

VOL. V. No. 53.

THE MARINE OBSERVER.

MAY, 1928.

TABLE OF PRINCIPAL CONTENTS.

	PAGE	
Old Time Marine Observer's Log, Note on	81	Lithographic Illustrations after page 104:—
The Wind Systems of the Oceans	82	South Pacific, Winds on the Tracks from Panama to Australian and New Zealand Ports (Middle Portion), June.
The Marine Observer's Log (with illustrations)	84	South Pacific, Currents on the Tracks from Panama to Australian and New Zealand Ports (Middle Portion), May, June, July.
Old Time Marine Observer's Log (with illustrations)	90	Indian Ocean, Mean Sea Surface Temperatures, May.
The Trade Winds.—II. Atlantic, Pacific and Indian Oceans (with illustrations)	93	
Weather Signals:—Azores, Portugal, Spain, Malta, Italy, Algeria and Egypt	100	

OLD TIME MARINE OBSERVER'S LOG.

MARINE SUPERINTENDENT'S NOTE.

THIS morning, January 21st, 1928, when looking through old Logs we came across some entries and sketches of extraordinary interest, many of them have never been published, they had certainly not been seen by Marine Observers of the present day and quite a few have not been sighted in the Meteorological Office for a very long time. Unless one happens to come across them by chance, search is necessary, for it was as late as 1920 when we commenced indexing special phenomena, interesting remarks, sketches and items of special importance.

There is so much of interest in these old logs, so much that the work of our predecessors has done for us and can still teach us—they did not have THE MARINE OBSERVER, it has come out of their work—that in fairness to them and in the interest of present and future Marine Observers and Marine Weather works it is only right that we should devote a space in this Journal to bringing these to the light of day, from their dusty old covers in the Log Store.

And so it is proposed in future, from time to time, to reproduce a selection in THE MARINE OBSERVER, under the heading "Old Time Marine Observer's Log".

In this section a selection of remarks, sketches and extracts of interest from the old Abstract Logs, Weather Books, Meteorological

Registers and Meteorological Logs, as they have been variously called, of more than 50 years ago will be published.

One of these old Meteorological Registers is now before me that of the Ship *Gloriana*, Captain HENRY TOYNBEE, in 1857. Besides the pages of routine observations, remarks, his diagrams and his wife's beautiful microscope drawings and paintings of Crustacean and land marks, there are pages of the results of Lunars with the errors and rates of his chronometers ascertained at sea. He remarks:—

"It will be noticed that very few Star and Moon Lunars have been taken this voyage sometimes only two the same night for a series, still they prove themselves a useful check on the chronometers. It will also be noticed that the difference between the lunars and chronometer (1759) (which went well) was nearly the same for several weeks and that on the ship's arrival in Madras the lunar error made this best chronometer 30 seconds or $7\frac{1}{2}'$ nearer the truth than the maker's error and it made the worst chronometer (1690) 16 minutes or 240 miles nearer the truth than the maker's error. Having been fully occupied this voyage I have only taken as many lunars as I thought actually requisite for navigating the ship.

"June 4th. Made the Start and found that 1759 chronometer is correct".

Then follow remarks giving recommendations to the Meteorological Department of the Board of Trade of which Admiral FITZROY was in charge and of which TOYNBEE later became Marine Superintendent. With regard to the barometer, wind stars, the observation of magnetic variation, clouds and the weather-book, in the latter he asked for additional blank pages such as are now given in the Meteorological Log for additional remarks.

With regard to Wind Stars the method by which FITZROY gave graphic representation of grouped observations of wind with current, sea surface temperature, dip and variation, see page 90, Volume II, No. 18, MARINE OBSERVER,

TOYNBEE wrote in his log:—

"Wind Stars."

"I like the plan of the Wind Stars, but as I have before said think that they would be more useful for squares of 5° at least, and in the neighbourhood of the Horse Latitudes and of the Equatorial Calms for squares of 1° or at most 2°. It would be a still further improvement if the radius of the circle inscribed in one of the

squares were a fixed extreme quantity; all the lines would then be proportionate to each other and this extreme quantity might be given in a scale in the margin divided into 10° and by this means the proportion of head-winds and slants of wind might be obtained by the aid of a pair of compasses".

It is quite evident that TOYNBEE wanted more detailed information especially in the region of calms and variables and that he was looking for a clearer method of showing the variations of the wind, later he was himself to bring about the use of the wind rose, but it was left to his successor BAILLIE to perfect the rose which has been used to such good effect and which we now think the best arrangement for charting averages of wind.

As the old logs show there were many highly skilled Marine Observers one to two generations ago, TOYNBEE was one of the foremost if not the foremost navigator in the Merchant Navy of his day, he was also an oceanographer of exceptional merit and he had few equals in his knowledge of Marine Meteorology.

It is well to compare our work with that of these old timers, they had not the aids which modern inventions give us, they had more time, and the necessity for skill in making the best use of the wind under sail spurred them on to gather knowledge of Marine Meteorology.

THE WIND SYSTEMS OF THE OCEANS.

THOSE who have experience of the circum-navigation of the globe remember from personal observation the general wind systems of the Oceans and probably if asked, 99 master mariners out of a 100 who have used the wind to sail ships round the World would give a description of the general wind systems from memory and without reference, somewhat as follows:—

Near the Equator, but north of it according to the sun's declination, there is a belt of calms and light and variables with much cloud and rain known as the Doldrums which may sometimes be as much as 400 miles in width. To the northward and southward of the Doldrums extending beyond both tropics again according to the sun are the North-East and South-East Trades, fine weather regions, which, with the exception of those of the South Atlantic, are occasionally disturbed by Hurricanes or Cyclones in the summer. In the Indian Ocean the N.E. trade known there as the N.E. Monsoon is replaced by the S.W. Monsoon in the summer. Northward of the N.E. trade there often exists another well known calm belt, the limits of which it would be difficult to state from memory, known as the Horse Latitudes. Similar calms may be experienced beyond the S.E. trade.

To the southward in the region of Latitude 40° and southward are the Roaring Forties. Westerly gales commencing somewhere about N.W. and veering to S.W.—or, as they now say in accordance with modern usage, backing—frequently occurred. We used to speak of the changes of the direction of the wind as veering in the sense of the natural changes which we got on the side of the depression nearest the Equator and backing when these changes of direction were reversed. To the northward of the Horse Latitudes is the region of the Brave West Winds though these are probably less regular than the gales of the Roaring Forties.

Though the personal knowledge and experience, of the winds of the Oceans, of many seamen is considerable yet none of us know them completely, much less do we know the frequency of their variations and their seasonal average limits.

Hence the series of articles which is now appearing in THE MARINE OBSERVER upon the Trade Winds which we hope will be followed by articles dealing with the remaining systems, all part of the great air circulation of the Earth.

To fully describe the winds all over the Oceans in words would be to make an account so long as to be impracticable and in any case the information is not yet sufficiently collated.

Before knowledge is complete, even of the surface winds of the Oceans, they must be adequately charted. Hence charts are required, both for ready reference and for compiling information in narrative form, and it is hoped that these articles, giving as they do a good description of Trade Winds so far as they are

known, will not only stimulate interest in observation, but that they will help to show how much efficient charts of all the Oceans are needed.

In 1892, Navigating-Lieutenant C. W. BAILLIE, R.N., then Marine Superintendent of the Meteorological Office, who had been Captain TOYNBEE's assistant and so had seen all the early methods of Charting winds used by TOYNBEE in laying the sure foundation upon which British Marine Meteorology is built, introduced what is known as the BAILLIE wind rose.

Ever since 1892 the BAILLIE wind rose has been used in the Marine Division for charting the winds of the Oceans and before the Great War, charts were made of the Red Sea, the Southern Ocean from the Cape to New Zealand, the Indian Ocean, the South Atlantic Ocean and Baffins Bay and Davis Straits, the data being extracted from the logs for each as they were compiled. The North Atlantic and North and South Pacific remain to be so charted.

Since the Great War data has been extracted from the logs and punched on cards as received from all Oceans so that the compilations may be made by machine with accuracy and speed far surpassing that of the old method when sufficient observations are prepared.

Many years' observations must be used to give a correct representation of wind and other meteorological elements.

In my note in the January Number reference to the wind charts of a part of the South Pacific for four selected months which we are publishing in THE MARINE OBSERVER, along with the Quarterly Charts of currents this year, was made, and in my note in the March Number, it was shown that these charts are based upon insufficient data, but they give us a very good idea and they serve to stimulate interest and encourage us to do more. The method used is such that the roses can be revised when sufficient observations are prepared. These charts are constructed on a scale of two inches to 10° of Longitude and the arrows of the roses are so made that 10 per cent. frequency in direction and force is equivalent to the length of a degree on the longitude scale of the chart. We find that after years of investigation and trial, this scale and these roses will give the best arrangement for constructing charts for all Oceans upon a uniform plan which will render more than one explanation of the scales and roses unnecessary in atlases.

As an example, taking the two roses below for 5° squares in the South Indian Ocean:—

The first in the South-East trade region shows us that S.E. winds prevail, there being less than 1 per cent. observation of wind from S.S.W. to N.N.E. by way of west; that the wind was S.E. on 38 out of 100 occasions and when from that direction it was light on 4

in every 100 observations, moderate on no less than 31 occasions in every 100, and the trade wind was gale force on the remaining 3 out of 100 occasions when the wind was S.E. or between S.E. by S. and S.E. by E.

The next greatest frequency is from the direction E.S.E. and there are less than 1 per cent. of calms and so on, the arrows in the rose speak for themselves.

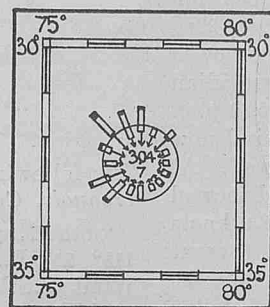
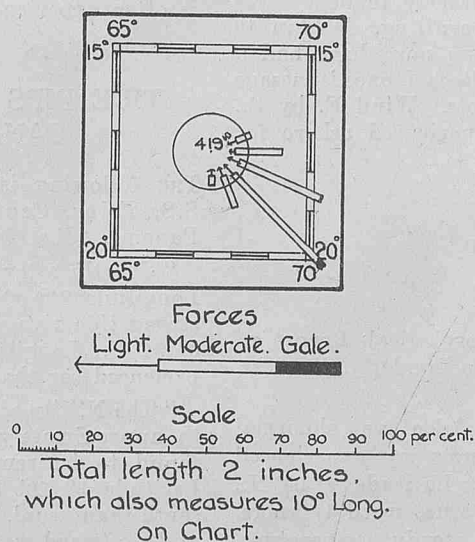
The second rose in the region beyond the S.E. trades where there are considerable variations, shows these clearly and very completely. The lower figure represents the percentage of calms. The number

of observations being given by the upper figures in the roses, the reliance which may be placed upon them may be judged remembering that the observations were made every four hours.

With a chart covered with BAILLIE wind roses the eye soon becomes able at a glance to compare the winds and their variations in force and direction, so that the seaman may know conveniently, exactly what winds occur in whatever part of the Oceans he may be navigating.

These charts are also invaluable for compiling information in narrative form and without the averages from which they are con-

Baillie Wind Rose giving frequency
of force as well as direction.
observations years 1854 to 1903
MAY



The arrows fly with the wind; length shows frequency. Thickness of arrow represents Beaufort forces 1 to 3 light winds, 4 to 7 moderate winds, and 8 to 12 gales.

The circle supplies a gauge for estimating by eye the frequency of winds from any direction; from the head of the arrow to the circle measures 5 per cent., the semi-diameter of the circle being one-fifth inch or equivalent to 10 per cent. on the scale.

The directions of the observed winds are given to the nearest second point of the True Compass.

The upper figures in the roses indicate the total number of observations upon which they are based.

These roses are constructed from observations made at the end of each four-hour watch throughout the day and night.

The lower figure in the rose represents the percentage of observations of calms.

structed it is not possible to give full and reliable information of the winds of the Oceans. Better information of the winds of the Oceans is necessary. The difference of the sun's heat received in the Tropics and in the polar regions is the prime cause of the wind systems of the Earth.

These differences of the sun's radiation in different parts of the Oceans cause differences in temperature and density of the sea which affect the pressure gradient in the waters, this generates current which the wind materially effects by surface friction and the rotation of the earth deflects both the wind and current in their courses. Wind is in direct proportion to the pressure gradient in

the atmosphere which we measure with the barometer and is directly related to all Meteorological elements. Hence the need to press on with this, the oldest branch of the work, so that the charting of the Oceans may be completed as soon as possible while vigorously maintaining all the activities which Wireless Telegraphy and modern conditions at sea have made essential.

In "Work of the Year" we shall continue to show the state of the extraction of data from Meteorological logs and the volume of observations available for compiling averages in all parts of the Oceans.

MARINE SUPERINTENDENT.

THE MARINE OBSERVER'S LOG.

It is hoped that these pages will be filled each month with a selection of the contributions of Mariners in manuscript, or remarks from the Logs and Reports of regular Marine Observers.
Responsibility for statements rests with the Contributor.

CURRENT.

Caribbean Sea.

THE following is an extract from the Meteorological Report of S.S. *Cavina*, Captain A. H. RISELEY, Avonmouth to Gulf of Mexico. Observer, Mr. W. J. DODD:—

"22nd May, 1927. From 25 to 30 miles N.E. by N. of the 'Boca Monos,' Trinidad Island, a very distinct northerly tendency was given to the set (N66°W.) which had been prevailing. Within 10 miles of the 'Boca Monos' the outgoing stream must have had a speed of at least 3½ knots, whilst actually in 'Boca Monos' passage itself the estimated outflow was at least 5 knots. Wind E. by S., light to moderate. Heavy rains had been experienced ashore for some days previous."

ABNORMAL CURRENT.

Gulf of Aden.

THE following is an extract from the Meteorological Report of S.S. *Ranpura*, Captain A. M. KING, Bombay to London. Observer, Mr. G. RANDALL, 4th Officer:—

"May 24th, 1927, approaching Gulf of Aden an abnormal current setting N. 79° E. at the rate of 2.9 knots was experienced from Latitude 14° 50' N., Longitude 54° 52' E., to Latitude 14° 05' N., Longitude 51° 38' E. Ship steering S. 77° W. true, speed 17 knots, wind W.S.W., force 3, barometer at 8 a.m. 29.83, steady, temperature, air 83°, sea 84°. Slight W.S.W. sea and swell. At 5.28 a.m. position by stellar observations showed that current from 6.48 p.m. on 23rd was S. 77° E. 11'. At 8.49 a.m. longitude by chronometer showed ship 9' to eastward of morning star position, and the meridian altitude at noon 5' N. Observation of sun for longitude at 3.32 p.m. placed ship 36' to eastward of morning star position, the wind now having backed to S.S.W. force 4, moderate S'ly. sea and swell. At 6.40 p.m. position was again fixed by stellar observations and showed that the set and drift from 5.28 a.m. was N. 79° E. 39' or 2.9 knots for 13.7 hours (clock retarded 30 mins. in forenoon). The current from 6.40 p.m. on 24th to 5.20 a.m. on 25th was N. 13° E. 11' so the strong E'ly. current must have ceased to run about the time of stellar observations on the evening of 24th (at 2 a.m. on 24th we passed the S.S. *Hatkhol* eastward bound having experienced a similar current)."

The following report has been received from S.S. *Hatkhol*, Captain A. A. PARKER, Aden to Bombay:—

May, 1927.	Time.	Courses.	Dis- tance.	Latitude North.		Longitude East.		Set.	Drift.	Time and Remarks.
				D.R.	Ob- served.	D.R.	Ob- served.			
21st	13.20				12° 42½'		45° 03'			13.20. Ras Mar- shag Lt.-House, 0000 distance 2 miles. In 22 hrs. 20 mins.
22nd	12.00	Various	219	13° 20½'	13° 20'	48° 44½'	48° 35½'	267°	8	In 6 hrs. 32 mins.
	18.32	077°	64	13° 34½'	13° 32½'	49° 39½'	49° 38½'	206°	2	
23rd	4.55	077°	103	13° 55½'	14° 04'	51° 22'	51° 21'	354°	9½	In 10 hrs. 23 mins.
	9.12	077°	43	14° 13½'	14° 16'	52° 04'	52° 14'	076°	10	In 4 hrs. 17 mins.
	Noon	077°	25	14° 21½'	14° 24'	52° 39'	52° 48½'	076°	10	In 2 hrs. 33 mins.
	14.58	077°	29	14° 30½'	14° 33½'	53° 13'	53° 31'	080°	18	In 2 hrs. 58 mins.
	18.30	077°	34	14° 41'	14° 44'	54° 05'	54° 20'	078°	15	In 3 hrs. 32 mins.
24th	5.00	077°	105	15° 8½'	15° 09'	56° 06'	56° 15'	087°	8½	In 10 hrs. 30 mins.
	12.00	077°	69	15° 24½'	15° 23½'	57° 24½'	57° 23'	235°	2	In 6 hrs. 42 mins.

NOTE.—The Meteorological Charts of the Red Sea compiled under the supervision of Lieutenant BAILLIE, R.N., in 1895, indicate that the strongest current observed in the month of May was at the rate of 25 miles a day to the W.N.W. between the Longitude of 50° E. and Perim and that in June a set and drift of E.N.E., 62 miles per day in the western portion of the Gulf of Aden had been recorded.

A note appears on the Current Chart for May, "In the Gulf of Aden the prevailing current is to the westward, but an Easterly set is often experienced."

TIDE RIPS AND CURRENT BETWEEN PANAMA
CANAL AND GALAPAGOS ISLAND.

THE following is an extract from the Meteorological Report of S.S. *Tekoa*, Captain H. BARNETT, Liverpool to New Zealand, via Panama. Observer Mr. D. J. MURRAY, 3rd Officer:—

"Shortly after 4 p.m. on the 24th May, 1927, Latitude 2° 22' N., Longitude 84° 40' W., vessel passed through what appeared to be strong tide rips which continued until the following noon Latitude 0° 34' S., Longitude 87° 48' W. A N.E'ly set of 20 miles was experienced for that day.

