman, W. A. ...	G. C. Case, F. D. Shaw ...	M.L.	Manchester Liners ...	Met. Log. 6.10.28 to 9.1.29 ...	22.1.29
*† Manchester Brigade ...	Stott, C. H. ...	J. H. Round, H. Boyce, E. E. Bonnaud.	No. A.	" ...	Form 911 25.8.28 to 4.2.29 ...	15.2.29
Manchester Corporation.	Makin, T. ...	J. F. Whitly ...	M.L.	" ...	Form 911 6.1.29 to 12.2.29 ...	19.2.29
*† Manchester Hero ...	Riley, J. E. ...	H. Anderton, J. H. Emmett, H. Dobson, A. Ricketts, A. Grant.	No. A.	" ...	Met. Log. 24.3.28 to 12.10.28 ...	19.10.28
Manchester Producer	Barclay, J. ...	... ..	"	" ...	Form 911 20.1.29 to 20.2.29 ...	4.3.29
*† Manala ...	Struss, F. D. ...	... ..	No. M.	British India... ..	" ... ..	...
*† Mangalore ...	Maples, S. H. ...	... ..	No. M.	Brocklebank ...	" ... ..	...
*† Manipur ...	Malchay, G. ...	... ..	No. M.	Brocklebank ...	" 28.10.28 to 14.1.29 ...	24.1.29
*† Manistee ...	Cochran, G. N. ...	R. Penston, G. B. Falconer ...	No. M.	Elders & Fyffes ...	Form 911 26.8.28 to 22.11.28 ...	17.1.29
*† Manora ...	Pengelly, J. ...	... ..	" M.	British India... ..	" ... ..	...
†† Mantua ...	Hudson, H. T., R.D., Commr. R.N.R.	... ..	" M.	P. & O. ...	" 4.11.28 to 7.2.29... ..	25.2.29
*† Marella ...	Davis, H. C. D.S.C., Commr. R.N.R.	... ..	M.L.	Burns Philp ...	Met. Log. 3.7.28 to 18.9.28... ..	19.1.29
*† Marengo ...	Mortimer, S. ...	H. Bryan, G. W. Revell, F. Foyal, S. Butcher.	"	Ellerman Wilson ...	" 18.7.28 to 6.1.29... ..	22.1.29
Maresfield ...	Berry, V. ...	T. Connolly ...	No. A.	Woods, Tyler & Brown	Form 911 3.5.28 to 19.5.28... ..	9.6.28
†† Margha ...	Hughes, C. G. ...	P. Wright, H. Watkins ...	M.L.	British India... ..	Met. Log. 1.12.28 to 28.2.29 ...	5.3.29
*† Marquesa ...	Smiles, R. S. ...	L. Owen... ..	No. M.	Furness Houlder ...	Form 911 15.10.28 to 22.12.28 ...	28.12.28
*† Marstna ...	Mitchie, ...	... ..	No. A.	Burns, Philp & Co. ...	Met. Log. 20.12.28 to 16.1.29 ...	26.2.29
*† Matakana ...	Thurston, H. P. ...	E. Davies, B. Forbes-Moffatt, J. Dickson.	M.L.	Shaw, Savill & Albion	Met. Log. 29.9.28 to 11.2.29 ...	13.2.29
Mataram ...	Voy, W. ...	R. M. Blunt ...	No. A.	Burns, Philp & Co. ...	Form 911 12.12.28 to 12.1.29 ...	18.2.29
†† Mataroa ...	Kershaw, W. A. R. ...	F. Eadon, J. J. Nicoll, C. Meyer.	M.L.	Shaw, Savill, & Albion	Met. Log. 28.9.28 to 4.1.29 ...	7.1.29
*† Matheran ...	Ison, W. A. ...	J. Richardson ...	No. M.	Brocklebank ...	Form 911 6.11.28 to 18.11.28 ...	23.11.28
*† Matiana ...	Green, F. V. ...	W. McInnes ...	" M.	British India... ..	" 4.8.28 to 23.10.28 ...	29.10.28