"The N.E'ly set usually experienced after passing Cape Mala and to approximately Latitude 3° 00' N., Longitude 85° 00' W., was found to be remarkably strong and was encountered as far as Latitude 3° 29' S., Longitude 92° 08' W. This is much further south than usual. From here on, the customary set to the southward and westward was experienced."

TIDE RIP.

China Sea.

THE following is an extract from the Meteorological Log of H.M.S. *Iroquois*, Commander A. L. JACKSON, R.N.:—

"6th May, 1927, at 1800 in Latitude 19° 31' N., Longitude 113° 25' E., course 215°, 8½ knots. Sea S.S.W., disturbance 1. Wind S.S.W., force 2. Slightly confused swell. Weather b.c., visibility 8.

"Sighted a long line of breaking sea about 2 miles on port beam, direction approximately parallel to ship's course with calm water behind. Course was altered to 130° in order to pass through this area. (See photograph A.)

"At the western edge of the area the sea was S.S.E., disturbance 3-4, no swell. On passing through this, the ship came suddenly into calm water (sea calm, swell confused, very slight) the calm area was about a mile and a-half broad, stretching as far as could be seen, 040°-220°. Sounding (KELVIN tube) $\frac{7}{10}$. On the far (S.E.) side of the calm area another disturbed area was met; sea S.S.E. disturbance 1 with slight S.S.W. swell, and to S.E. of this again another disturbed area was seen, though not so marked as the ones the ship had passed.

"Course was then altered to 215°.

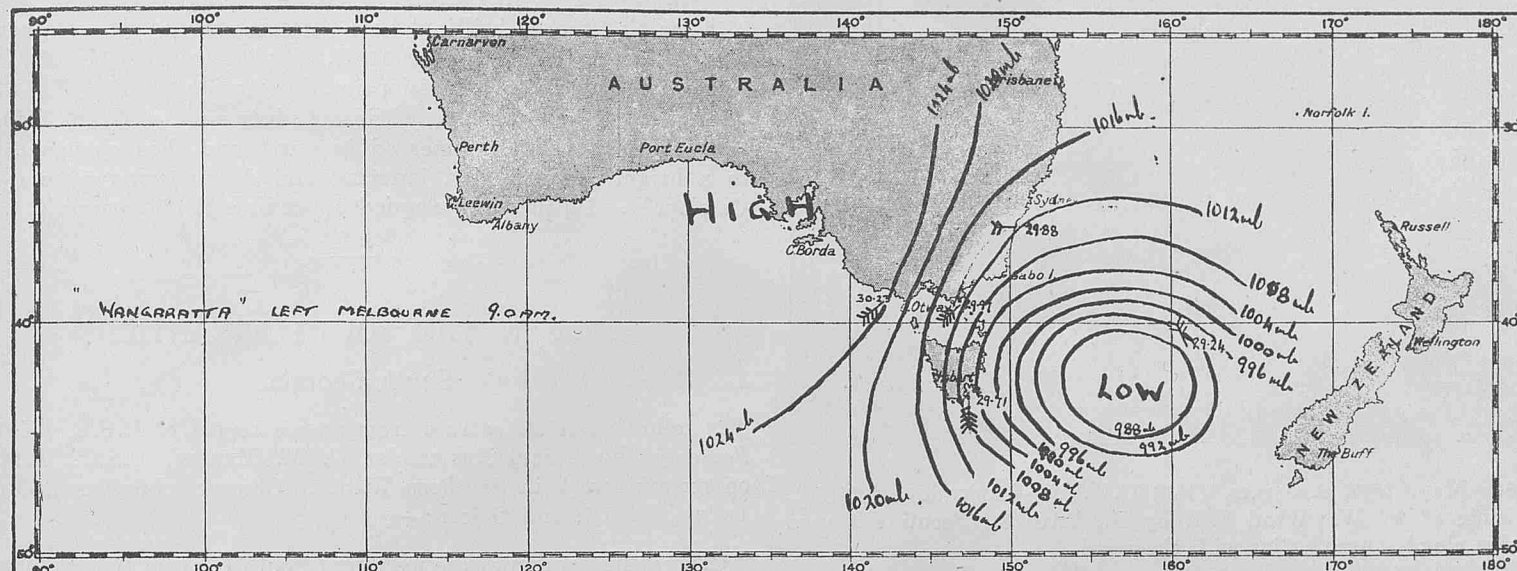
"A diagram is attached, showing ship's course and the three disturbed areas.

"When first sighted, this tide rip looked very like a shallow submerged reef, the only difference being that the calm water had not the pale green colour usually associated with coral reefs.

"It is considered that tide rips of this nature give rise to many reports of uncharted reefs which, upon investigation, are found to be non-existent."

In Australian Waters.

Weather Chart (one of a series) made on board S.S. *Wangaratta*, Captain W. SCUTT, Melbourne to Sydney, by Mr. S. R. MILLARD, 2nd Officer, on Saturday, May 28th, 1927, at 9.0 a.m., Victorian Standard Time.



FORECAST :-

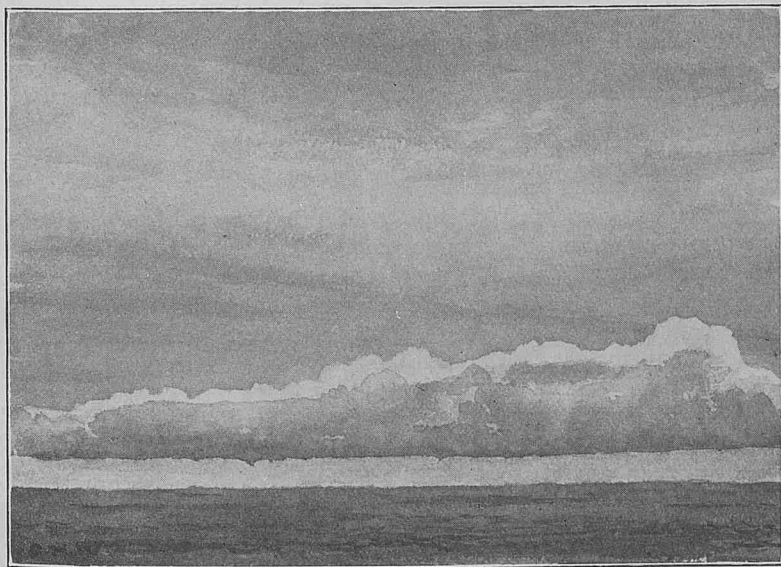
STRONG SOUTHERLY TO S.W. WIND, MODERATING SLOWLY, CLOUDY, WITH POSSIBLE RAIN SQUALLS.
 BAROMETER STEADY OR RISING SLOWLY.
 GENERALLY FINE PASSAGE, ROUGH AT FIRST BUT MODERATING LATER

According to *Wangaratta's* Meteorological Log, wind remained from S.W. fresh to strong breeze until 10 p.m., when it backed to S.S.E., force 4 to 5. Barometer remained steady throughout day. Rain squalls of short duration during the afternoon.

CUMULUS CLOUDS IN THE DOLDRUMS AND S.E. TRADE WINDS.

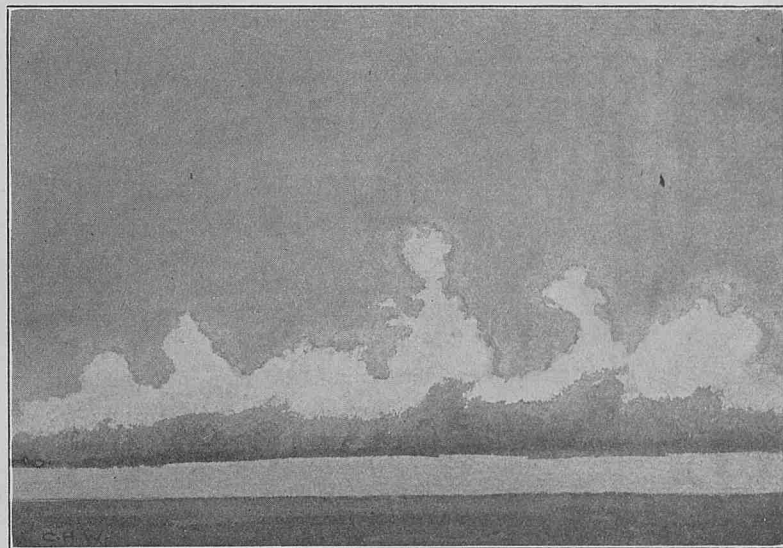
Atlantic Ocean.

THE cloud sketches and accompanying descriptions given below are from the Meteorological Log of S.S. *Llandoverly Castle* Captain G. OWENS, London to Cape Town. Observer, Lieutenant C. H. WILLIAMS, R.N.R. :-



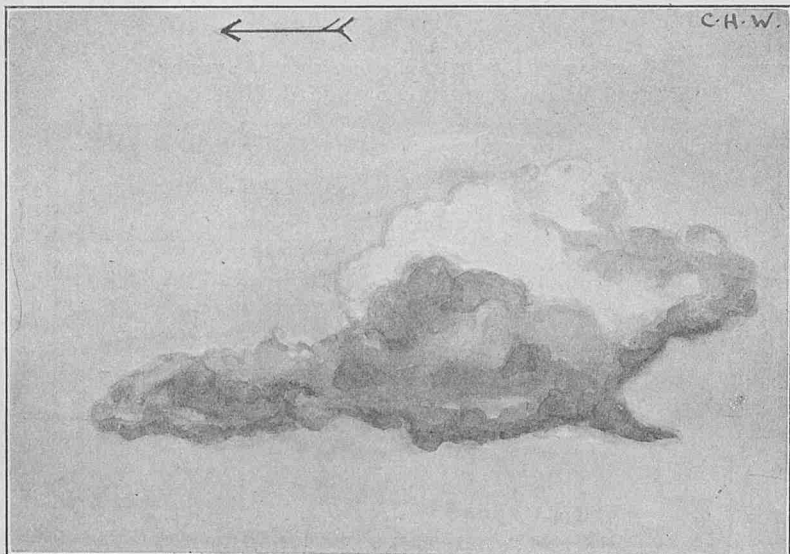
"13th May, 1927, Latitude 10° 15' N., Longitude 17° 23' W., 1310 G.M.T.

"Cumulus line round southern horizon from S.S.E. to N.W., sky overcast with mixed and high cloud.

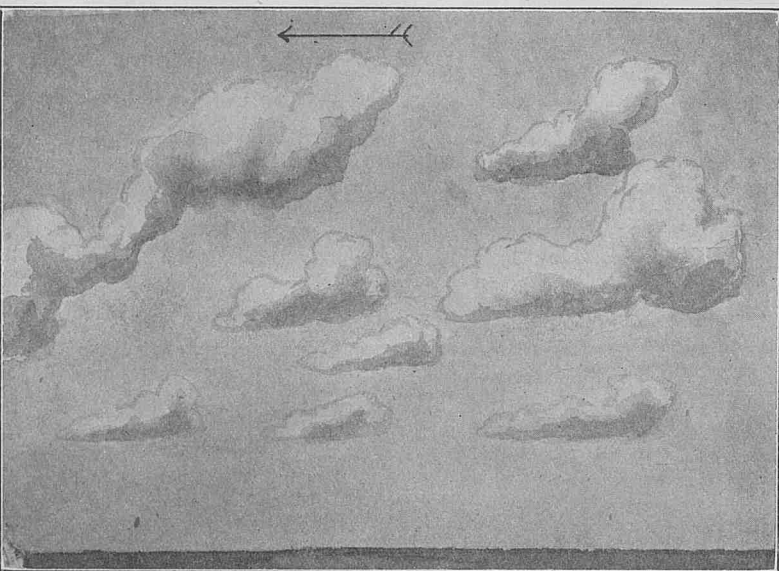


"14th May, 1927, at 0221 G.M.T., Latitude 7° 40' N., Longitude 16° 59' W. Bright moonlight. Long line of Cumulus, E.S.E. to W.N.W., moving from S.W. slowly.

"On 14th May, 1927, at 7.46 a.m. (0848 G.M.T.), in Latitude 6° 04' N., Longitude 16° 38' W. Calm. Heavy rain squall from southward. Wind shifted to S.S.E. and increased to force 6-7. Barometer 1014mb. Temperature, dry 81° F., wet 76° F. At 7.50 a.m., very heavy rain commenced. 7.56 a.m., wind veered to S.W., decreasing, rain abating. 8.0 a.m., calm, moderate rain, 8.09 a.m., rain ceased, wind west, force 4. Lightning and thunder to eastward. Barometer 1014.9 mb. Temperature, dry 76.5° F., wet 75.5° F.



"18th May, 1927, 2.40 p.m. (1512 G.M.T.).—Latitude 13° 31' S., Longitude 8° 26' W. Wind S.E. by E., force 3. Peculiar shaped Cumulus cloud. Arrow flies with the wind.



"20th May, 1927, at 1330 G.M.T.—Latitude 19° 25' S., Longitude 1° 10' W. Small Cumulus clouds, with tops 'staggered' back as shown. Arrow flies with the wind."

NOTE.—The sketches of May 18th and 20th show the inclination of the upper part of the Trade Cumulus to the base, referred to in the first of the series of articles on the Trade Winds, MARINE OBSERVER, Volume V, No. 50. It will be noticed that the inclination of the cloud is against the direction of the wind, probably indicating that the wind has greater velocity at the base of the cloud than at the top.

AURORA BOREALIS AND METEOR.

THE following is an extract from the Meteorological Report of S.S. *Scholar*, Captain J. J. EGERTON, New Orleans to Liverpool. Observer, Mr. J. McLELLAN, 3rd Officer:—

"May 3rd, 1927, in Latitude 49° 36' N., Longitude 13° 49' W., course 064°, speed 10.6 knots at 2300 (ship's time), observed the northern sky to be illuminated with a flickering greenish yellow glare, striated and variable, in a semicircle extending to an altitude of 40°. Near the horizon the colouring and flickering was

most pronounced both gradually diminishing as the altitude increased.

"This phenomenon lasted till daybreak on May 4th.

"May 3rd, 1927, in Latitude 49° 38' N., Longitude 13° 45' W., at 2350 (ship's time), a brilliant pale blue meteor was observed near α Ursæ Minoris, Declination 88° 54' N. Right Ascension 1H. 35m. 16s. disappearing close to γ Cassiopeiae, Declination 60° 19.3 N. Right Ascension 0H. 52m. 17s. Midway between α Ursæ Minoris and γ Cassiopeiae it appeared to burst and then change colour to a bright green finally, bursting and disappearing close to γ Cassiopeiae. Its passage occupied approximately 7 seconds."

ICE IN THE SOUTH ATLANTIC.

South Georgia.

THE following is an extract from an ice report of R.S.S. *William Scoresby*, Lieutenant-Commander G. M. MERCER, D.S.C., R.N.R., on research work in Southern Waters. Observer, Lieutenant M. C. LESTER, R.N.R. 2nd Officer:—

"General impression of the ice round South Georgia (Chart 3579) "

"We spent two periods at South Georgia—the first time from the 8th November, 1926, to the 16th February, 1927, and the second time from the 15th May to the 30th May, 1927. Although the latter stay was comparatively brief, yet we saw sufficient of the ice to the north and northwest of the Island to receive the impression that the ice conditions had not materially altered since last February.

"Taking into consideration the comparatively short time we spent on the south side of the Island and the large number of bergs we saw there during that time leaves little doubt that the preponderance of icebergs is to be found off the south coast. Perhaps mostly in the region from southwest of the Annenkov Islands to the southeast of the Filchner Rocks. Certainly the largest bergs were seen to the southeast from a position in the vicinity of Drygalski Fjord. One or two very small bergs or ice of some description was very frequently found within the various harbours that we visited in the Island. The Norwegians think that Grytviken is the harbour which is the least troubled with ice and from our experience this appears to be the case.

"The majority of bergs met with round the Island appeared to be originally of tabular formation, but most of them were weathered and much listed. As regards the general size of these bergs they ranged from about 200 feet to about 5,000 feet in length and from about 50 feet to about 500 feet in height—which estimate is very approximate. Bergs which could be termed 'very large' were seldom seen and then mostly on the south side of the Island.

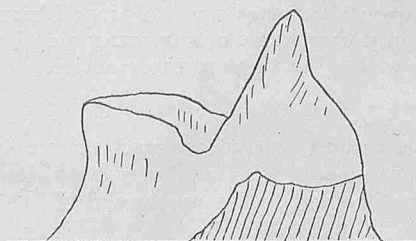
"The unweathered tabular bergs were invariably white and only the smaller bergs of irregular shape and of a very worn appearance were frequently blue or green in colour. On the other hand very small bergs (berg bits) and growlers were seldom white and nearly always of a deep blue or green colour. Occasionally black growlers were encountered (watery grey colour) and these were regarded as the most dangerous as it was impossible to see them during the dark hours.

"A few bergs usually of pyramidal shape were seen and so earth-marked were these bergs that even with powerful glasses it was difficult to convince one that it was not land.

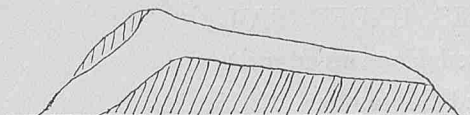
"Very few bergs showed any trace of discolouration or of earth marks.

"The waters around South Georgia could never at any time be said to be ice free during our stay there.

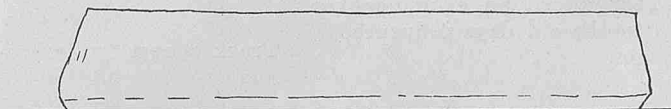
"A few accompanying sketches will give a rough idea of the general appearance of the ice which we encountered."

Few common types of bergs

Peaked berg

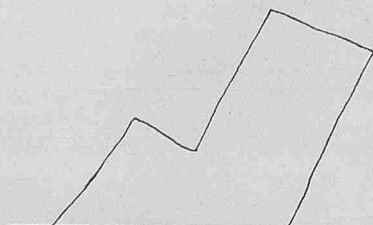


Berg or growler

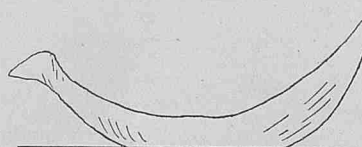


Tabular Berg.

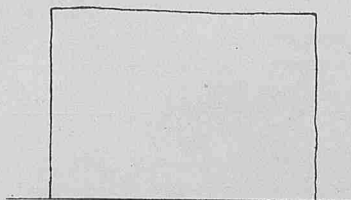
From about 500 feet in length to 5 and 7 miles - and from about 200 to 500 feet in height.



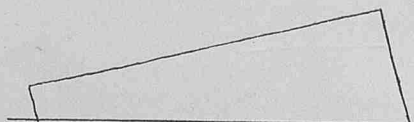
Listed Berg.



Growler



Square tabular Berg.



Sloping top berg



Berg-connected under water.



Weathered Berg



Spherical growler.

R.S.S. William Scoresby:

McLester.
2nd officer

WATERSPOUT.**Off South-East African Coast.**

The following is an extract from the Meteorological Log of S.S. *Newby Hall*, Captain J. K. STOREY, London to Durban:—

"16th May, 1927, Latitude $31^{\circ} 04' S.$, Longitude $30^{\circ} 16' E.$ At 0955 G.M.T. observed a waterspout. Bearing S. $15^{\circ} E.$, true. Distance about 5 miles. Shaped about a third of the circumference of a

circle, bent towards the east. The base almost reached to the water, it being suspended for about five minutes, then burst throwing up water from its base in the appearance of a smoke cloud, three minutes later it had dispersed.

"The spout came from the base of a heavy Nimbus cloud lying low over the horizon.

"Sextant angle of the spout measured $1^{\circ} 26'$ from the base. Barometer 1018.7. Air 71° . Sea 73° ."

" May 17th, 1856, Mid Part.—Clear, bright weather, wind from N.W. until 3. At that time black clouds rising from S.W'ward. At 3.30 a whole gale came suddenly from that quarter, with rain and dark gloomy weather.

Latter Part.—Blowing hard with furious squalls. High sea running.

At noon south rock of Diego Ramirez Islets bore west, seven miles distant.

First Part.—Moderating sky, looking better. The barometer gave ample warning of this gale.

" May 18th, Mid Part.—Strong wind veering northward, overcast sky, high sea.

Latter Part.—Increasing wind, gloomy, murky sky, very high sea from W.N.W.

At 8, passed a large Ice Berg. It was low, of a smooth outline, but of great extent.

First Part.—Increasing gale from 6, blowing very heavily and in hard, furious gusts. A tremendous sea going. Barometer lowering very fast.

" May 19th, Mid Part.—Blowing very hard, clouds loose and jagged flying over the moon at a furious rate, a red glare in the sky, a very bad sea running.

Latter part.—Moderating, the wind variable, frequent showers of hail and snow, a very heavy swell from W.S.W.

First Part.—Moderate until 6, from that time blowing in hard squalls.

" May 20th, Mid Part.—Very squally with showers of hail and snow, moderate between the squalls.

Latter Part.—At 6 the wind shifted to S.W'ward, sky in parts clear, clouds large and very dense, a very high and confused sea.

First Part.—Blowing hard squalls very severe, sea high, ship under water, bitter, bitter weather for all on board.

" May 21st, Mid Part.—Blowing strong squalls of hail and snow, very high sea; obliged to keep off N.W

Latter Part.—Less wind, but very unsettled, squalls very severe.

First Part.—The wind backing to the westward, very unsettled squally weather.

Bad weather appears to have set in and I have got too close to the Fuegian shore.

" May 22nd, Mid Part.—Increasing wind at midnight, blowing very hard; severe squalls of hail.

Latter Part.—Squalls harder than ever with large fierce hail and thick with snow; high sea getting up; the ship under water; very severe weather.

First Part.—Heavy gale with tremendous squalls; ship trembling like a leaf under them. I am keeping her reaching under the close reefs.

" May 23rd, Mid Part.—The squalls as hard as ever but less wind between, from midnight. Less wind at 3, I bore up and tried to run, but we shipped such heavy seas I was obliged to bring her to again.

Latter Part.—Moderating. 6, bore up and made sail.

First Part.—Moderate, the wind unsteady; ship under full sail; sky overcast; heavy swell.

This last has been a very bitter gale of wind. The barometer fluctuated a great deal at its commencement."

THE BIRTH OF A WEST INDIAN HURRICANE.

September 11th, 1856.

THE following is an extract from the Weather Book of the Wooden Ship *Gloriana*, 1,057 tons, Captain HENRY TOYNBEE, from London to Madras, under date 11th September, 1856:—

" September 11th, 1 a.m.—Torrents of rain with a treble reefed topsail breeze (at times) from the southward; lowered the topsails and took all smaller sails in. Ship labouring heavily to a very confused sea. During the rain, fancy I saw bright sparks in the

cloudy sky nearly overhead; there was a lightning conductor in the direction in which I looked. This is the season for West Indian Hurricanes and we are near their birth place, is this the commencement of one?

" September 11th, Noon.—Latitude, Obs. 14° 42' N., Longitude, Obs. 27° 49' W., wind S.W. 3 to 4, barometer 30.110, attached thermometer 80.5, dry 81, wet 79.7. Cir. Str., Str., 10, c.m., heat drops.

" September 12th.—2 a.m. westerly swell. 6 a.m. high southerly swell. Notice the southerly swell which would be expected where the east side of a hurricane had been."

TOYNBEE, when Marine Superintendent of the Meteorological Office, made and published the most detailed investigation of the Meteorology of this part of the North Atlantic which has ever been made of any part of the Oceans and he confirmed the fact that this locality is the birth place of many West Indian hurricanes.

ICEBERGS AND SEA TEMPERATURE.

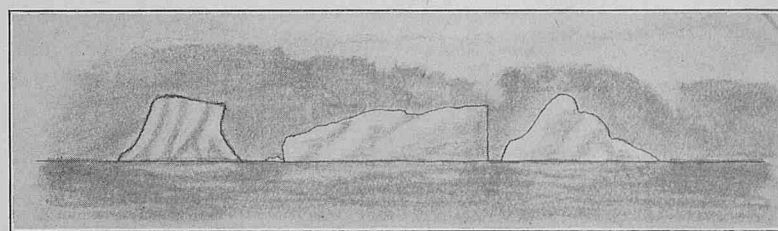
February, 1860. South Pacific.

A Famous Clipper.

THE following observations and tracing of a sketch (the original was coloured) are taken from the Weather-Book Register of the Wooden Clipper Ship *Lightning* of 1,769 tons, Captain JAMES CLARKE, from Melbourne to Liverpool, under date February 25th, 1860.

" Noon, Latitude Obs. 55° 9' S., Longitude Obs. 128° 45' W. Sea surface temperature 43°, wind S.W.4, barometer 30.054, attached thermometer 50°. Dry bulb 46, wet 45. Cum-Str. 8. Fine.

" Ice in sight to the southward at 6 a.m. At noon seven icebergs in sight, six to the northward and one to the southward of the ship's track, distant from five to ten miles (sea water not so cold as at 8 a.m. with one iceberg, distant 10 miles). Specific gravity of water 1.026."



The sea temperatures recorded were as follows: 4 a.m. 43°, 6 a.m. 43°, 8 a.m. 41°, 9 a.m. 42°, 10 a.m. 42°, noon 43°, 2 p.m. 45°, 3 p.m. 45°.

Here was information showing that the thermometer was, as is now known, of little use in detecting the proximity of ice.

This was the Clipper Ship *Lightning* which is reported to have made the greatest day's run of any sailing ship.

According to BASIL LUBBOCK in "Colonial Clippers" the following is a list of all runs of 400 miles and over made by Clipper Ships:—

" March 1st, 1854.—*Lightning*, 436 miles.

March 19th, 1857.—*Lightning*, 430 miles.

February 6th, 1855.—*James Barnes*, 423 miles.

February 27th, 1855.—*Donald MacKay*, 421 miles.

June 18th, 1856.—*James Barnes*, 420 miles.

February 27th, 1854.—*Red Jacket*, 413 miles.

January 27th, 1855.—*James Barnes*, 407 miles.

July 6th, 1854.—*Red Jacket*, 400 miles."

In 1857 *Lightning* under the command of Captain ANTHONY ENRIGHT returned a Weather-Book Register for a voyage from Liverpool to Melbourne, February to July, 1857, which was destroyed probably during the Great War; 1914-1918, when many old logs were pulped owing to paper shortage.

OVERCOMING DIFFICULTIES OF NAVIGATION IN A TEA CLIPPER WITH INACCURATE CHARTS OF THE SULU AND CELEBES SEAS, EASTERN ARCHIPELAGO, IN 1860.

THE Sketch Chart below is reproduced from the original by photography which with the observations and remarks are extracted from the Weather Book of the wooden clipper ship *Crest of the Wave*, 855 tons, Captain JOHN STEEL, from Foochow to London under dates September 17th to 20th, 1860.

"September 17th, 1860.—8 a.m., Longitude Obs. $121^{\circ} 35' 45''$ E. Observed magnetic variation by azimuth 28° E. Ship's head S.W. by S. Noon, Latitude Obs. $6^{\circ} 9'$ N.

"Wind E.N.E.2. Barometer 30.01. Attached thermometer 85.4, dry 83.4, wet 80.7. Cir., Cum and Cum 7. Weather m.

"Tide in the Strait turned to run southerly at 11 p.m. 16th. Duo Bolod, south 3 miles. Halo round the sun.

"Bearing of Duo Bolod and small islands to the southward of it agree with chronometers.

"Tide setting about E.S.E. $1\frac{1}{2}$ knots, we appear to have brought a S.E. tide since last night at 11 p.m.

"At 12.30 tide commenced running westerly, we carried this tide till 10 p.m. no doubt advancing in our position through and towards the different straits added to the length of the tide. The tide was exactly 6 hours each way at the western entrance of Basselan Strait.

"September 18th.—9 a.m. Longitude $120^{\circ} 47'$ E. Bearings give $120^{\circ} 24'$. Noon, Latitude Obs. $5^{\circ} 42'$ N., Longitude D.R. $120^{\circ} 37'$ E. Wind S.E.1. Barometer 30.02. Attached thermometer 85.2, dry 82.4, wet 79.7 b.c.

"4 p.m. Longitude Obs. $120^{\circ} 37' 15''$ E.; bearings give Longitude $120^{\circ} 15'$. Casts of lead, soundings 35 fathoms, 5 p.m. 16 fathoms, 6 p.m. 28 fathoms, had altered our position about 3 miles S.S.E. during the two hours, 8 p.m. 32 fathoms, 10 p.m. 32 fathoms, 11 p.m. 28 fathoms.

"The water in the channel between Lapak and the 'Horse Shoe' is from 17 to 21 fathoms depressing towards the 'Horse Shoe.'

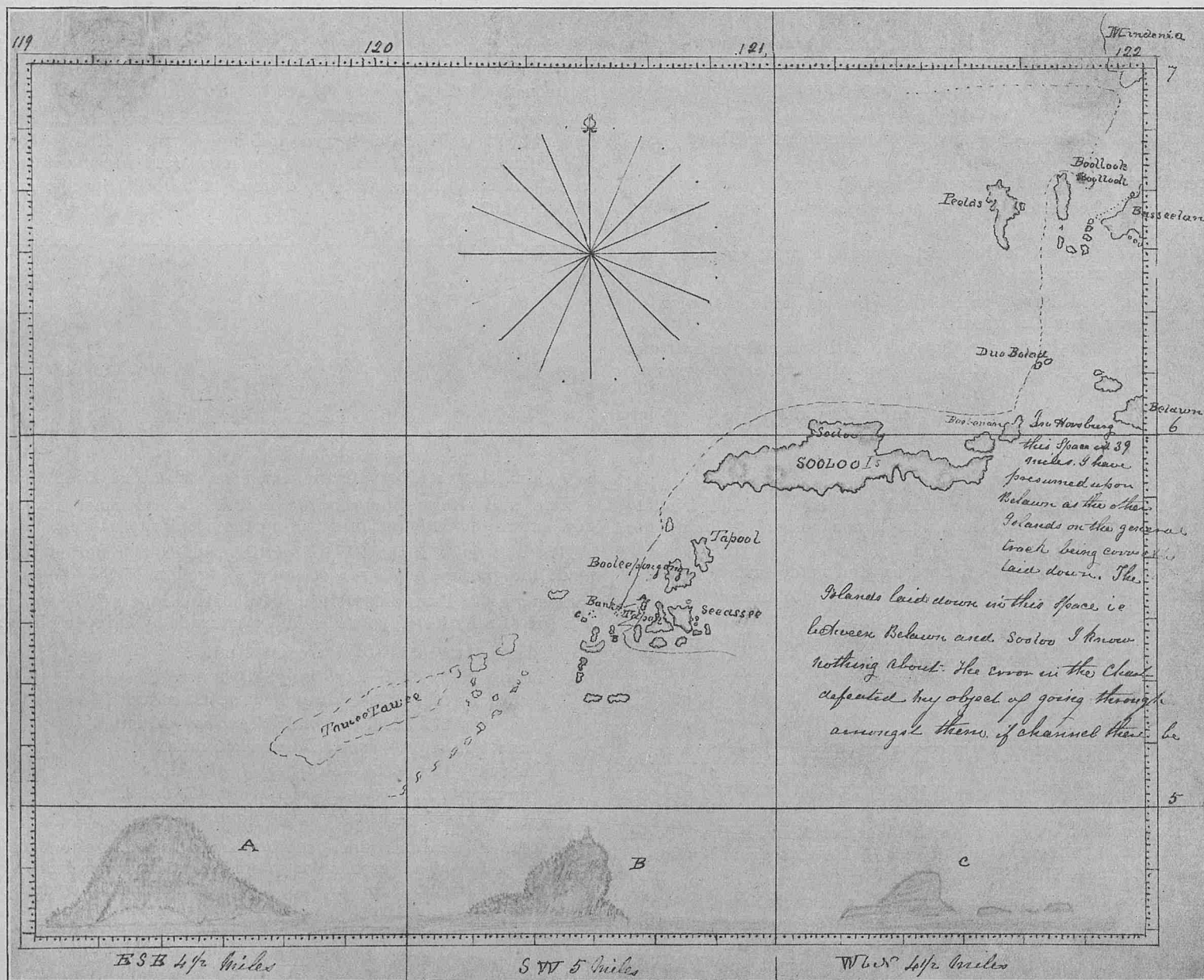
4 p.m. Magnetic Variation by azimuth $1^{\circ} 18'$ E.

6 p.m. Magnetic Variation by amplitude $1^{\circ} 00'$ E.

"HORSBURGH'S Chart shows many open passages to the eastward of Sooloo. I could not find any such passages and was obliged to run to the westward of Sooloo and I believe the whole of this group to be set down too far to the westward, about 16 miles.

Sketch Chart Correcting Position of Sulu Group by Captain JOHN STEEL, Ship "Crest of the Wave."

February, 1860.



"At daylight this morning we found ourselves within a mile of a small island of coral formation with a lagoon in its centre; this island (without name) is shown on the chart as having a reef extending more than a mile from its southern end; when close inshore so that the people were hallooing to us, we had no bottom at 90 fathoms neither have we been able to get soundings on the whole passage down the north side of Sooloo. The lead was cast sometimes twice in an hour.

"At 4 p.m. S.W. point of Beelopongong, E. by N., Lapak S.W., point, S.S.W., gives Longitude 120° 15' E., about 22 miles too far West.

"There are three small islands in the vicinity of this 'Horse-shoe'-like group (bearing S.S.W.) not laid down on the Chart.

"At midnight anchored on bank (coral) in five fathoms. Sent the gig to sound and found it to be a bank about one and quarter miles in diameter gradually shallowing from 14 to 4½ fathoms in the shallowest part which even in the dark showed white. From this bank the S.W. point of Lapak Island bears S. 70° E., the high island in front of the Horse Shoe, S. 25° W. Tide ran S.E. ½ E. from 4 p.m. yesterday till 7.15 a.m., then ran W.N.W. till noon.

"Weighed anchor at 5.30 a.m.

"September 19th.—8 a.m. Longitude, Obs. 120° 40' 0" E. Bearings give Longitude 120° 17' E. Halo or Corona round the sun. Noon, Latitude 5° 33' N. Wind S. by E.2. Barometer 30.02. Attached thermometer 84.4, dry 82.9, wet 80.2. Cir., Cum 3, m.

"There are two low flat islands bearing South and S. by E. from this Horse-Shoe-like island 12 miles (or about) not down on the Chart, indeed the Chart is very little guide for the position I have been in the last two days. The three small islands to the south and west of Lapak are laid down about 3 miles too far off shore on the Chart. The channel inside them is not more than a mile and a quarter broad and showed quite white and reef-like.

"I passed close outside the small islands. The tide ran strong to S.E. after noon till 6 p.m. Overfalls very heavy outside the islands at the west point of Lapak.

"I shall send in a small chart to correspond with this page showing the islands as I found them, leaving the question of passages to the eastward of Sooloo an open question as the error in the bearing and distance of Sooloo (east end) from Duo Bolod left me no chance of testing if passages there be, they must be

much narrower than HORSBURGH shows them, for as Duo Bolod agreed with my chronometer I have no doubt but the islands to the eastward of it are also correct.

"September 20th.—Noon, Latitude 5° 20' N. Current N. 27° E., 24 miles. Wind S. by W.4. Barometer 30.00. Attached thermometer 86.4, dry 83.8, wet 79.8. Cir., Cum 5.