*† Matra ...	Cornish, N. P. ...	W. Gibson, Hodgson, G. G. ...	" M.	Brocklebank ...	" 23.10.28 to 3.11.28 ...	13.12.28
*† Maunganui... ..	Toten, A. T. ...	A. J. Herbert ...	" M.	Union S.S. Co. of N.Z.	" 27.12.28 to 21.1.29 ...	25.2.29
††32 Mauretania ...	McNeil, S. G.S., R.D., Capt. R.N.R.	R. H. C. Crawford, C. B. Osborne B. J. P. Tuck.	W.T.	Cunard ...	W.T. Reg. 3.1.29 to 16.1.29 ...	21.1.29
††66 Megantic ...	Kearney, J. ...	F. E. Patchett ...	W.T.	White Star ...	Form 911 16.7.28 to 2.8.28 ...	13.8.28
††22 Melita ...	Stewart, A. ...	J. Shearer, T. Gillette ...	W.T.	Canadian Pacific ...	W.T. Reg. 12.2.29 to 28.2.29 ...	5.3.29
Memnon ...	Watson, C. J. ...	J. A. C. McGregor ...	No. A.	A. Holt... ..	Form 911 12.1.29 to 23.1.29 ...	28.1.29
††21 Metagama ...	Rothwell, A. ...	C. L. de H. Bell, J. Stewart, J. Coldwell.	W.T.	Canadian Pacific ...	W.T. Reg. 27.1.29 to 15.2.29 ...	21.2.29
*† Middlesex ...	Wilde, H. ...	D. J. Murray, ...	No. M.	Federal... ..	Form 911 22.1.29 to 6.2.29 ...	5.3.29
Minna ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A.	Scottish Fishery Brd.	" 1.2.29 to 28.2.29 ...	8.3.29
††23 Minnedosa ...	McQueen, D. S. ...	F. E. Williams, C. D. Watt, W. J. P. Roberts.	W.T.	Canadian Pacific ...	W. T. Reg. 20.1.29 to 8.2.29 ...	14.2.29
†† Minnesota ...	Finch, E., R. D., Commr. R.N.R.	... ..	No. M.	Atlantic Transport... ..	Form 911 27.11.28 to 16.12.28 ...	28.12.28
†† Minnetonka ...	Gates, T. F., C.B.E. ...	H. E. D. McCartney ...	" M.	" ...	" 20.1.29 to 9.2.29 ...	12.2.29
†† Minnewaska ...	Claret, F. H., C.B.E., Commr. R.N.R.	F. J. Mummery ...	" M.	" ...	" 14.1.29 to 2.2.29... ..	12.2.29
*† Mirror, C.S. ...	Jones, T., M.B.E. ...	J. G. West ...	" M.	Eastern Tel. Co. ...	" 13.2.28 to 18.3.28 ...	10.4.28
Mississippi ...	Wylie, J. T. J. ...	W. M. Shoesmith ...	No. A.	Atlantic Transport... ..	" 13.2.29 to 25.2.29 ...	27.2.29
*† Modasa ...	Gilchrist, J. W. ...	A. E. Baker, E. Crozier ...	" M.	British India... ..	" 10.6.28 to 28.8.28 ...	18.9.28
*† Moeraki ...	Lorlard, C. ...	F. E. Lucas ...	No. A.	Union S.S. Co. of N.Z.	" 21.12.28 to 7.1.29 ...	18.2.29
†† Moldavia ...	Burleigh, C. W., D.S.O., R.D., Capt. R.N.R.	C. B. Holmes ...	No. M.	P. & O. ...	" 20.12.28 to 8.1.29 ...	22.1.29
†† Mongolia ...	Furlong, G. H. S., R.D., Capt. R.N.R.	A. H. Cole ...	" M.	" ...	" 26.10.28 to 11.1.29 ...	15.1.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
††24 <i>Montcalm</i> ...	Landy, E. ...	F. H. Steel, M. Williams, L. Thornton.	W.T.	Canadian Pacific ...	W.T. Reg. 11.11.28 to 29.11.28 ...	4.12.28
††25 <i>Montclare</i> ...	Griffiths, J. N. ...	A. Mansey, C. Draper, T. Sargent.	"	" " {	" 27.11.28 to 14.12.28 ...	18.12.28