"4 p.m. Longitude Obs. 121° 47' E. Magnetic variation by azimuth 34' E. Ship's head S.E. by E."

These remarks, with sketch chart by Captain STEEL and the HORSBURGH's chart upon which he navigated *Crest of the Wave*, were forwarded by Admiral FITZROY to the Hydrographer on February 9th, 1861, and again by Captain TOYNBEE on November 27th, 1869.

The chart by HORSBURGH was found to be obsolete then and the position of the Sulu group given by *Crest of the Wave* to coincide very nearly with that on the Admiralty Chart of the time. The bank reported was not then shown on the Admiralty Chart which was accordingly corrected in December, 1869. Reference to Admiralty Chart 928, Sulu Archipelago, published under the superintendence of Captain F. J. EVANS, R.N., C.B., F.R.S., Hydrographer, on September 10th, 1879, latest edition December, 1914, with large corrections to May 21st, 1926, shows this shoal clearly marked and named Crest of the Wave Shoal.

Crest of the Wave weighed and proceeded to sea from Sharp Peak, Foochow, on August 24th, 1860, and made the Start on January 1st, 1861, 130 days out.

Other remarks are recorded as to wrongly charted positions of which the following is another example:—

"September 1st, 1860, North end of Camigurn W. ½ N., Didicas Rocks W.N.W., which gives by HORSBURGH's last charts 19° 04' N. There are four observers with good sextants and all agreeing my Latitude can hardly be wrong.

Corrected all for dip semi-diameter, etc. ... 79° 24' = 10° 36' N.

Declination corrected for Greenwich Time ... 8° 14' N.

18° 50' N.

Longitude of Didicas agrees with my chronometers."

THE TRADE WINDS.

II. Atlantic, Pacific and Indian Oceans.

THE first article of this series dealt with general considerations and with historical matter relating to the discovery and early descriptions of the Trade Winds. It also referred to the improvements made in sailing-ship passages in the nineteenth century due to the collection and study of marine meteorological data. A short account of the history of the theory of the Trade Winds will be included in a later article. The present article is concerned with summarising the knowledge we possess with regard to the strength, direction and variability of the Trade Winds over the surface of the respective oceans. It will perhaps be well to realise at the outset that we can hardly yet claim to have exact scientific knowledge of these features of the Trades, covering as they do such extensive areas of the globe. Our knowledge is what might be popularly described as scrappy and uneven. It depends almost entirely on the observations made by marine observers in ships "upon their lawful occasions," in other words on ships following the well-known trade routes. Many thousands of such observations have been used for the charts issued by the British, Dutch and United States Governments, but on account of the great regions of the Trade Winds and the relatively restricted areas embraced by modern steamship routes it follows that the wind arrows or roses in many parts of the charts depend upon too few observations to be really reliable. Of the oceans in which the Trade Winds occur,

these remarks apply with greatest force to the North Atlantic and Pacific Oceans. It is, however, always useful, whatever department of knowledge be in question, to make a pause and summarise what we do know, however imperfect it is, for the benefit of those who have neither the means nor the time for collecting scattered information and also in order that we may see more clearly in what directions or in what actual parts of the oceans more knowledge is chiefly desired.

There are other available sources of information, besides the charts mentioned which also depend entirely on the work of the corps of voluntary marine observers. These are the investigations of Captain H. TOYNBEE in 1876 and of Captain M. W. CAMPBELL HEPPWORTH, R.N.R., in 1910, both referring to the Trade Winds of the Atlantic Ocean. The sources not depending on the work of seamen are relatively few in number and comprise island observations, notably those of St. Helena and the West Indies and observations made on scientific expeditions such as the voyage of H.M.S. *Challenger* in 1873-6 and more recent expeditions made for oceanographical purposes or for the exploration of the upper air. It should also be remembered that besides the charting or scientific generalisation of the work of marine observers there exists a practical knowledge of facts relating to the Trade Winds, the fruit of the actual experience of many passages through these regions,

as crystallised in Sailing Directions and other works of reference. Sometimes knowledge of this type has to be subsequently modified in view of more exact numerical data. This does not necessarily imply that the original deduction was wrong; it may for example have been true for a limited region but had not a more general application. On the other hand it may have been wrong in the sense that the experience on which it was founded was not long enough to give an impression of the real average conditions.

The point already emphasised, that charts of the winds of the oceans in their present state are imperfect, affords a reason why exact information of certain types relating to the Trade Winds is difficult or impossible to get from the charts. Spurious effects may also be observed in certain charts. Thus if resultant wind directions, where the wind has only been charted to every fourth point of the compass, be laid down on a chart, the N.E. Trade of the Atlantic Ocean shows in almost every month of the year a sharp line of division running north-eastwards from the coast of French Guiana. To the east of this line the winds are almost wholly N.E. while to the west of it they are almost wholly E. We know both from theory and observation that the N.E. direction of the N.E. Trade in the eastern part of the ocean passes into the E. direction of the Caribbean by gradual change through N.N.E. There is no line of discontinuity of direction, which is purely a false effect introduced through taking the wind to only 8 compass points instead of to 16 points. This spurious line, however, clearly shows an important fact which would not have been quite so easily determined from a more perfect chart. Its fixity of position indicates that for ten or eleven months in the year approximately the same wind direction is on the average experienced in a given place in the central longitudes of the N.E. Trade.

The present article is an attempt to combine the information derived from the various sources outlined above, which, as might be expected, do not in certain cases agree with one another. Before proceeding to consider the oceans separately a few remarks will be made which are applicable to all the oceans and so may be stated once and for all. It is not within the scope of this series of articles to consider the characteristics and position of the Doldrums in detail, but, as the Trade Wind belts are in immediate juxtaposition to the Doldrums, to say, for example, that the southern limit of the N.E. Trade moves northward during a given month is precisely the same thing as saying that the northern limit of the Doldrums moves northward. Excluding the northern part of the Indian Ocean in which as is well-known there is no Trade Wind, the alternating Monsoons holding undisputed sway, the Trade Wind belts in all oceans, both north and south of the Equator, occupy a region extending over 1,000 to 1,400 miles of latitude. While the Trade of the Northern Hemisphere is called the N.E. Trade and is stated to blow from the N.E. and the Trade of the Southern Hemisphere is called the S.E. Trade and is stated to blow from the S.E. the actual fact, as determined both by observation and theory, is that the directions are not the same in different parts of the ocean. Proceeding from the eastern to the western sides of an ocean in the Northern Hemisphere the Trade Wind veers from N.E., or even from N.N.E. or N. in some months, through E.N.E. to E. or to a point slightly S. of E. In the Southern Hemisphere the Trade Wind backs in a corresponding manner from S. or S.S.E. through S.E. to E. or even a little N. of E. In thus speaking we are of course dealing with average directions and it may be as well to anticipate the subsequent article in this series sufficiently to say that this behaviour of the Trade Winds represents a circulation of the air round the great permanent anticyclones which are found in the latitudes of about 30° N. and S. This circulation is of exactly the same character as that around an anticyclone which forms and persists for a short period in the temperate westerlies. Seamen who have made many passages through the Trades are fully aware that these winds are not, as is often popularly supposed, perfectly steady and regular either in force or direction. They vary, within certain limits, from day to day, from season to season, from year to year, and again at different times of the day. This applies to all the oceans,

but the Atlantic Trades are more regular than those of the Pacific and the S.E. Atlantic Trade is more regular than the N.E. Atlantic Trade. In the Pacific and Atlantic Oceans the zone of Doldrums occupies the region immediately to the north of the Equator. In the Indian Ocean the zone is less well-marked and lies always to the southward of the Equator. Following the seasonal changes in the sun's declination, not only the Doldrums and the Trade Winds, but the regions of light and variable winds beyond the Trades, over the centres of the permanent anticyclones, move on the average northward and southward following the sun. There is, however, a considerable lag in time behind the sun, thus while the sun attains its highest northern declination, 23½° N., near the end of June, the N.E. Trade of the Atlantic does not reach its most northerly latitude until August. The rate of motion is greatest near the time of the equinoxes, in April and October. The average annual range of this movement in all oceans is about 4° of latitude, but there is a tendency for the poleward range to exceed the equatorial range with a consequent slight periodical widening of the Trade Wind belts. In the Atlantic and Pacific Oceans the N.E. Trade Wind never extends south of the Equator but the S.E. Trade Wind crosses the Equator during the northern summer. In the Indian Ocean the S.E. Trade Wind never crosses the Equator.

The day to day fluctuations of the Trade Winds may be considered as having their origin in the day to day variations in intensity and position of the great permanent anticyclones. Such fluctuations affect not only the force and direction of the Trade Wind at any given place within the belt, but also frequently give rise to considerable transitory variations in the limiting latitudes of the Trades, and hence in the width of the Doldrums. Thus for days together the Doldrums in a given part of the ocean may be unusually wide, even up to 600 miles or so in extreme cases. The Trade Wind then breaks in with renewed energy, invading the Doldrums area and sometimes almost extinguishing it for a short time. As MAURY said, speaking of the Doldrums, "we find that such is its state that within certain boundaries it is continually changing place and limits. This fact is abundantly proved by the speed of ships, whose log books show that it is by no means a rare occurrence for one vessel, after she had been dallying in the Doldrums for days, in the vain effort to cross that calm belt, to see another coming up to her 'hand over fist,' with fair winds, and crossing the belt after a delay in it of only a few hours instead of days."

Of the six regions of the oceans where hurricanes occur, four come within the Trade Wind regions, the other two lying in the regions of the Indian and China Sea monsoons. The four regions are (1) North Atlantic Ocean, The West Indies, Gulf of Mexico, Caribbean Sea and Florida Coast; (2) South Indian Ocean, East of Madagascar, about the islands of Mauritius and Reunion; (3) South Indian Ocean, between the north-west coast of Australia and the Cocos or Keeling Islands; (4) South Pacific Ocean, from the coast of Queensland to the Taumoto Islands.

The various Trade Winds will now be considered separately. The average limiting latitudes as given below must not be considered to be exactly determined. It must be remembered in the first place that our information is not exact enough for the average limits to be determined to a degree of latitude or even more, and secondly, although on individual voyages the Trades may be entered or left very suddenly, there is in general no hard and fast line of demarcation between them and the winds or calms to the north or south. This particularly applies to the poleward limits of the N.E. and S.E. Trade Winds. If we examine the wind roses on the charts along the poleward boundaries we frequently find roses showing winds more or less from every direction yet with a preponderance of winds between N. and E. or between S. and E., so that if a resultant wind arrow were drawn it would lie in this quadrant. In charts showing resultant winds therefore the Trades would appear to be extended a certain distance polewards, yet from the point of view of the navigator the winds in these boundary regions could not be called Trades on account of their irregularity.

Atlantic Ocean.

Extent of the N.E. Trade.—Information regarding the North Atlantic Ocean is less complete than that for the South Atlantic, for which better charts are available. The average width of the N.E. Trade is about 1,200 miles. This belt stretches right across the ocean, being bounded on the east side by the continent of Africa and on the west side by Florida, the West Indian Islands and the north coast of South America. The maximum movement of the northern limit occurs on the African side of the belt, with a minimum of but slight movement on the coast of Florida. The northern limit may therefore be conceived as being pivoted on the coast of Florida with its eastern end moving alternatively northward and southward. In February at the most southerly point it just includes the Canary Islands, while in August the most northerly point is reached when the Trade Wind belt touches Lisbon. The actual latitudes of the two ends and of the middle point are approximately:—

	Off Florida.	Mid-Ocean.	Off Morocco.
February ...	24° N.	24° N.	31° N.
	Off Florida.	Mid-Ocean.	Off Portugal.
August ...	26° N.	30° N.	38° N.

The Southern limit of the N.E. Trade Wind has a somewhat similar range of travel, but it maintains a line more parallel to the equator across the ocean. In March when it is furthest south it extends from the mouth of the Amazon to Freetown, Liberia. In August when it is furthest north it extends from Trinidad (West Indies) to Cape Verde. The latitudes of the two ends and the middle point are approximately:—

	Off Amazon.	Mid-Ocean.	Off Sierra Leone.
March ...	0° N.	2° N.	8° N.
	Trinidad.	Mid-Ocean.	Off Senegal.
August ...	10° N.	11° N.	15° N.

In the case of both the northern and southern boundaries the line thus bends northward on the African side of the ocean.

Extent of the S.E. Trade.—The southern limit of the S.E. Trade Wind lies in a diagonal across the ocean in a south-easterly direction from the Brazilian Coast towards South Africa, and its annual movement is chiefly found on the eastern side of the ocean, being almost entirely non-existent on the western side. It is furthest north in August and furthest south in February. The actual latitudes of the two ends and of the middle point are approximately:—

	Off Brazil.	Mid-Ocean.	Off S. Africa.
February ...	17° S.	25° S.	35° S.
August ...	16° S.	23° S.	28° S.

During the southern summer the Trade extends as far as the Cape where it is known as the "Southeaster," but in all months of the year there is at the Cape a preponderance of winds from the southern quadrant. In the case of the northern limiting line the opposite conditions prevail. The eastern end remains at a more or less fixed distance of 350 miles from the coast, moving slightly northward or southward off the northern coast of Angola, while the western end moves through about 10° of latitude in the neighbourhood of the Amazon. This boundary is a fairly straight diagonal line in August but curves to the northward in February. It is also furthest north in August and furthest south in February. The actual latitudes of the two ends and of the middle point are approximately:—

	Off Brazil.	Mid-Ocean.	Longitude 0°.
February ...	4° S.	1° N.	8° S.
	Off Guiana.	Mid-Ocean.	Longitude 0°.
August ...	6° N.	5° N.	5° S.

Limits of the Trade Winds of the Atlantic.

TABLE I was drawn up by HORSBURGH, of the equatorial limits usually found in the track pursued by the East Indiamen, at the commencement of the nineteenth century.

Table I.

The Equatorial Limits of the N.E. and S.E. Trade Winds between the Meridian of 18 and 26 Degrees West (Horsburgh).

CEASES.	N.E. TRADE WIND.		S.E. TRADE WIND.		INTERVAL BETWEEN.
	General Extremes. Latitude N.	Probable Mean. Latitude N.	General Extremes. Latitude N.	Probable Mean. Latitude N.	Mean Breadth.
In January ... at	3 to 10	5	0 $\frac{1}{2}$ to 4	2 $\frac{3}{4}$	2 $\frac{1}{4}$
February ... "	2 " 10	4	0 $\frac{1}{2}$ " 3	1 $\frac{1}{4}$	3 $\frac{1}{2}$
March ... "	2 " 8	4 $\frac{3}{4}$	0 $\frac{1}{2}$ " 2 $\frac{1}{2}$	1 $\frac{1}{4}$	3 $\frac{1}{2}$
April ... "	2 $\frac{1}{2}$ " 9	5	0 " 2 $\frac{1}{2}$	1 $\frac{1}{4}$	3 $\frac{3}{4}$
May... ... "	4 " 10	6 $\frac{1}{2}$	0 " 4	2 $\frac{1}{2}$	4
June ... "	6 $\frac{1}{2}$ " 13	8 $\frac{1}{2}$	0 " 5	3	5 $\frac{1}{2}$
July ... "	8 $\frac{1}{2}$ " 14	11	1 " 6	3 $\frac{1}{2}$	7 $\frac{1}{2}$
August ... "	11 " 15	13	1 " 5	3 $\frac{1}{4}$	9 $\frac{3}{4}$
September ... "	9 " 14	11 $\frac{1}{2}$	1 " 5	3	8 $\frac{1}{2}$
October ... "	7 $\frac{1}{2}$ " 14	10	1 " 5	3	7
November ... "	6 " 11	8	1 " 5	3	4 $\frac{1}{4}$
December ... "	3 " 7	5 $\frac{1}{2}$	1 " 4 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{1}{4}$

The following table is compiled from recent charts and information:—

Table II.

Approximate average limits of N.E. Trade Wind.

—	Longitude 60° W.	Longitude 40° W.	Longitude 20° W.
North Limit—August ...	27° N.	30° N.	35° N.
February ...	25° N.	26° N.	29° N.
South Limit—August ...	10° N.	11° N.	14° N.
March ...	—	1° N.	4° N.

Approximate average limits of S.E. Trade Wind.

—	Longitude 30° W.	Longitude 10° W.	Longitude 10° E.
North Limit—August ...	5° N.	0° N.	—
February ...	1° S.	1° S.	—
South Limit—August ...	17° S.	23° S.	26° S.
February ...	19° S.	26° S.	33° S.

Direction of the N.E. Trade.—This Trade varies considerably in direction eastward of Longitude 25° W. to the African coast, including the region of the Canary Isles. In all parts of this area, during most of the months of the year winds outside the quadrant N.—E. may be experienced. The resultant winds for restricted areas lie mainly between N. and N.N.E. North of Latitude 30° N. the resultant wind during the northern summer is from the north, with, however, an appreciable proportion of westerly winds, particularly in the latitude of Lisbon. Broadly speaking, except during the month of August, the resultant direction of the Trade Wind may be defined by reference to the imaginary line previously referred to drawn from the coast of French Guiana to the point Latitude 20° N., Longitude 40° W. This is the zone of the E.N.E. Wind. Eastward to about Longitude 25° W. is the region of the N.E. wind and westward up to and right through the Caribbean Sea is the region of the E. wind. During August these areas are shifted to the westward, the zone of E.N.E. winds extending from about Latitude 30° N., Longitude 30° W. to the island of Trinidad (West Indies). The areas selected for Captain CAMPBELL HEPWORTH's investigation of the N.E. Trade Wind were from Latitude 10° N. to 30° N. between Longitude 30° W. and the West Coast of Africa, thus including the Canary and Cape Verde

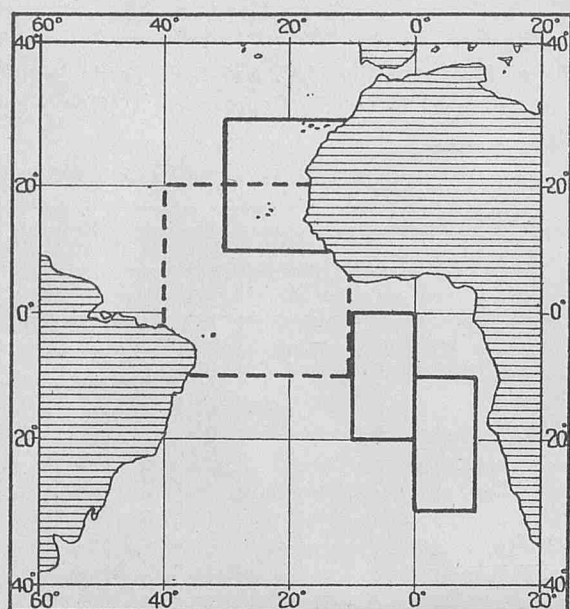


Figure 1.

--- Area included in Captain Toynbee's investigation.
 — Areas included in Captain Hepworth's investigation.

Islands, as shown in FIGURE 1. The mean direction of the wind for the whole year, from observations made during the years 1902-1906, was found to be N. 30° E., varying between N. 18° E. in May and N. 48° E. in January. It is often stated that when the sun is at its maximum south declination the N.E. Trade is more from the north and when in the northern hemisphere it is more from the east. This statement seems to require considerable qualification; the charts show that in general the wind is more easterly during August, when the effect of the sun's maximum north declination in June is felt, but there is no very marked change and it is certainly not in the form of a gradual appreciable change from month to month. At first sight Captain HEPWORTH's results appear to indicate a precisely opposite change of direction. It must, however, be remembered that a large part of the area which he investigated is affected by the African coast and the wind off the African coast varies in a different manner to the Trade of the open ocean. It is, roughly speaking, northerly for a great part of the year, including the northern summer and becomes north-easterly for three or four months in the winter season. In an investigation by O. L. FASSIG of the Trade Wind at Porto Rico, West Indies, from observations extending over 10 to 12 years, it is shown that the prevailing direction of the wind throughout the year is between E. and S.E., varying only slightly with the season of the year. During October and November there is a considerable proportion of S. wind and during the winter months there is more N.E. wind, this latter sometimes becoming the prevailing direction for the month.

Direction of the S.E. Trade.—More exact information is available for the South Atlantic from the charts. The S.E. Trade Wind of the Atlantic shows on the whole less seasonal variation of direction than the N.E. Trade, and is, broadly speaking, constant throughout the year, when resultant direction is considered, save for the exceptions mentioned below. The wind roses show that the winds along the great sweep of the Trade northwards to the Equator lie almost entirely between E.S.E. and S.S.E. at all seasons, giving a resultant south-easterly wind which extends in low latitudes to the coast of South America in the Cape St. Roque region. In somewhat higher latitudes, say from 10° to 20° S. and from the Brazilian coast to about Longitude 15° W., the Trade is on the average easterly. It is commonly said that a state of affairs exists, analagous to that in the N.E. Trade, whereby the S.E. Trade inclines more to the southward at or after the time when the sun is furthest north, and inclines more to the eastward during the southern summer. The charts do not bear this out for the area as a whole, where no seasonal change can be detected among the slight month-to-month variations of individual roses. The change referred to is, however,

quite marked in the region of about Latitude 10° to 15° S., Longitude from the South American coast up to about 15° W. and is traceable in lesser degree between Latitude 5° to 10° S., Longitude from the coast to 25° W., off Cape St. Roque and Pernambuco. The resultant wind in this region is essentially S.E. during the southern winter and E. during the southern summer. Another interesting feature presented by this Trade is its gradual merging on its eastern side into the S.W. monsoon of the Gulf of Guinea and African Equatorial Coast. During the northern summer, and especially in August, there is a broad sweep of air from the S.E. Trade by gradual change of direction into the S.W. monsoon which at this season blows on to the coast as far north as Latitude 10° N. During August this belt of intermediate wind reaches out into the Atlantic as far as Longitude 30°—35° W. and occupies a considerable part of what would otherwise be the Doldrums. Captain HEPWORTH's investigation of the S.E. Trade covered the two pairs of ten-degree squares Latitude 0° to 20° S., Longitude 0° to 10° W., and Latitude 10° to 30° S., Longitude 0° to 10° E., as shown in FIGURE 1. The mean direction for the year from observations made during the years 1902-1906 was found to be S. 38° E. varying from S. 35° E. in February and October to S. 41° E. in August and November. This investigation is therefore in agreement with the result deduced from the charts, that the N.E. Trade shows more variation of direction than S.E. Trade.

Force of the Trade Winds of the Atlantic.—Captain HEPWORTH found for the areas already mentioned that the mean annual velocity of the N.E. Trade was 10.6 miles per hour, varying from 7.4 miles per hour in October to 13.5 miles per hour in April. For the S.E. Trade the mean velocity was 14.2 miles per hour, varying only from 13.1 miles per hour in January to 15.0 miles per hour in April, June, and August. The S.E. Trade is therefore appreciably stronger than the N.E. Trade and appears to be but slightly subject to seasonal variation which is marked in the case of the N.E. Trade. It is interesting to note that for the S.E. Trade observations for a much longer period, 1855 to 1899, were worked up and showed a mean annual velocity of 14.7 miles per hour, differing but slightly from the result of the five-year period. The average monthly results do not agree so well; for the 45 years the greatest velocity was 15.5 miles per hour in February and the least 13.7 miles per hour in April. It thus appears that the S.E. Trade is strongest shortly after the sun is at its greatest south declination, but there is no confirmation for the statement sometimes made that the N.E. Trade is strongest about the time the sun is at its greatest north declination. A further point which Captain HEPWORTH's work made clear was that the year-to-year strength of the N.E. Trade had no relation to that of the S.E. Trade, both might be below normal for a given year, or one above and one below &c. In 1904 and 1905 PRINCE ALBERT OF MONACO, with the collaboration of Professor HERGESSELL, made two expeditions to study the upper wind over the Trade Wind of the North Atlantic Ocean in the course of which the force of the surface Trade Wind was also determined. During the month of April, 1904, in the triangle Oporto-Tenerife-Azores the average force was found to be 16 miles per hour, and during the month of August, 1905, on the route Gibraltar to the Sargasso Sea and back to the Azores it was found to be 12 miles per hour. On the Beaufort scale the average force may be expressed as from 3 to 4. In the investigation of FASSIG, previously referred to, the average velocity of the easterly Trade of the West Indies is slightly less than 11 miles per hour, with a maximum of 13 miles in July and a minimum of 8 miles in October. It may be noted that the South Atlantic wind roses show no winds of gale force anywhere in the Trade region save in the extreme south near the Cape. These gales attain their greatest frequency in February when in the region of latitude 30° S. to 35° S., longitude 15° E. to the coast, about 8 per cent. of the total wind observations were of gale force from E.S.E. and S.E.

The St. Helena Observations.

It is interesting to compare the results of observations made on this small island, set in the heart of the S.E. Trade Wind, with those made at sea. As has already been stated the S.E. Trade Wind is particularly steady and reliable, and at St. Helena it blows day after day with no more variation than a point or two in direction and a few miles per hour in velocity. The records of the anemometer at St. Matthew's Vicarage, 1,960 feet above sea level,

for the years 1892-1907, show an average direction for the year of S. 40° E., varying from S. 35° E. in October to S. 42° E. in April. They also show a very marked seasonal change of velocity, from 12.9 miles per hour in May to 20.0 miles in September.

Table III.

Average Monthly Strength of the Trades of the Atlantic in miles per hour.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
N.E. Trade (Sea observations)	10	11	11	12	11	10	9	7	8	6	8	10	9.4
S.E. Trade (Sea observations)	12	13	12	13	13	13	11	13	13	12	13	13	12.6
S.E. Trade (St. Helena)	14	13	13	12	11	12	12	15	17	15	16	15	13.8

In TABLE III the average monthly velocities are set out to the nearest mile per hour for comparison. The St. Helena values have been reduced by 15 per cent., which it is considered gives the velocities that would have been recorded at sea-level. The marine observations have also been reduced by somewhat more than a mile per hour, because the conversion scale from Beaufort to miles per hour used at the time of the investigation differs slightly from that in use at the present time by the Meteorological Office. It will be seen that the St. Helena winds are appreciably stronger than the S.E. Trade marine observations and show a much more definite seasonal variation. Explanations of this fact have been attempted, but none are satisfactory. It is remarkable that for every month the N.E. Trade observations and the St. Helena observations are almost exactly complementary. Thus September, the month of weakest N.E. Trade, is the month of strongest S.E. Trade, and so on.

In 1861 MAURY published in the U.S. Nautical Monograph, No. 3, "The South-East Trade Winds of the Atlantic," a determination of the relative strengths of the N.E. and S.E. Trade Winds. A table was given showing the average daily run of 520 vessels along a mean track, extending from latitude 30° S., longitude 10° E., via longitude 33½° W. on the Equator, to latitude 30° N., longitude 66¼° W. MAURY says: "By this table the average speed through each system of Trades is the same (six knots) but through the S.E. Trades the winds are nearly aft, through the N.E. just abaft the beam, which, with most vessels, is the most favourable point for speed. Now if we knew the force of wind that would give an average vessel six knots before the wind, and the force that would give her six knots with the wind abaft the beam, we should be able to form a pretty correct estimate as to the average difference in velocity between the N.E. and S.E. Trade Winds of the Atlantic Ocean. Admiral CHABANNES, while in command of the French fleet on the coast of Brazil, was kind enough to make a series of experiments upon this subject for me in his sailing frigate, the *Alceste*, on her homeward passage in 1860." After giving the Admiral's results in tabular form, he continues: "From this we infer that if these 520 vessels had sailed through the S.E. Trades at the same angle with the wind that they sailed through the N.E. Trades, their average speed would have been mainly nine (8.8) instead of six knots." MAURY thus determines the ratio of the strength of the Trades as 6 to 8.8, and it is interesting to note that the ratio of the N.E. Trade to the St. Helena Trade in TABLE III (9.4 to 13.8) is precisely the same, while the rate of the two sets of marine observations works out at rather less, 6 to 8.0. MAURY has, of course, made the assumption that the sailing qualities of the frigate under the influence of wind at different angles are the same as the mean of the 520 merchantmen. This is probably not far from the truth, as he would have received his observations from the best ships of the day, including a number of fast clippers.

A general wind of gale force has been recorded at St. Helena on only one occasion in 26 years, but the Trade Wind is said at times to sweep down the ravines in the high ground of the interior with a speed sufficient to uproot trees and unroof houses.

Captain Toynbee's Results.

Space does not permit the quoting in full of the monthly summaries of the character of the N.E. and S.E. Trade Winds given in the "Remarks to Accompany Monthly Charts of Meteorological Data for Nine Ten-degree Squares," but these have been used with other data in the compilation of TABLE II. One point which Captain TOYNBEE deals with at considerable length is the occurrence of remarkable clear weather gusts in the region of latitude 10° to 20° N., longitude 30° to 40° W. These are referred to for the months December to July inclusive, and in each of these months it is stated that this square (Marsden 40) is more squally and gusty than in the squares lying further eastward and hence nearer the African coast. He says: "The gusts often come with a clear sky and with very little wind between them, as though they were the effect of downward rushes of dry air. Sharp gusts, with blue sky, very cool weather and the atmosphere very transparent, are frequently met with at the polar verge of each Trade."

Comparison of the N.E. and S.E. Trades.

The main points of difference between these Trades may now be stated:—

- (1) The annual movement of the N.E. Trade in the Atlantic is on the whole greater than that of the S.E. Trade.
- (2) The area affected by the Trades is greater on the eastern than on the western side of the Ocean.
- (3) The N.E. Trade has a considerably greater extent in longitude than the S.E. Trade, but the area in which the wind is easterly is much more extensive than in the case of the S.E. Trade.
- (4) The S.E. Trade is appreciably stronger than the N.E. Trade.
- (5) The S.E. Trade is markedly steadier both in force and direction.

The N.E. Trade besides being more variable is more subject to squalls. In the days of the sailing ship sail was reduced much more frequently in the N.E. Trade than in the S.E. Trade, in spite of the latter being on the whole the stronger wind.

Diurnal Variations of the Trades.

Comparatively little exact information is available with reference to this subject, except in the case of island observations. Captain TOYNBEE considered, as a result of his investigation of the area previously referred to, that both N.E. and S.E. Trades are often more easterly in direction and weaker in force during the night than during the day. He also found a slightly greater tendency to squalls during the night. Similar conditions prevail at Ascension and a veer in the direction at night was also found by FASSIG at San Juan, Porto Rico, where the average direction during the day is E. and during the night S.E. The average velocity at San Juan for the year at 6 a.m. is 6 miles per hour, rising to 16 miles about 2 p.m. At St. Helena the diurnal variation in velocity is less marked and the wind draws a little southward during the night.

Local Winds.

It should be noted that the "Northers" of the Gulf of Mexico which blow from directions between N.E. and N.W. are not a part of the N.E. Trade Wind and have none of the characteristics of a Trade, being very variable, sometimes only light, at other times fresh to strong, gusty and squally, reaching force 8 to 11 or even more and accompanied by intermittent rain. They are directly associated with high pressure areas in the North American continent. The variable but true Trade Wind of Florida Strait is described in an article on page 99 of Vol. IV of this Journal, and the coastal modifications of the easterly Trade along the north coast of South America are described in a further article on page 160. It may be noted that the north-easterly winds which blow on the coast between Rio de Janeiro and Monte Video from October to April, also described in the latter article, form a continuation of the circulation round the permanent anticyclone of the South Atlantic Ocean. It will be noted that these N.E. winds blow during the southern summer, when as we have seen that on the American side of the Ocean the winds from latitude 5° to 15° S. are easterly, while north-easterly winds extend far into the ocean along

the parallels 15° to 20° S. At Bathurst the N.E. Trade blows from directions between N.E. and N.W. from November to May during the dry season, alternating with the easterly Harmattan. At Free-town the Trade blows from December to April, but is at times very variable, the district being situated near the southern limit of the Trade.

Dustfall in the N.E. Atlantic Trade.

Over a large area of the eastern Atlantic adjacent to the coast of Africa, centred roughly on the Cape Verde Islands, falls of fine reddish or brownish dust are experienced which may at times lie quite thickly on board ship. The approximate area affected by these falls is shown in FIGURE 2, the relative frequency of the falls being indicated by three degrees of shading. Normally the dust appears to be carried from the land by the Trade Wind and it has its origin in the Sahara in the windstorms of which it is carried into the upper air. Sometimes, however, it comes from the offing, a case being described in detail in THE MARINE OBSERVER, Volume IV, 1927, pages 64-5, with a suggested explanation. The dustfall is most frequent in winter and spring. Visibility in this area is often indifferent, the air being filled with dry dust haze. Not infrequently this is so thick that the sun appears as a blood-red disc and all but the brightest stars at high altitudes are obscured at night.

Area of Dustfall in the Atlantic Ocean.

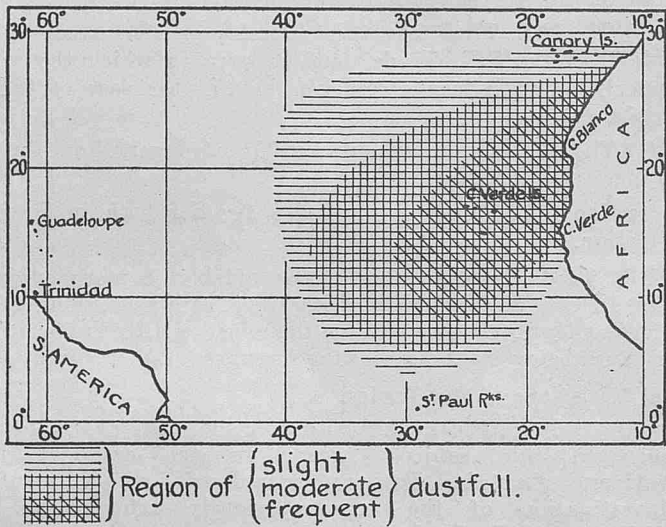


Figure 2.

After SCHOTT "Geographie des Atlantischen Ozeans."

Pacific Ocean.

The Trade Winds of the Pacific Ocean are in many ways analogous to those of the Atlantic Ocean. The American Pacific coastline, after crossing the Equator from the southward, bends away to the westward for 1,000 miles or more very much in the same way that the African coastline does. Centres of atmospheric high pressure are, on the average, features of the North and South Pacific Oceans in latitudes which are nearly identical with those of the North and South Atlantic Oceans. As in the Atlantic, therefore, the N.E. Trade Wind lies to the west of and not opposite to the S.E. Trade Wind. Here the resemblance ends, for whereas in the Atlantic the centres of high pressure are but slightly displaced towards the eastern side of the Ocean, in the Pacific they are definitely set on the eastern side, especially in the case of the South Pacific Ocean. The Trades of the Pacific, speaking generally, are not so strong or so steady as those of the Atlantic and this particularly applies to the S.E. Trade. Conditions in the Pacific are thus the opposite of those of the Atlantic where as we have seen the S.E. Trades are the strongest and most reliable.

The North-East Trades.

These prevail across the greater part of the North Pacific Ocean from an average of latitude 5° N. to 25° N. On the eastern side this wind is first felt about 200 miles from the Californian coast and it ceases to be felt in about longitude 150° E. Westward of this meridian to the coasts of Asia is a region of monsoons, where

the wind alternates between N.E. and S.W. The N.E. monsoon of the China Sea blows from November to March and during its prevalence it forms a continuous wind with the N.E. Trade. Thus, particularly during the months of December and January when the monsoon is at its height, a belt of strong and steady N.E. wind is found extending right across the Ocean. The whole area of the Trade Wind and the high pressure area of calms and variable winds lying on its north-eastern side move northward and southward as the sun's declination changes.