*† <i>Montoro</i> ...	Williams, D. J. ...	D. J. L. Pemberton, R. M. Blunt, J. Campbell.	M.L.	Burns, Philp & Co. ...	Form 911 23.12.28 to 10.1.29 ...	15.1.29
††26 <i>Montrose</i> ...	Dott, J. F. ...	W. P. Haines, J. M. Roche ...	W.T.	Canadian Pacific ...	W.T. Reg. 10.2.29 to 1.3.29 ...	5.3.29
††20 <i>Montroyal</i> ...	Freer, A. R.D., Capt. R.N.R.	L. Outram, D. Ewing ...	"	" " {	Form 911 3.2.29 to 22.2.29 ...	26.2.29
*† <i>Moresby</i> ...	Henderson, D. A., Commr. R.N.R.	S. F. Bolton, G. A. Gould ...	M.L.	His Majesty's Australian Ship.	Met. Log. 8.12.28 to 27.12.28 ...	3.1.29
†† <i>Morvada</i> ...	Mills, T. L., O.B.E., R.D., Commr. R.N.R.	A. J. Norris, H. Maguire ...	No. M.	British India ...	Form 911 17.4.28 to 14.8.28 ...	12.10.28
†† <i>Mulbera</i> ...	Caffyn, F. ...	J. Rose ...	" M.	" ...	Form 911 29.7.28 to 29.10.28 ...	31.10.28
...	...	...	...	...	" 28.10.28 to 30.11.28 ...	7.12.28
*† <i>Nagara</i> ...	Miles, F. R., R.D., Capt. R.N.R.	G. Elliott ...	" M.	R.M.S.P. Co. ...	" 26.7.28 to 20.9.28 ...	25.9.28
*† <i>Nagoya</i> ...	Bedwell, L. A. ...	S. Gerrans ...	" M.	P. & O. ...	" 26.5.28 to 19.8.28 ...	23.8.28
†† <i>Naldera</i> ...	Randell, G. G. ...	C. H. Hand, M. F. Shute, J. O. Davies.	M.L.	" ...	Met. Log. 20.10.28 to 23.1.29 ...	8.2.29
*† <i>Nardana</i> ...	Moth, F. L. ...	F. G. Sharps ...	No. M.	British India ...	Form 911 8.10.28 to 13.11.28 ...	3.12.28
†† <i>Narkunda</i> ...	Collyer, R. M., R.D., Commr. R.N.R.	M. Boyd ...	" M.	P & O ...	" 9.1.29 to 20.2.29 ...	22.2.29
*† <i>Nellore</i> ...	Hignett, A. H., R.D., Lt-Commr. R.N.R.	A. J. Brown ...	" M.	P. & O. ...	" 17.1.29 to 17.2.29 ...	19.2.29
*† <i>Nerbudda</i> ...	Williams, B. N. ...	G. A. Farley, S. Henderson ...	" M.	British India ...	" 16.12.28 to 8.2.29 ...	11.2.29
*† <i>Nestor</i> ...	Houghton, G. K. ...	A. Caird, N. Anderson, R. T. Dryden.	M.L.	A. Holt ...	Met. Log. 8.1.28 to 13.5.28 ...	24.5.28
*† <i>Newby Hall</i> ...	Gorst, W. ...	E. M. Robertson, F. Wrigley, A. W. Wise, W. S. Smith.	No. M.	Ellerman ...	" 17.8.28 to 27.1.29 ...	18.2.29
*† <i>Newfoundland</i> ...	Foxworthy, A. W.	R. F. Handley, E. Sainty, D. Hetherington.	M.L.	Furness Withy ...	" 31.7.28 to 10.12.28 ...	22.12.28
*† <i>Niagara</i> ...	Brown, J. F. S. ...	R. N. Turner, V. Knight, G. Webb.	"	Canadian-Australasian	" 25.7.28 to 10.12.28 ...	11.12.28
†† <i>Ningchow</i> ...	Beale, H. E. ...	H. Morley ...	No. A.	A. Holt ...	Form 911 9.1.29 to 26.1.29 ...	23.2.29
*† <i>Nirvana</i> ...	Ayres, R. M. ...	" ...	" M.	British India ...	" ...	...
†† <i>Norfolk</i> ...	Mead, G. F. ...	A. Hocken ...	M.L.	Federal ...	" 30.12.28 to 6.2.29 ...	8.2.29
*† <i>Norna</i> ...	Wright, J. W. ...	T. R. Ness ...	No. A.	Scottish Fishery Bnd	" 30.1.29 to 9.2.29 ...	5.3.29
*† <i>Norseman, C.S.</i> ...	Davis, E. R. ...	R. W. Greenfield ...	" M.	Western Tel. Co. ...	" 20.12.28 to 11.1.29 ...	9.2.29
*† <i>Northumberland</i> ...	Upton, H. L., D.S.O., R.D., Lt-Commr. R.N.R.	A. J. Robertson, W. J. Glass-borow, J. F. Clements.	M.L.	Federal ...	Met. Log. 12.5.28 to 13.10.28 ...	17.10.28
†† <i>Nova Scotia</i> ...	Furieux, S. ...	" ...	No. A.	Furness Withy ...	Form 911 31.10.28 to 6.11.28 ...	20.11.28
*† <i>Nowshera</i> ...	Rowe, S. N. ...	W. Ashcroft ...	" M.	British India ...	" 8.1.29 to 18.1.29 ...	21.1.29
*† <i>Nuddea</i> ...	Morrison, W. C. ...	A. W. Smith ...	" M.	British India ...	" 22.1.29 to 11.2.29 ...	7.3.29
...	...	...	...	...	...	...
†† <i>Oaklands Grange</i> ...	St. Clair, C., D.S.O. ...	C. F. Foxwell ...	" A.	Houlder Bros. ...	Form 911 1.1.29 to 25.1.29 ...	28.1.29
††57 <i>Olympic</i> ...	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	A. E. Harvey, A. E. Weller, J. Day, J. W. Paine.	W.T.	White Star ...	W.T. Reg. 14.2.29 to 28.2.29 ...	5.3.29
†† <i>Orama</i> ...	Matheson, C. G., D.S.O., R.D., Capt. R.N.R.	J. M. M. Swanson, C. K. Blake, J. D. Archer.	M.L.	Orient ...	Form 911 13.12.28 to 27.12.28 ...	5.1.29
†† <i>Oranian</i> ...	Bolton, W. ...	" ...	No. A.	Leyland ...	Met. Log. 11.11.28 to 12.2.29 ...	15.2.29
†† <i>Orbita</i> ...	Dominy, R. H., C.B.E., Commr. R.N.R.	J. R. Bubb ...	" M.	R.M.S.P. Co. ...	Form 911 2.9.28 to 17.9.28 ...	3.10.28
†† <i>Orcoma</i> ...	Mander, T. ...	T. J. Waylor, R. H. Sissons, J. W. Fraser, J. Allan.	M.L.	Pacific S.N. Co. ...	" 1.11.28 to 17.1.29 ...	25.1.29
†† <i>Orduna</i> ...	Daniel, T. ...	R. D. Eckford ...	No. M.	" ...	Met. Log. 31.5.28 to 14.8.28 ...	30.8.28
†† <i>Orestes</i> ...	Flynn, G. A. ...	R. Martin ...	" A.	A. Holt ...	Form 911 7.10.28 to 20.12.28 ...	28.12.28
†† <i>Orford</i> ...	Owens, A. L., Commr. R.D., R.N.R.	O. C. Davies ...	" M.	Orient ...	" 28.7.28 to 8.9.28 ...	26.11.28
†† <i>Orlita</i> ...	Barkley, E. ...	D. W. Hutchinson, G. W. Irvine, L. L. Hunter.	M.L.	Pacific S.N. Co. ...	" 26.10.28 to 4.1.29 ...	19.1.29
†† <i>Ormonde</i> ...	Rice, W. V., D.S.O., D.S.O., Commr. R.N.R.	H. P. Price ...	"	His Majesty's Ship ...	Met. Log. 18.6.28 to 27.11.28 ...	4.12.28