Table IV.

Limits of the N.E. Trade Wind, Pacific Ocean.

North-east Trade Wind, north and south limits.	At Long. 150° E.	At Long. 150° W.	At 200 miles from American Coast.
North limit line of north-east trade belt.	{ January } { February }	Lat. 22° N.	Lat. 29° N.
Do. do.	{ July } { August }	Lat. 30° N.	Lat. 34° N.
South limit line of north-east trade belt.	{ January } { February }	Lat. 0°	Lat. 7° N.
Do. do.	{ July } { August }	Lat. 8°	Lat. 10° N.

From TABLE IV which has, together with TABLE V, been taken from Admiral SOMERVILLE'S "Ocean Passages for the World," it is seen that neither the northern nor southern limiting lines runs straight across the ocean. The Trade Wind belt has an average width, from north to south, of about 22° in latitude throughout the year, and this width is maintained on the meridian of 150° E. while in central and western longitudes it is increased during the summer, from 22° to 24° at longitude 150° W. and from 17° to 23° near the American coast. It will be seen the movement of the southern limit is less than that of the northern limit and also that the movement of both northern and southern limits is less in central longitudes than at either end of the belt. As in the case of the Atlantic Ocean the direction of the wind is successively northerly, N.E. and E. with increasing distance westward from the American coast, and at the western edge of the belt southeasterly winds may be experienced. The Trade is sometimes very strong in the neighbourhood of the Hawaiian Islands.

The South-East Trades.

Only during the southern winter, June, July and August, is there a continuous belt of S.E. wind across the ocean of steady strength. For the remainder of the year there is a region about 600 miles in width stretching south-eastwards across the eastern part of the ocean from the Phoenix Islands on the Equator to the Tuamotu or Low Archipelago and onwards nearly to Easter Island. Over this extensive area the force of the Trade Wind is broken, its direction often changed to N.E. succeeded by calms and followed again by days of S.E. winds in redoubled force. Heavy rain squalls occur. The eastern edge of the S.E. Trade belt is at a distance of about 350 miles from the South American coast and the western edge reaches the north-east coast of Australia and Torres Strait from April to October, but ceases during the rest of the year at about 500 miles from the coast.

Table V.

Limits of the S.E. Trade Wind, Pacific Ocean.

South-east Trade Wind, north and south limits.	At Long. 155° E.	At Long. 130° W.	At Long. 80° W.
North limit line of south-east trade belt.	{ January } { February }	Lat. 3° S.	Lat. 5° N.
Do. do.	{ July } { August }	Lat. 1½° N.	Lat. 9° N.
South limit line of south-east trade belt.	{ January } { February }	Lat. 24° S.	Lat. 25° S.
Do. do.	{ July } { August }	Lat. 21° S.	Lat. 18° S.

The average width of the S.E. Trade belt is about 27°, and thus rather more than in the case of the N.E. belt. It will be seen from TABLE V that the northern limit of the S.E. Trade lies a little north of the Equator save at the western limit during the southern summer. There is practically no movement of the northern limit in longitude 80° W., on the coast of Ecuador but in central and western longitudes the S.E. Trade resembles the N.E. one in that the movement of the polar limit is greater than that of the equatorial limit. At all times of the year the highest north latitude is reached in central latitudes.

Wind Charts of the Pacific Ocean.

No wind charts showing the frequency and strength of wind to 16 compass points such as those available for the South Atlantic and Indian Oceans have yet been constructed for the Pacific Ocean. A small area immediately westward of the west coasts of South America is included in the South Atlantic Charts and in the present volume of the MARINE OBSERVER wind charts for certain months giving accurate data are being published for the region including the tracks from Panama to Australian and New Zealand ports. Of the three portions into which this region is divided only the eastern portion and the more easterly longitude of the middle portion show part of the Trade Wind area. The features of the S.E. Trade Wind are well shown, for example on the chart for March (eastern portion) published in Volume V, No. 49. The gradual backing of the Trade Wind with increasing westerly longitude and southern latitude in accordance with its circulation round the permanent anticyclone is easily seen.

Local Winds.

The violent northerly winds of the Gulf of Tehuantepec occurring chiefly between December and April must not be associated with the Trade Wind, but rather with the "Northerers" of the Gulf of Mexico. Close to the western coast of South America within Trade Wind latitudes the winds are southerly with a proportion both from S.E. and S.W. directions. These winds are analogous to those of similar direction found between the S.E. Trade Wind of the Atlantic and the African coast. The Trade Winds of the islands are dealt with in the third article of the series on Local Winds of the Pacific Ocean, MARINE OBSERVER, Vol. III, pp. 118-119. On the Queensland coast the strongest S.E. Trade is experienced in July and August. It backs to the eastward in September and October and to the north of east in November. Between November and March the Trade Wind is interrupted by the N.W. monsoon, giving more variable winds with a larger proportion of calms.

South Indian Ocean.

THE S.E. Trade Wind of the Indian Ocean is exactly analogous to the Trade Winds of the Atlantic and Pacific Oceans and blows from the eastern and northern sides of the permanent anticyclone lying over the south of the ocean in about latitude 35° S. Here the resemblance with the other oceans ends for there is no N.E. Trade Wind, the region north of the Equator being mainly occupied by the N.E. monsoon, which blows from October to April, and the S.W. monsoon, which blows from May to September. Further points of difference from the other oceans exist in the Doldrums. This region lies to the southward of the Equator, and the S.E. Trade, though it just reaches the Equator on the western side of the ocean, does not cross it. Also during the months of October to March, while the N.E. monsoon is blowing further north and the Trade Wind belt is most southerly, a wide equatorial region is occupied by winds rather variable in character with a predominating north-westerly wind, called the N.W. or middle monsoon. During these months the Doldrums are ill-defined. They may be described as the southern part of the zone of the N.W. monsoon, lying immediately to the north of the Trade Wind belt, where there is on the whole little of the predominating N.W. wind and a larger proportion of calms and variable winds. During the remainder of the year, when the S.W. monsoon is blowing, calms are very rare in the vicinity of the Equator and vessels usually pass from the monsoon to the S.E. Trade with little or no intervening belt. In the longitude of the Seychelles, however, there is generally a zone of separation 40 to 60 miles wide, between latitude 1° and 2° N., characterised by violent squalls from the southward or eastward. It should be noted that

when the Trade Wind belt has moved northward again the S.E. wind is blowing in the region previously occupied by the N.W. wind or the Doldrums. When referring above to the S.E. Trade of the Pacific it was stated that from November to March this wind was not felt within 500 miles of the Queensland coast. During this period the N.W. monsoon of the Indian Ocean extends through the Torres Strait and may be felt in greater or less degree up to the New Hebrides islands.

The Limits and Direction of the S.E. Trade.

The S.E. Trade Wind extends across the Indian Ocean from Madagascar and the coast of Africa to the western coasts of Australia. From May to September it spreads across and between the southern islands of the Eastern Archipelago and northern Australia and becomes during these months continuous with the S.E. Trade Wind of the Pacific. The northern and southern limits do not, during most months of the year, form straight lines parallel to the Equator, especially on the eastern and western sides of the ocean. The belt is narrowest in December, when it is less than 1,000 miles across, and is widest during the southern winter, when it reaches 1,600 or 1,700 miles, the average for the year being 1,200 or 1,300 miles. Both the northern and southern limits extend to the coast of Africa in all months of the year, except during January and September when the northern limit ends on the western coast of Madagascar, and February when this limit does not reach the coast of this island at all; also in December both the northern and southern limits end at the extreme north of the island with a separation of only about 1½° of latitude. The limits, taken from the charts for each month of the year are shown in TABLE VI.

Table VI.

Limits of the S.E. Trade Wind, Indian Ocean.

NOTE.—All Latitudes are South.

Month.	Longitude 50° E.		Longitude 70° E.		Longitude 90° E.		Longitude 110° E.	
	North Limit.	South Limit.	North Limit.	South Limit.	North Limit.	South Limit.	North Limit.	South Limit.
January ...	17½	27½	12	29½	10	31	17	about 35
February ...	—	31½	12	31½	10½	31½	19	about 35
March ...	12	31½	11½	30	11½	32	11	about 35
April ...	6	29	7½	29	6½	30½	8	34
May ...	0	28	4½	29	5	28	3	29½
June ...	5	28	4½	28	7	26	3	25½
July ...	0½	26	1½	26½	4	26½	3	26
August ...	1	27½	2	29	4	28½	3	26
September ...	1	21	2½	27	5½	27	3	27½
October ...	0	26	5	26½	5	28	8	29½
November ...	7½	26	8	26½	7	28	8	29½
December ...	12½	14	8½	21	7	23½	18	29

IN TABLE VI under the meridian of 110° E. where latitude 3° S. occurs, the Trade is blowing in the Java Sea, this being the latitude of the south coast of Borneo on this meridian; where latitude 8° S. occurs the Trade Wind is bounded by the south coast of Java on the same meridian. As in the other oceans the whole system moves northward and southward following the sun, but it will be seen that, contrary to the cases of the Atlantic and Pacific Oceans, the greatest amount of movement is on the equatorial side and the least on the poleward side. As in the South Atlantic and South Pacific Oceans the Trade Wind blows from a southerly direction at its most south-easterly point, in this case off the coast of Australia, and tends at times to be easterly or even north-easterly on the western side near the African coast. In central longitudes the wind is steady, mainly from S.E. and E.S.E., particularly from May to September when the S.W. monsoon is blowing north from the Equator. During the remainder of the year the wind is less stable, more easterly on the whole with a proportion of N.E. and even N. winds. Towards the northern and

southern boundaries of the belt the wind may occasionally even reach the N.W. and in this case it is often broken by calms or gales and is nearly always accompanied by rain or squally weather, with lightning.

Strength of the S.E. Trade.

The average force is Beaufort 4. It should also be noted that winds of gale force may occur in all months of the year over most of the Trade Wind area, whereas in the roses of the South Atlantic and the available portion of the South Pacific, gales are almost entirely absent. It is probable, however, that some of these observations are those made in cyclonic storms within the Trade Wind area. The strength of the Trade does not vary much from month to month, but it is on the whole rather stronger during the prevalence of the S.W. monsoon in June to September.

Local Winds.

At Mauritius the S.E. Trade prevails, with occasional interruptions, throughout the year, blowing usually between S.E. and E.; it is most steady during June, July and August and least steady from November to March. There is a marked diurnal variation, the average for the year being about 8 miles per hour in the early morning and 16 miles per hour about 1 p.m. At Cocos Island the conditions are very similar, the Trade being strongest in August and least strong in February and March. At Christmas Island, the Trade blows from April to November; for the remainder of the year the island is generally in the transitional zone between the Trade and the N.W. monsoon, but sometimes the latter wind definitely prevails.

WEATHER SIGNALS.

II.—WIRELESS WEATHER SIGNALS.

WIRELESS WEATHER BULLETINS.

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

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

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

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.

AZORES.

C.W. Issues.

Pico de Vigario W/T Station, call sign **PQA**, 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,

$1_n 1_n$ BBBDD FwwTT cbWVH, followed by a group of figures relating to cloud observations.

1832 G.M.T. bulletin,

$1_n 1_n$ BBBDD FwwTT cbWVH, followed by groups of figures relating to observations of cloud, rainfall 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 Pico de Vigario 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 XXXIII, and Centigrade degrees to Fahrenheit, Table XXXIV.)

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

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

Wavelength 3,000 metres 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	Burlings 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 G.M.T. Bulletin.

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

1_n1_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. 19, Vol. V, No. 49, of this Journal.

1445 G.M.T. Bulletin.

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

1_n1_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 G.M.T. Bulletin.

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 XXXIII, and degrees Centigrade to Fahrenheit Table XXXIV.)

Monsanto W/T Station also transmits a weather message at 1130 and 2300 G.M.T. en clair, in Portuguese and English, on a wavelength of 1,000 metres (Spark) and 2,400 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 V.

ITALY.

C.W. Issues.

Rome (S. Paolo) W/T Station, approximate Latitude 41° 52' N., Longitude 12° 31' E., call sign **IDO**, broadcasts weather bulletins at 0850 G.M.T. on a wavelength of 4,800 metres (C.W.), and at 1950 G.M.T. on wavelengths of 4,800 metres (C.W.) and 32 metres (C.W.).

The bulletin broadcast at 0850 G.M.T. contains observations of 0700 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° 04' N.	7° 41' E.
02	Milan	45° 28' N.	9° 11' E.
04	Padua	45° 24' N.	11° 52' E.
05	Trieste	45° 39' N.	13° 45' E.
06	Genoa	44° 23' N.	8° 55' E.

Index Number or Letters.	Stations.	Position (approximate).	
		Latitude.	Longitude.
07	Florence	43° 47' N.	11° 14' E.
08	Leghorn	43° 33' N.	10° 18' E.
09	Ancona	43° 37' N.	13° 31' E.
11	Rome	41° 54' N.	12° 27' E.
12	Maddalena	41° 15' N.	9° 25' E.
13	Naples	40° 52' N.	14° 08' E.
15	Cagliari	39° 13' N.	9° 05' E.
16	Messina	38° 12' N.	15° 33' E.
17	Palermo	38° 07' N.	13° 20' E.
19	Taranto	40° 28' N.	17° 15' E.
22	Zara	44° 07' N.	15° 13' E.
30	Tripoli	32° 54' N.	13° 20' E.
31	Benghazi	32° 05' N.	20° 06' E.
TO	Tobruk	32° 04' N.	24° 00' E.

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

0850 and 1950 G.M.T. Bulletins.

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

1_n1_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 XXXV.)

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

EGYPT.

C.W. Issue.

Ismalia W/T Station, approximate Latitude 30° 35' N., Longitude 32° 16' E., call sign **GHK**, broadcasts a weather bulletin at 1100 G.M.T., containing observations from selected stations in List I.

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

List I.

Index Number.	Station.	Position (approximate).	
		Latitude.	Longitude.
683	Sollum	31° 34' N.	25° 12' E.
684	Mersa Matruh	31° 22' N.	27° 14' E.
686	Siwa	29° 12' N.	25° 29' E.
688	Tor	28° 13' N.	33° 37' E.
690	Assiut	27° 11' N.	31° 13' E.
691	Aswan	24° 02' N.	32° 53' E.
692	Wadi Halfa	21° 55' N.	31° 19' E.
693	Port Sudan	19° 37' N.	37° 13' E.
694	Khartoum	15° 37' N.	32° 33' E.
695	Limassol	34° 41' N.	33° 04' E.
696	Aboukir	31° 18' N.	30° 06' E.
697	Heliopolis	30° 05' N.	31° 22' E.
698	Abu Sueir	30° 35' N.	32° 09' E.
739	Candia	35° 20' N.	25° 08' E.
760	Haifa	32° 48' N.	34° 59' E.
762	Ramleh	31° 53' N.	34° 53' E.
763	Amman	31° 57' N.	35° 57' E.
770	Mosul	36° 20' N.	43° 08' E.
771	Kirkuk	35° 28' N.	44° 22' E.
772	Baiji	34° 55' N.	43° 34' E.
773	Palkanah	34° 49' N.	44° 44' E.
774	Baghdad	33° 21' N.	44° 28' E.
775	Diwaniya	31° 58' N.	44° 51' E.
776	Rutbah	33° 00' N.	40° 00' E.
777	Shaibah	30° 26' N.	47° 41' E.

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

Observations from selected stations in List II are also broadcast:—

List II.

Index Number.	Station.	Position (approximate).		
		Latitude.	Longitude.	
151	London ...	51° 21' N.	0° 07' W.	Observations of 0700 G.M.T.
203	Bordeaux ...	44° 50' N.	0° 42' W.	
209	Paris ...	48° 56' N.	2° 26' E.	
210	Lyons ...	45° 45' N.	4° 55' E.	
216	Perpignan ...	42° 43' N.	2° 54' E.	
302	Milan ...	45° 28' N.	9° 11' E.	
306	Genoa ...	44° 23' N.	8° 55' E.	
307	Florence ...	43° 47' N.	11° 14' E.	
309	Ancona ...	43° 37' N.	13° 31' E.	
311	Rome ...	41° 54' N.	12° 27' E.	
312	Maddelena ...	41° 15' N.	9° 25' E.	Observations of 0700 L.M.T.
316	Messina ...	38° 12' N.	15° 33' E.	
319	Taranto ...	40° 28' N.	17° 15' E.	
330	Tripoli ...	32° 54' N.	13° 20' E.	
331	Benghasi ...	32° 05' N.	20° 06' E.	
341	Malta ...	35° 53' N.	14° 31' E.	
520	Prague ...	50° 05' N.	14° 26' E.	
541	Budapest ...	47° 29' N.	19° 03' E.	
575	Bucharest ...	44° 25' N.	26° 05' E.	
661	Tunis ...	36° 46' N.	10° 10' E.	Observations of 0700 G.M.T.
662	Bizerta ...	37° 16' N.	9° 52' E.	
663	Sfax ...	34° 44' N.	10° 45' E.	
664	Médinine ...	33° 14' N.	10° 05' E.	
701	Belgrade ...	44° 47' N.	20° 28' E.	
703	Zagreb ...	45° 49' N.	19° 58' E.	
720	Sofia ...	42° 42' N.	23° 20' E.	
730	Athens ...	37° 57' N.	23° 43' E.	Observations of 0600 G.M.T.
733	Corfu ...	39° 35' N.	19° 55' E.	
740	Angora ...	39° 58' N.	32° 48' E.	
830	Kiev ...	50° 27' N.	30° 30' E.	
831	Koursk ...	51° 45' N.	36° 12' E.	
838	Saratov ...	51° 32' N.	46° 03' E.	
841	Odessa ...	46° 29' N.	30° 44' E.	
843	Rostov ...	47° 13' N.	39° 43' E.	
845	Sebastopol ...	44° 37' N.	33° 31' E.	
848	Stavropol ...	45° 03' N.	41° 39' E.	Observations of 0700 Local Time (Russian).
853	Poti ...	42° 08' N.	41° 36' E.	
855	Petrovsk ...	43° 00' N.	47° 30' E.	
856	Baku ...	40° 21' N.	49° 51' E.	
867	Krasnovodsk ...	40° 00' N.	52° 59' E.	
868	Askhabad ...	37° 57' N.	58° 23' E.	
—	Aden ...	12° 49' N.	45° 02' E.	