†† <i>Oronsay</i> ...	Shelford, W. S., Lt-Commr. R.N.R.	T. Fox Russell, R. S. Hawker, K. M. Morrison.	M.L.	Orient ...	" 9.8.28 to 2.11.28 ...	8.1.29
*† <i>Oroya</i> ...	Ridyard, A. ...	P. H. Ray ...	No. M.	Pacific S.N. Co. ...	" 28.10.28 to 29.1.29 ...	31.1.29
†† <i>Orsova</i> ...	Cameron, E. P., R.D., Commr. R.N.R.	L. J. Vesty, A. Addison, N. W. Smith. ...	M.L.	Orient ...	Form 911 21.11.28 to 29.1.29 ...	5.2.29
†† <i>Orvieto</i> ...	O'Sullivan, F. R. ...	J. G. Goldsworthy, G. L. Carter, H. A. Whittle, C. D. Lane	"	" ...	Met. Log. 19.8.28 to 21.11.28 ...	23.11.28
†† <i>Osterley</i> ...	Sarson, M. J. ...	G. B. H. Jones ...	No. M.	" ...	" 2.9.28 to 4.12.28 ...	7.12.28
*† <i>Otaki</i> ...	McNish, R. ...	G. Dibley ...	" A.	New Zealand S.S. Co.	Form 911 26.11.28 to 26.2.29 ...	5.3.29
*† <i>Otra</i> ...	Wood, C., D.S.O.	S. Winton ...	" M.	Shaw, Savill & Albion	" 3.1.29 to 1.3.29 ...	8.3.29
†† <i>Otranto</i> ...	Staunton, H. G., C.B.E., R.D., Commr. R.N.R.	O. C. Davies ...	" M.	Orient ...	" 22.3.28 to 28.4.28 ...	8.5.28
...	...	...	...	...	" 29.1.28 to 30.3.28 ...	14.4.28
†† <i>Oxfordshire</i> ...	Foster, W. L. ...	E. A. Insley ...	" A.	Bibby Bros. ...	" 24.1.29 to 21.2.29 ...	4.3.29
...	...	...	...	...	...	...
†† <i>Pacific Shipper, M.V.</i> ...	Goodwin, J. ...	" ...	" A.	Furness Withy ...	" 5.9.28 to 4.12.28 ...	28.12.28
*† <i>Pacifique</i> ...	Edwards, A. C. ...	H. C. Bull, P. V. E. Dore, L. H. Moorhouse.	M.L.	Elders & Fyffes ...	Met. Log. 19.1.29 to 1.2.29 ...	4.3.29
*† <i>Pakeha</i> ...	W. P. Clifton Mogg, Lt-Commr. R.N.R.	H. C. Smith, G. Almond, W. Canner ...	M.L.	Shaw, Savill & Albion	Met. Log. 23.6.28 to 10.11.28 ...	15.11.28
*† <i>Pancras</i> ...	Reynolds, H. B. W. ...	C. C. Beal, E. Owen, R. Parry.	M.L.	Booth ...	" 31.7.28 to 5.2.29 ...	1.3.29
†† <i>Pareora</i> ...	Evans, J. O. ...	J. Greenaway ...	No. A.	Hain S.S. Co. ...	Form 911 7.8.28 to 7.9.28 ...	19.11.28
†† <i>Paris</i> ...	Cook, C. L. ...	Mr. Biles ...	C.C.	Southern Rly.	Telegraphic Report, 31.7.27 ...	31.7.27
†† <i>Patia</i> ...	Makepeace, S. ...	J. Green ...	No. A.	Elders & Fyffes ...	Form 911 18.8.28 to 22.9.28 ...	25.9.28
†† <i>Pelsander</i> ...	Slater, H. N. ...	H. E. Readshaw ...	" A.	A. Holt ...	" 29.12.28 to 28.1.29 ...	31.1.29
†† <i>Pennland</i> ...	Making, V. ...	" ...	" A.	Red Star ...	" 16.12.28 to 3.1.29 ...	7.1.29
*† <i>Peshawar</i> ...	Wilding, H. G. ...	K. A. H. Cummins, S. H. Baldwin, A. M. Tolfree.	M.L.	P. & O. ...	Met. Log. 20.5.28 to 17.10.28 ...	2.120.28