The bulletin is broadcast in International Code represented by Key letters as follows:— $I_n I_n B B D D F w_i T T K W$.
NOTE:—Barometric pressure is given in millibars and tenths (to convert to inches, see Table XXXIII) and temperatures in degrees F.

SPECIAL WEATHER TELEGRAPHY TABLES,
NOT INTERNATIONAL CODE.

Table XXXIII.

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 XXXIV.

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 XXXV.

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			

WIRELESS STORM WARNINGS.
ALGERIA.

Oran-Ain-el-Turck W/T Station, approximate Latitude 35° 45' N., Longitude 0° 45' W., call sign FUK, broadcasts storm warnings when necessary at 1400 G.M.T. on a wave length of 1,350 metres. The direction of the centre of the cyclonic depression is transmitted *en clair*.

III. WIRELESS TIME SIGNALS.
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	CQ Time Signal from Lisbon Observatory (in Portuguese).
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	CQ Time Signal from Lisbon Observatory (in Portuguese).
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	CQ Time Signal from Lisbon Observatory (in Portuguese).
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).

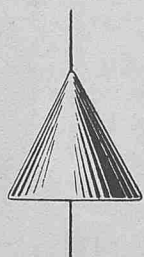
The above time signal is not broadcast without previous warning.

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.

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:—

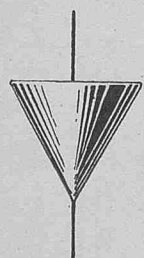


West Coast Signification.

Gale probable from W. to N.

South Coast Signification.

Gale probable from E. to S.



Gale probable from S. to W.

Gale probable from S. to E.

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

SPAIN.

The system of Visual Gale Warnings explained on p. 78 of Vol. V., No. 52 (the April, 1928, 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.

MALTA.

SOUTH CONE.

By Day.



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.

By Night.



NORTH CONE.

By Day.



Hoisted for Gales.

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

By Night.



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.



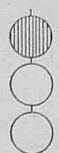
Gale probable, commencing from N.W'd.








Gale probable, commencing from N.E'd.



Signification.

By Night.



ITALY (continued).

By Day.	Signification.	By Night.	By Day.	Signification.	By Night.
	Gale probable, commencing from S.E'd.			Gale probable, direction of wind uncertain.	
	Gale probable, commencing from S.W'd.				

 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 MULHALL, of S.S. *St. Julien*, at Weymouth, on March 17th, 1928, at the age of 60 years is noted with deep regret.

A native of Waterford, Ireland, he served his time in square-rigged sailing ships, and later was an Officer in the BRITISH INDIAN STEAM NAVIGATION COMPANY's service.

In 1897, Captain MULHALL joined the GREAT WESTERN RAILWAY COMPANY's STEAM PACKET service and commanded a number of their cross-channel and Channel Island packets, including *Ibex*, *Reindeer* and *Roebuck*. As senior master in the Weymouth-Jersey service he took command of the new *St. Julien* when she joined the fleet some three years ago and was on the eve of his retirement when his fatal illness occurred.

Captain MULHALL was a member of the Corps of Voluntary Marine Observers since 1920 and the ships under his command contributed many of the valuable reports of conditions observed at the mid-channel position which are so valuable in forecasting wind and visibility for the general information of seamen in the British "Weather Shipping" Bulletin.

A seaman of wide experience and a great expert in the navigation and handling of light high-speed craft he was selected as pilot for the Royal Yacht when His Majesty The King visited the Channel Islands some seven years ago and was in command of the hospital ship *St. Andrew* during the Great War.

Captain MULHALL is followed in his profession by one of his sons who is an Officer in the UNION CASTLE LINE.

SOUTH PACIFIC.

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

JUNE

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

Pitcairn I.

Henderson I.

Rapa I.
Bass Is.
(Marotini)

Maria Theresa Rf.

EXPLANATION OF WIND ROSE.

Each wind rose refers to the ocean areas enclosed by 5° of Latitude and Longitude. The arrows which fly with the wind show by their length the frequency of the winds and by their thickness the various forces; light winds forces 1 to 3, moderate winds 4 to 7, and gales 8 to 12.

Gales Moderate Light.

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

0 25 50 75 100 per cent.

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

SOUTH PACIFIC.

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

MAY, JUNE AND JULY.

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

COOK ISLANDS
Rarotonga

Rapah.

Bass Is.
(Marotini)

Pitcairn I.

Henderson I.

Marie Theresa Rf.

EXPLANATION OF CURRENT ROSES.

The current roses are drawn from
observations within the pecked lines.
Arrows flow with the current, length
represents frequency, thickness strength
6-12 miles per day
13-24 " " "
25-48 " " "
49-72 " " "
73 " " " and above
Distance from tail of arrow to circle represents
5%. Scale 0 10 20 30 40 50%
The upper figure in the centre of the rose
gives total number of observations, the lower
figure the percentage frequency of currents less
than 6 miles per day. The roses are drawn so that
their centres lie within the areas to which they
refer.

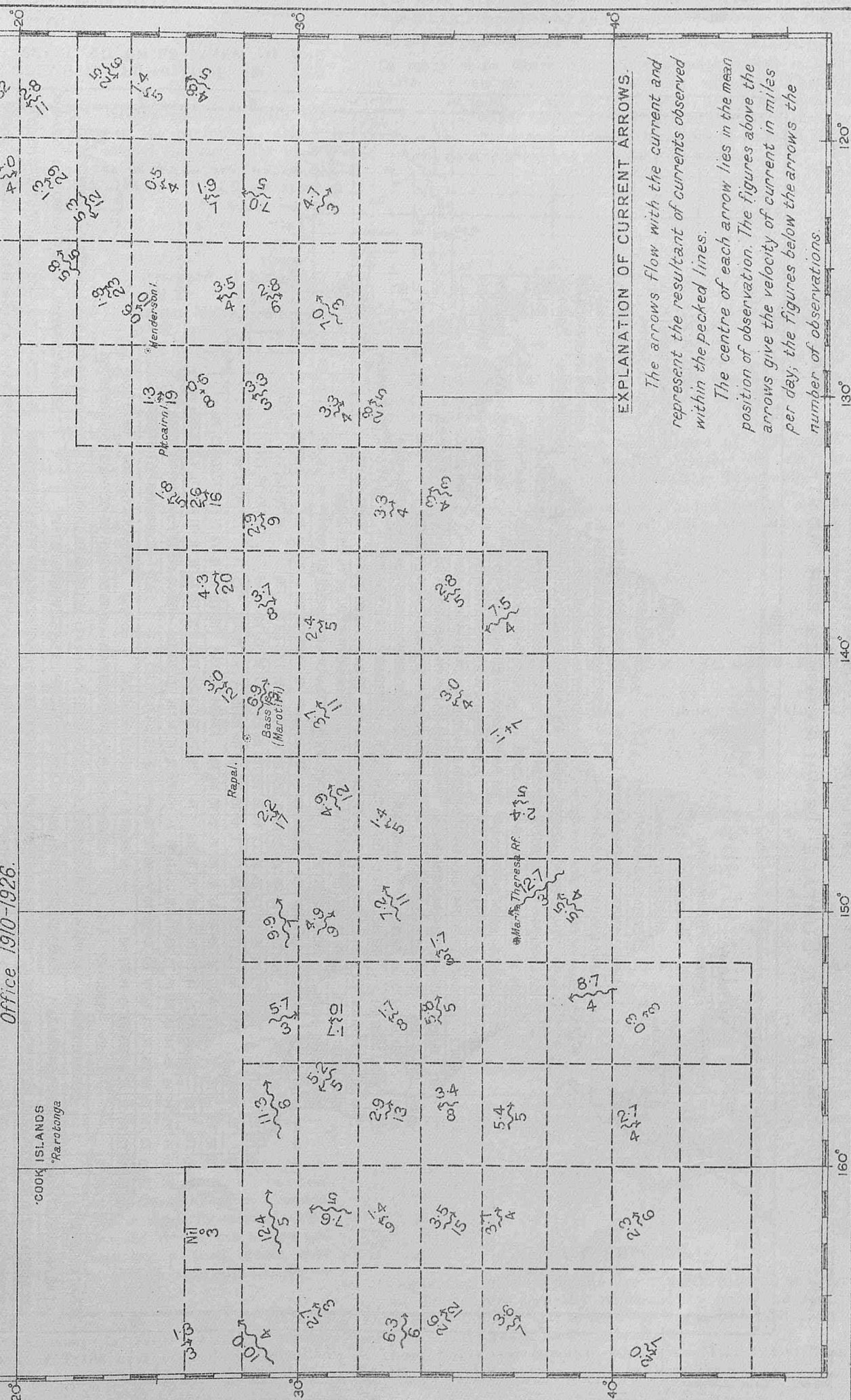
MAXIMUM DRIFTS REPORTED.

Name of Ship	Date Day Year	Middle		Current Set	Wind Dir. Force
		Lat.	Long.		
S.F. Tolmie	13 1924	26° 00' S	128° 13' W	S 82° W	44
Canadian-Scottish	31 1926	29° 09' S	146° 38' W	N 19° W	37

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

MAY, JUNE AND JULY.

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



INDIAN OCEAN.

MEAN SEA SURFACE TEMPERATURES FOR MONTH OF MAY,



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

VERY IMPORTANT. TRIAL.

SPECIAL REQUEST TO SELECTED SHIPS WHEN IN THE MEDITERRANEAN BETWEEN LONGITUDE 0° AND LONGITUDE 20° E.

Ships in the Fleet List in *THE MARINE OBSERVER* with the letters M.L., W.T., or M. appearing in the equipment column, when at sea in the Mediterranean between the meridians of 0° and 20° E. and within Wireless range of Malta are invited to address their routine reports to "All Ships" to CQ as usual. From May 1st, 1928, these reports should also be addressed to GHA. until further notice. The form of report is given on page 18 of the January, 1928, *MARINE OBSERVER* and also in Chapter I of "Wireless and Weather and Aid to Navigation." The times of observation in the Mediterranean to the Westward of Longitude 20° E. for these reports are 0700 and 1800 G.M.T.

From May 1st, 1928, **Calafrana W/T. Station Malta**, Call sign **GHA**. Latitude 35° 54' N., Longitude 14° 31' E. approx., will look out for and receive these reports until further notice.

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

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

"Selected ships" will greatly assist in the furtherance of Wireless and Weather as an Aid to Navigation and in the general application of Meteorology by taking special care in the accuracy of their observations, in drafting their reports and in following closely the above advice during this trial.

There will generally be several "Selected Ships" within range of Malta and their Commanders are asked to instruct their W/T. operators to do all in their power in making these reports to obviate jamming each other during the above specified times.

The fact that "Selected Ships" are sending reliable Weather reports during the above periods will enable other ships to know exactly when to listen for these reports and render unnecessary similar transmissions by them.

If successful this trial may be the means of regulating a system which will be to the general benefit of shipping and seamen and which will be of assistance to airmen and all who require meteorological information from the sea.

Chapter III of "Wireless and Weather an Aid to Navigation" indicates how these reports may be made use of at Malta and in ships and aircraft receiving them.

SELECTED SHIPS.

ROUTINE WIRELESS WEATHER REPORTS.

Importance of Logging Reports made.

At the present time it is more than ever important that "selected ships" should log the routine weather reports made in standard form to all ships.

Specially ruled columns are provided for this purpose at the end of the meteorological log and on Form 911. These columns form a useful key, so that correctly drafted reports will fit into them. The importance, in drafting these reports, of brevity and completeness cannot be overestimated.

With reference to the trial of which notification is given above, the Superintendent of the Meteorological Office at Malta has been requested to forward to the Marine Superintendent in London, copies of all reports intercepted at Malta made by selected ships, with time of receipt. Selected ships should log the exact time and the despatch of each report. By comparison to check errors, time occupied in transit, etc., we shall be able to ascertain the degree of success which this method may give.

Conferences are pending at which endeavour will be made to obtain international organization in ships' wireless weather telegraphy; and the Board of Trade have notified the intention to call a meeting of the International Committee on Safety of Life at Sea.

The work of selected ships may therefore prove of great value in obtaining simplification and seamanlike methods in this matter of ships' weather telegraphy organization.

In many ships where continuous wireless watch is not kept, the times given above are not entirely suitable. This trial is voluntary, as is all the rest of **The Work**. By the sacrifice of a few minutes of a watch below during this trial, where that may be involved, the Officers and Wireless Operators of Selected Ships will be helping to straighten out an invaluable service.

A NEW BOOK.

"Wireless and Weather an Aid to Navigation," the 1st and 2nd Editions of which appeared as serial chapters in Volumes I and IV of *THE MARINE OBSERVER*, is now being published as a separate book for the convenience of all who wish to have the necessary guidance for the practice of this modern application of Marine Meteorology.

The book will also contain descriptions of "Ships' Wireless Weather Signals," "British Wireless Weather Signals" and the decode tables of the "International Weather Telegraphy Code."

It will be obtainable in the course of a few months, on sale from H.M. Stationery Office, to whom all orders should be sent direct or through a bookseller.

BLUE POSTCARD FOR BAROMETER COMPARISON.

Marine Observers will greatly assist by obtaining comparisons with Standard instruments when at suitable ports; also regularly completing and returning the Blue Postcard whether their instruments are M.O. or Ship's.

Form 913.

Barometer Error.

TEST CARD FOR BAROMETER ERROR.

To be forwarded with Logs or Reports to

Meteorological Office,
Air Ministry,
Kingsway, London.

Name of Ship				Ship
Captain				Capt.
In Port of				Port
Mercurial or Aneroid				Date
Maker's Name and No.				Bar. No.
Height above Mean Sea Level .....ft.				..... } Too high
				..... } Too low
Date 192 .	Time.	Barometer readings.	Attached Therm.	At
				Date
				This counterfoil will be returned to Ship.

In British Home Ports please take three readings at 7 a.m. or 6 p.m. G.M.T. If in a colonial or foreign port, read at the Standard Time for Weather Telegraphy observations, see page 17, Vol. V, No. 48, "Marine Observer."

ICE REPORTS.

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

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

ICE CHART. WESTERN NORTH ATLANTIC.

IMPORTANT

ROUTE NOTICES.

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

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

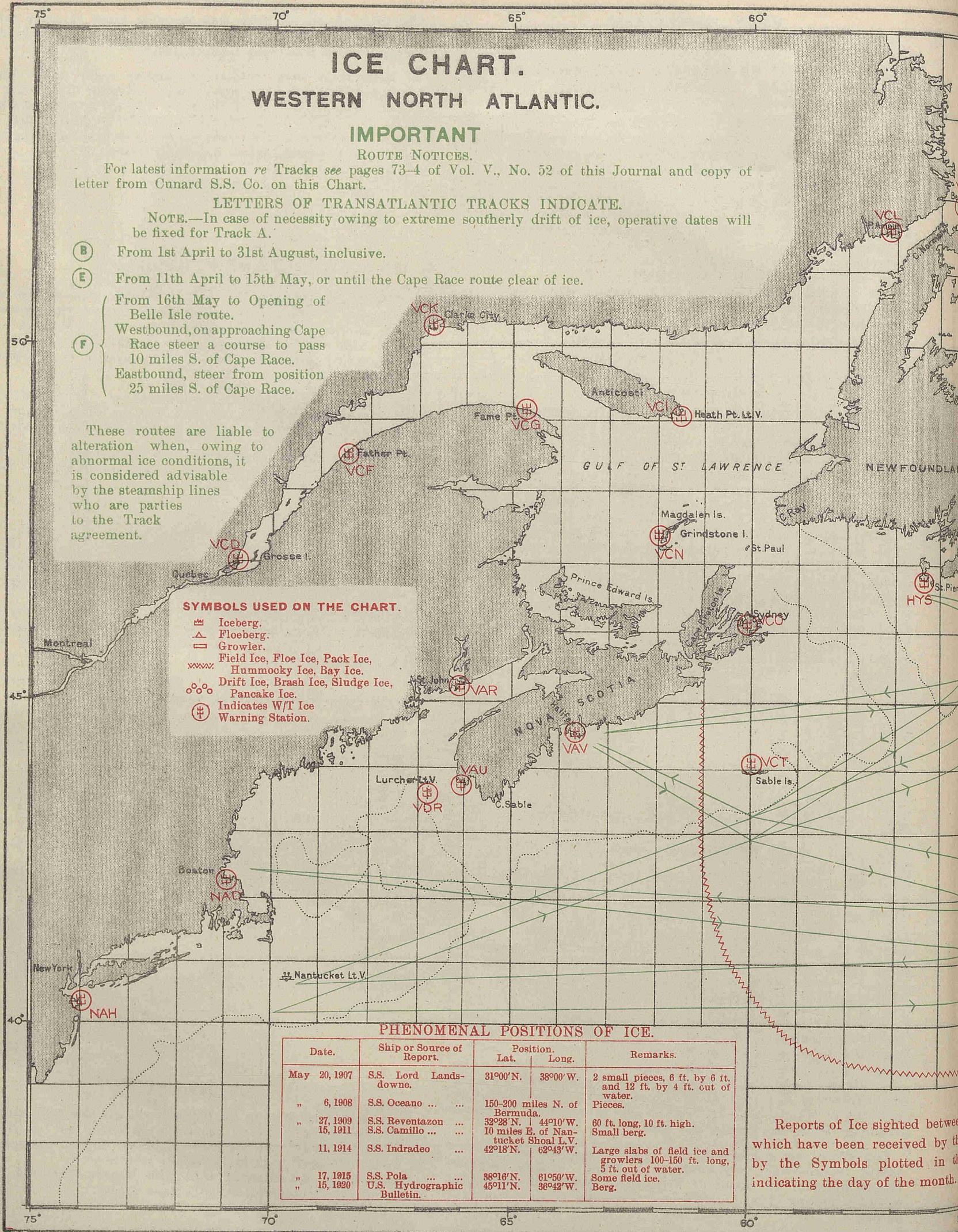
NOTE.—In case of necessity owing to extreme southerly drift of ice, operative dates will be fixed for Track A.