## vii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Report Contributed. Received up to 8.3.29.	Date Received.
<i>Polycarp</i> ...	Reynolds, W. H. B. ...	... ..	No. A.	Booth ...	Form 911	8.2.29
† <i>Port Adelaide</i> ...	Swan, L. H. ...	R. B. Linklater, C. J. Gorley, F. J. Lavers.	M.L.	Commonwealth & Dominion.	Met. Log.	28.12.28
† <i>Auckland</i> ...	Durham, R. S., D.S.C.	C. F. Post, E. R. Rowlands, W. Roberts, E. W. Dingle.	"	" " "	"	21.2.29
† <i>Bowen</i> ...	Hearn, G. W. ...	S. Ray ...	No. A.	" " "	Form 911	26.10.28
† <i>Campbell</i> ...	Needham, R. ...	J. G. Thom ...	M.L.	" " "	"	14.1.29
† <i>Caroline</i> ...	Brown, A. H. ...	J. B. Bradley, L. M. Bayly, R. Forrest, J. Stannard.	"	" " "	Met. Log.	9.10.28
† <i>Darwin</i> ...	Sawbridge, I. R. ...	H. Pinkney, E. M. Fenton, S. Moate.	"	" " "	"	7.1.29
† <i>Denison</i> ...	Ferris, J. ...	E. T. N. Lawrey, L. W. Cady. A. A. Cooper, J. Rowland-Hill.	"	" " "	"	11.9.28
" <i>Dunedin</i> , M.V.	Farmer, F. ...	E. G. Jones, H. M. Post, N. M. Muzzell.	"	" " "	"	21.11.28
" <i>Fremantle</i> , M.V.	Kearney, F. J. ...	A. G. Rhind ...	No. A.	" " "	Form 911	15.6.28
" <i>Gisborne</i> , M.V.	Hayter, S. W. ...	H. Boys-Smith ...	"	" " "	"	15.11.28
† <i>Hobart</i> , M. V.	Cottell, S. C. ...	R. Carter, L. Copeland, G. G. Langford, C. L. Webb.	M.L.	" " "	Met. Log.	9.10.28
† <i>Hunter</i> ...	Robinson, C. A. ...	R. B. Stannard, A. McClounan, J. T. Weldin.	"	" " "	"	31.12.28
† <i>Huon</i> ...	Compton, J. E. ...	A. R. Martin, F. W. Elgar, W. E. Simpson.	No. A.	" " "	Form 911	11.2.29
† <i>Melbourne</i> ...	Kippins, T. ...	J. H. Sloan, T. L. Kidwell, J. A. D. Fisher.	M.L.	" " "	Met. Log.	22.10.28
† <i>Nicholson</i> ...	Jack, J. ...	W. G. Jones, J. F. Martin, A. Brown.	"	" " "	"	27.2.29
† <i>Pirie</i> ...	Hudson, J. J. ...	E. E. Roswell, F. R. Gorman, R. D. Chamberlain.	"	" " "	"	10.1.28
† <i>Sydney</i> ...	Higgs, W. G. ...	W. Pickup, C. Hodson, C. E. Midwinter.	"	" " "	"	8.2.29
† <i>Victor</i> ...	Williams, R. ...	L. J. Skails ...	No. A.	" " "	Form 911	20.2.29
" <i>Wellington</i> ...	Jones, C. N. ...	A. C. Matson ...	M.L.	South African Naval Service.	Met. Log.	12.6.28
† <i>Protea</i> , H.M.S.A.S.	Dalglish, J., Lt.-Commr., S.A.N.S.	J. Milhench, A. C. Abbott, A. E. Martin, E. A. H. Gopp.	"	A. Holt ...	"	10.12.28
† <i>Protesilaus</i> ...	Quirk, T. W. ...	R. Singleton ...	No. A.	" ...	Form 911	26.1.29
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† <i>Rajputana</i> ...	Parker, J. W., R.D., Commr. R.N.R.	R. E. Tucker ...	" M.	P. & O. ...	"	5.2.29
† <i>Ranchi</i> ...	Brooks, C., D.S.O., R.D., Commr., R.N.R.	D. Meikle ...	" M.	P. & O. ...	"	...
† <i>Ranpura</i> ...	King, A. M., D.S.C.	E. J. Spurling ...	No. M.	P. & O. ...	"	5.3.29
† <i>Rawalpindi</i> ...	Thornton, E. J. ...	A. G. Stansfield...	" M.	" ...	"	...
† <i>80 Regina</i> ...	Davies, E. ...	R. S. Walker, E. A. A. Crowley, S. A. Jones.	W.T.	White Star - Dominion.	"	7.3.29
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† <i>St. Julien</i> ...	Pitman, R. ...	C. W. Sanderson ...	"	" ...	"	7.3.29
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† <i>Talma</i> ...	Hocking, R. W., R.D., Lieut.-Commr., R.N.R.	... ..	" M.	" ...	Form 911	18.2.29
† <i>Talhybuius</i> ...	Wilson, R. J. ...	... ..	" A.	A. Holt ...	"	17.1.29
† <i>Tamaroa</i> ...	Hartman, W. H. ...	F. W. Lutyens ...	" M.	Shaw, Savill & Albion	"	19.7.28



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 8.3.29.	Date Received.
** <i>Tanda</i> ...	Pilcher, E. T., Lieut.-Commr., R.N.R.	G. C. Smith, H. Murday, H. Nuzum.	M.L.	E. & A. S.S. Co. ...	Met. Log 3.7.28 to 11.10.28 ...	7.1.29
*† <i>Taranaki, M.F.</i> ...	Wood, C. ...	A. Chrystal, G. Campbell, P. Savill.	"	Shaw, Savill & Albion	" 17.10.28 to 12.2.29 ...	27.2.29
<i>Tarantia</i> ...	Henderson, F. M. ...	N. H. King ...	No. A.	Anchor ...	Form 911 29.12.28 to 5.2.29 ...	1.3.29
<i>Telesias</i> ...	Wilkinson, W. H. ...	C. B. P. Anderson ...	" A.	A. Holt & Co. ...	" 22.9.28 to 25.10.28 ...	29.10.28
*† <i>Tekoa</i> ...	Robinson, F. W. ...	" ...	" M.	New Zealand S.S. Co.	" 19.11.28 to 4.12.28 ...	21.1.29
<i>Telamon</i> ...	Willcox, J. H. ...	F. A. Brown ...	" A.	A. Holt ...	" 15.9.28 to 8.12.28 ...	17.12.28
<i>Tetela</i> ...	Brice, E. H. ...	F. L. Brealy ...	" A.	Elders & Fyffes	" 28.12.28 to 30.1.29 ...	7.2.29
<i>Teucer</i> ...	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	W. F. Cook ...	" A.	A. Holt ...	" 5.12.28 to 11.1.29 ...	31.1.29
†† <i>Themistocles</i> ...	Young, A. D. ...	" ...	" M.	Aberdeen Common-wealth	" 12.12.28 to 20.1.29 ...	28.1.29
<i>Theseus</i> ...	Jones, E. ...	W. A. Fyffe ...	" A.	A. Holt ...	" 10.8.28 to 7.10.28 ...	18.10.28
*† <i>Tilava</i> ...	Rowe, P. W. ...	E. A. Rabey ...	" M.	British India...	" 25.12.28 to 13.1.29 ...	18.2.29
*† <i>Tinhov</i> ...	Andoe, G. ...	J. S. King...	" M.	A. Weir & Co.	" ...	"
*† <i>Titan</i> ...	Power, J. J. ...	P. Cross, R. A. Shennan, C. F. Bailey.	M.L.	A. Holt ...	Met. Log. 19.8.28 to 3.1.29 ...	14.1.29
*† <i>Tongariro</i> ...	Burton Davies, J. ...	E. A. Burton, A. E. Williams, H. Wilkinson, D. Baldwin.	"	New Zealand S.S. Co.	Met. Log. 12.8.28 to 7.1.29 ...	18.1.29
<i>Transylvania</i> ...	Erskine, R. ...	P. Middleton ...	No. A.	Anchor ...	Form 911 23.9.28 to 10.11.28 ...	20.11.28
<i>Trefusis</i> ...	Hunt, D. ...	R. H. Silley ...	" A.	Hain S.S. Co. ...	" 29.12.28 to 17.1.29 ...	14.2.29
*† <i>Trematon</i> ...	Evans, B. ...	J. Jenkyn, C. M. Quick, R. Stitson.	M.L.	Hain S.S. Co. ...	Met. Log. 18.5.28 to 24.12.28 ...	7.1.29
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*† <i>Tyndareus</i> ...	Christie, W. ...	A. F. Barclay, T. R. Phillips, F. V. Smith, D. S. Bruce.	M.L.	A. Holt ...	Form 911 24.11.28 to 17.12.28 ...	20.12.28
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** <i>Valacia</i> ...	Inch, F. ...	" ...	" M.	Cunard ...	" ...	"
<i>Vardulia</i> ...	Fear, E. T. C. ...	W. H. Barker ...	" A.	" ...	Form 911 26.3.28 to 13.5.28 ...	17.5.28
†† <i>Viceroy of India</i> ...	Ohlson, B. J., D.S.O., R.D., Commr. R.N.R.	A. G. Stansfield...	" M.	P. & O. ...	" 1.12.28 to 11.1.29 ...	15.1.29
<i>Vigilant</i> ...	Simpson, E. S. S. ...	J. H. Hennessey ...	" A.	Scottish Fishery Board.	" ...	"
** <i>Waioapu</i> ...	Todd, D. ...	F. H. G. Clark ...	" M.	Canadian - Australasian.	Form 911 1.2.29 to 28.2.29... ...	5.3.29
** <i>Wairuna</i> ...	Ryan J. ...	J. E. Broughton, H. W. Jones, J. Ritchie.	M.L.	Union S.S. Co. of N.Z.	" 3.11.28 to 26.11.28 ...	28.12.28
<i>Walmer Castle</i> ...	Morton Betts, W. ...	G. H. Pickering...	No. A.	Union Castle ...	Met. Log. 12.6.28 to 15.9.28 ...	23.11.28
*† <i>Wangaratta</i> ...	Scutt, W. ...	T. W. Wordingham, S. R. Millard, A. G. Brooks, M. Harvey.	M.L.	British India...	Form 911 15.12.28 to 3.2.29 ...	5.2.29
<i>Warfield</i> ...	Steel, R. ...	" ...	No. A.	" ...	Met. Log. 22.4.28 to 1.10.28 ...	6.10.28
*† <i>War Nizam</i> ...	Moncrieff, T. ...	F. J. Marshall ...	" M.	British Tankers ...	Form 911 4.11.28 to 17.11.28 ...	26.11.28
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†† <i>William Scoresby, R.S.S.</i> ...	Shannon, R. L. V., Lieut.-Commr. R.N.	" ...	"	Falkland Islands Government.	Met. Log. 3.8.28 to 22.11.28 ...	29.11.28
†† <i>Windsor Castle</i> ...	Chave, Sir B., K.B.E.	A. J. Tweddell, C. Gorringer, R. Tyser.	"	Union Castle ...	" ...	"
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<i>Desado</i> ...	Hannan, F. S. ...	J. G. Scott ...	" ...	" ...	18.10.28
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May, M.O., 1929.

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