- (B) From 1st April 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.

SYMBOLS USED ON THE CHART.

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



PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position.	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. 1 44°10' W.	80 ft. long, 10 ft. high. Small berg.
" 15, 1911	S.S. Camillo ...	10 miles E. of Nantucket Shoal L.V.	
" 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°18' N. 61°50' W.	Some field ice.
" 15, 1920	U.S. Hydrographic Bulletin.	45°11' N. 38°42' W.	Berg.

Reports of Ice sighted between March 1st and March 31st, 1928, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

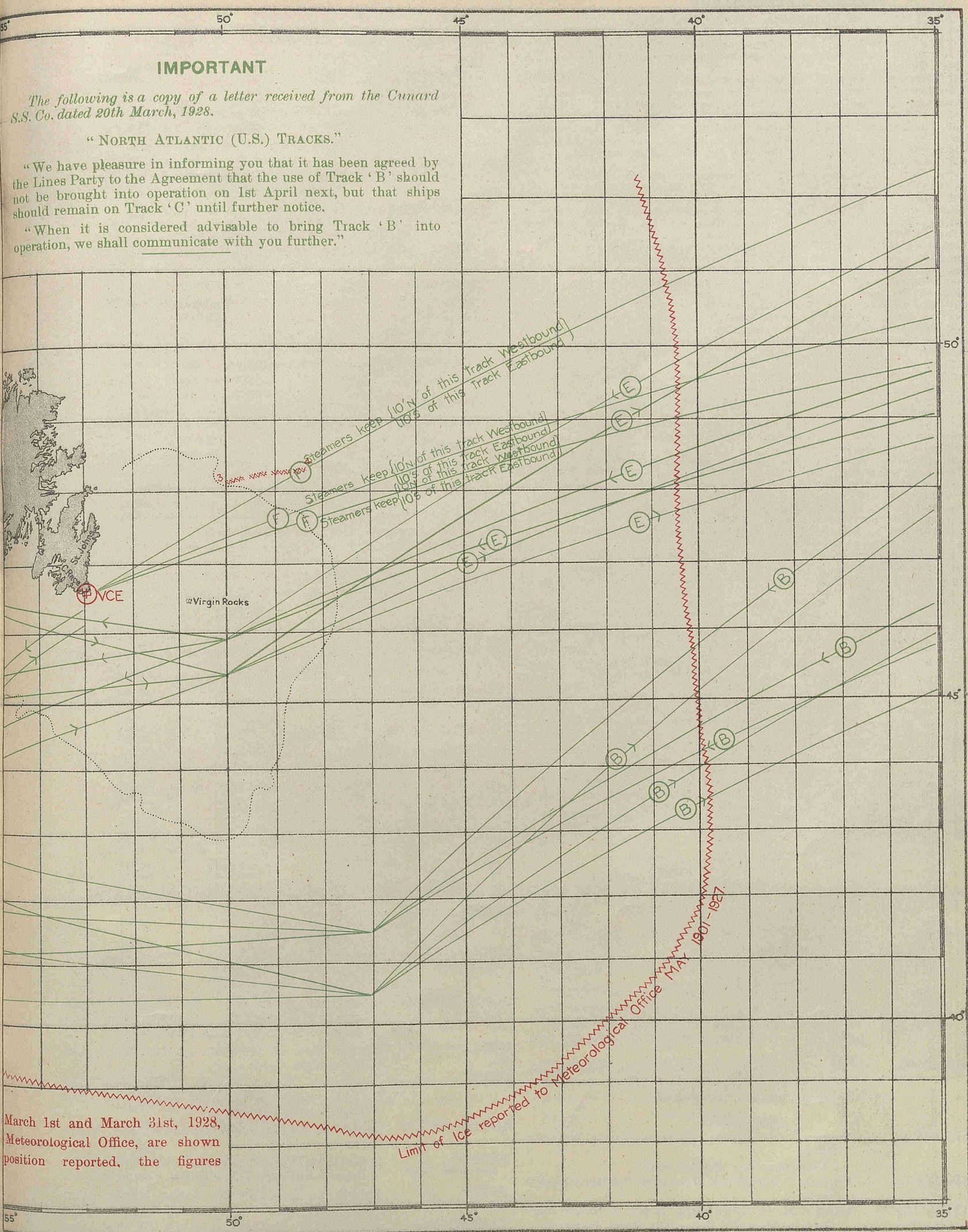
IMPORTANT

The following is a copy of a letter received from the Cunard S.S. Co. dated 20th March, 1928.

"NORTH ATLANTIC (U.S.) TRACKS."

"We have pleasure in informing you that it has been agreed by the Lines Party to the Agreement that the use of Track 'B' should not be brought into operation on 1st April next, but that ships should remain on Track 'C' until further notice.

"When it is considered advisable to bring Track 'B' into operation, we shall communicate with you further."



MARINE METEOROLOGY.

Co-operation of Shipowners, Masters and Mates.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LATE PRESS.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
3.3.28	54°22'N.	0°37'E.	Large piece of floating wreckage, piece of wood 4 ft. square, 40 to 50 ft. long.
ENGLISH CHANNEL.			
1.3.28	50°27'N.	0°50½'W.	Conical buoy with letters <i>C.D.</i>
23.3.28	50°29'N.	1°11'W.	Apparently side of large boat submerged.
MEDITERRANEAN.			
5.3.28	27°45'N.	33°48'E.	Large spherical buoy with vertical stripes.
16.3.28	32°16'N.	30°22'E.	Sch. <i>Saphoschisa</i> abandoned.
16.3.28	38°05'N.	3°43'E.	Wreck of sailing vessel emerging about 2 metres, dangerous to navigation.
22.3.28	6m. S.W. of Planier.		Three wrecks drifting from East to West.
NORTH ATLANTIC.			
2.3.28	51°18'N.	10°55'W.	Large gas buoy covered with barnacles, light cage painted red, dangerous to navigation.
2.3.28	23°27'N.	68°08'W.	Derelict, apparently a schooner bottom up, about 120 ft. long, drifting in southerly direction, dangerous to navigation.
4.3.28	47°20'N.	33°58'W.	Heavy spar apparently attached to wreckage protruding about 4 ft. above water, dangerous to navigation.
12.3.28	46°57'N.	6°46'W.	Buoy with Danzig flag, adrift.
12.3.28	38°36'N.	72°50'W.	Spar about 3 ft. diameter projecting about 6 ft. out of water.
14.3.28	26m. N. by E. of Bishops.		Auxiliary vessel <i>Garthloch</i> , abandoned.
15.3.28	42°08'N.	63°45'W.	Red nun buoy, no marks visible.
GULF OF MEXICO.			
2.3.28	28°47'N.	93°30'W.	Large tree trunk or mast broken off, projecting 8 to 10 ft. out of water, 2 ft. diameter, apparently attached to submerged wreckage.
10.3.28	25°34'N.	85°30'W.	Piece of wreckage about 50 ft. long, 20 ft. wide awash.
NORTH PACIFIC.			
1.3.28	47°54'N.	127°58'W.	Spar about 70 ft. long, 2 ft. diameter.
2.3.28	38°45'N.	124°18'W.	A large and small piece of wreckage.
8.3.28	3°13'N.	88°25'W.	Wooden mast about 30ft. long, floating horizontally, awash.

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

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

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

Agents.

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

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

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

Agents (contd.).

FREMANTLE, W. Australia. Captain J. J. AIREY, Deputy Director of Navigation, Dalgety's Buildings.
 (Telephone No.: B 1063).

HONG KONG, China. Lieut. Commander O. C. G. LEVESON-GOWER, R.N., Superintendent, Admiralty Chart and Chronometer Depot, H.M. Dockyard.

HULL ... Captain Geo. B. STURDY, c/o Mr. W. HAKES, Commercial Road.

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

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

SYDNEY, New South Wales. Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R., Deputy Director of Navigation, Customs House.

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

VANCOUVER, British Columbia. Mr. T. S. H. SHEARMAN, Room 40, Post Office Building.

LIST OF VOLUNTARY OBSERVING SHIPS

i

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

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

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

Only in special cases will individual letters be sent.

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

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

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

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

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

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

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

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

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

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

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

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
<i>Aba</i> ...	Yardley, H. A., D.S.C.	S. J. Bristowe, O. E. Jones,	M.L.	Elder Dempster	Met. Log. 30.3.27 to 26.8.27 ...	15.9.27
<i>Abinsi</i> ...	Williams, T. E. ...	E. E. Roberts.				
<i>Achilles</i> ...	Millson, H. E. ...	G. M. de la Cour ...	No. A.	"	Form 911 25.1.28 to 4.3.28 ...	9.3.28
	Dodds, R. ...	J. Powell, L. Hutchinson,	M.L.	A. Holt	Met. Log. 8.11.27 to 10.1.28 ...	20.2.28
		F. B. Allen, G. M. Kirk.				
<i>Actor</i> ...	Haylett, E. ...	A. Frew, F. M. Eales, G. Morrice.	"	Harrison	" 10.9.27 to 20.12.27...	6.1.28
<i>Adda</i> ...	Toft, J. T. ...	A. E. Longlen, J. S. Turner,	M.L.	Elder Dempster	Form 911 6.7.27 to 3.11.27 ...	14.12.27
50 <i>Adriatic</i> ...	Hickson, V. W., Lieut.-Commr. R.N.R.	R. G. Roberts, O. V. Lucas ...	W.T.	White Star	W.T. Reg. 15.2.28 to 3.3.28 ...	13.3.28
<i>Aeneas</i> ...	Wallace, W. K. ...	E. R. Owen ...	No. A.	A. Holt	Form 911 18.1.28 to 6.2.28 ...	5.3.28
<i>Agapenor</i> ...	Ramsay, J. ...	S. G. Ellams ...	" A.	"	" 7.1.28 to 3.2.28 ...	13.2.28
<i>Aidan</i> ...	Pym, J. ...	J. S. Thompson ...	" A.	Booth	" 29.12.27 to 13.1.28 ...	26.1.28
<i>Alban</i> ...	Barlow, F. P. ...	E. M. Lyons ...	" A.	"	" 4.11.27 to 23.12.27...	11.1.28
<i>Alippo</i> ...	Leggott, W. G. ...	P. B. Hill ...	No. A.	Ellerman Wilson	" 18.12.27 to 27.2.28...	5.3.28
<i>Alipore</i> ...	Smith, H. E., R.D., Lt.-Commr. R.N.R.	D. A. C. Butler, C. H. Stokes	" M.	P. and O.	" 24.8.27 to 24.10.27...	14.11.27
<i>Almanzora</i> ...	Clarke, E. C. ...	D. O. Llewellyn ...	" A.	R.M.S.P.	" 14.5.27 to 27.6.27 ...	29.6.27
63 <i>Albertic</i> ...	Summers, F. F., R.D., Commr. R.N.R.	J. W. Paine, A. E. Dyer, E. Smith.	W.T.	White Star	" 5.11.27 to 21.11.27...	1.12.27
<i>Alondra</i> ...	Scott, L. S. ...	H. Peters ...	No. A.	Yeoward	W.T. Reg 20.2.28 to 11.3.28 ...	14.3.28
<i>Alynbank</i> ...	Clayton, W. E. ...	R. Ardley ...	" A.	A. Weir & Co.	Form 911 28.1.28 to 18.2.28 ...	23.2.28
<i>Ambuscade</i> ...	Abbey, A. T. N., D.S.O., Commr. R.N.	F. G. Bullock ...	M.L.	His Majesty's Ship...	" 29.12.27 to 3.2.28 ...	27.2.28
<i>Ampetco</i> ...	Vandenkerckhove, A.	J. Abicht ...	No. A.	American Petroleum	Form 911 11.12.27 to 27.1.28...	9.2.28
<i>Andalucia</i> ...	Thomas, R. J. ...	C. W. Vaughan, B. May ...	" M.	Blue Star	" 11.12.27 to 27.12.27...	9.2.28
<i>Anchises</i> ...	Woodgett, R. J. ...	" ...	" A.	A. Holt	" 1.10.27 to 21.10.27...	14.11.27
<i>Andes</i> ...	Smith, W. E., D.S.O., R.D., Capt. R.N.R.	H. Whittle ...	M.L.	R.M.S.P. Co.	" 21.1.28 to 5.3.28 ...	7.3.28
<i>Antilochus</i> ...	Salter, G. H. ...	O. P. H. Wynne ...	No. A.	A. Holt	" 30.12.27 to 23.1.28...	6.3.28
<i>Aorangi</i> ...	Crawford, R. ...	G. H. Kime, E. Anderson, E. V. Bilger, W. J. Weber.	M.L.	Canadian-Australasian	Met. Log. 21.9.27 to 5.1.28 ...	7.2.28
30 <i>Aquitania</i> ...	Charles, Sir J. T. W., K.B.E., C.B., R.D., Commr. R.N.R.	J. L. Croasdaile, J. Locke, D. MacLean.	W.T.	Cunard	W.T. Reg. 30.12.27 to 12.1.28...	16.1.28
62 <i>Arabic</i> ...	Bulman, J. B. ...	J. M. Appleby, W. Jackman, W. N. Jenkins.	"	White Star	" 13.2.28 to 3.3.28 ...	6.3.28
<i>Arafura</i> ...	Gordon, A. S. ...	F. O. Colvin, F. R. Miller,	M.L.	Eastern and Australian	Met. Log. 29.7.27 to 25.10.27...	17.12.27
<i>Arawa</i> ...	Diamond, S. L. ...	C. Stratford.	"	Shaw, Savill and Albion	" 30.3.27 to 28.7.27 ...	11.8.27
	Summers, W. G. ...	D. Aitchison, A. C. Jones, J. Jackson.	"			
<i>Archimedes</i> ...	Downs, E. B. ...	" ...	No. A.	Lampart & Holt	Form 911 10.10.27 to 5.1.28 ...	18.1.28
<i>Argyllshire</i> ...	Wallace, J. ...	J. M. Crone ...	" M.	Federal	" 26.9.27 to 14.10.27...	15.11.27
<i>Ariguani</i> ...	Scudamore, J. H. H., D.S.C., R.D., Commr. R.N.R.	G. McKee, J. L. Owen, S. K. Scott, A. J. J. Moar.	M.L.	Elders & Fyfes	Met. Log. 26.9.27 to 4.2.28 ...	8.2.28
<i>Ariosto</i> ...	Biggins, R. L. ...	F. E. Whitfield ...	No. A.	Ellerman Wilson	Form 911 25.12.27 to 21.1.28...	13.2.28
<i>Armada Castle</i> ...	Imlah, C. B. ...	E. Roach, G. D. Pennick, E. Fullick.	M.L.	Union Castle	Met. Log. 12.11.27 to 4.3.28 ...	8.3.28
<i>Arracan</i> ...	Duncan, S. S. ...	J. Summers, J. Henderson, C. C. Weir.	"	P. Henderson	" 5.5.27 to 19.9.27 ...	29.9.27
<i>Arundel</i> ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly.	Telegraphic Report 16.3.28 ...	16.3.28
<i>Arundel Castle</i> ...	Knight, A. ...	R. May ...	No. A.	Union Castle	Form 911 30.12.27 to 15.1.28...	18.1.28
<i>Astronomer</i> ...	Richards, J. ...	A. Browne, C. C. Heaton, H. M. Fitz-Simons.	M.L.	Harrison	Met. Log. 28.10.27 to 7.1.28 ...	13.1.28
<i>Ascanius</i> ...	Wilson, C. A. ...	T. Robb, J. B. Marshall, W. Cook.	"	A. Holt	" 31.10.27 to 5.3.28 ...	14.3.28
<i>Athenic</i> ...	Binks, J. W. ...	W. Hill ...	No. A.	White Star	Form 911 20.2.28 to 7.3.28 ...	9.3.28
<i>Atreus</i> ...	Rundle, R. R. ...	R. B. Ansell ...	" A.	A. Holt	" 18.1.28 to 2.2.28 ...	5.3.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
<i>Atsuta Maru</i> ...	Narui, N. ...	K. Fuse ...	No. A.	Nippon Yusen Kaisha	Form 911 16.7.27 to 15.8.27 ...	19.11.27
<i>Auditor</i> ...	Owen, W. T. ...	L. A. Bennett ...	" M.	Harrison ...	" 13.9.27 to 13.12.27 ...	17.12.27
<i>Autolyceus</i> ...	Dunlop, J. K. ...	" ...	" A.	A. Holt ...	" 26.1.28 to 9.2.28 ...	12.3.28
<i>Ausonia</i> ...	Stafford, W. D.S.C., R.D., Lt.-Commr., R.N.R.	J. J. Wiseman ...	" A.	Cunard ...	" 21.8.27 to 8.10.27 ...	11.10.27
<i>Avon</i> ...	Spriddell, F. G., R.D., Commr., R.N.R.	R. H. East, J. E. P. Matthews	" M.	R.M.S.P. ...	" 25.12.27 to 5.2.28 ...	8.2.28
<i>Balmoral Castle</i> ...	Chave, Sir B., K.B.E.	C. S. Keen ...	" A.	Union Castle ...	" 30.12.27 to 16.1.28 ...	6.2.28
<i>Balmoral</i> ...	Townshend, W. P., Commr., R.N.R.	C. Hammen, F. Ward, R. E., Cowell, J. C. Davis, L. S. Bailey.	M.L.	P. & O. Branch ...	Met. Log. 9.6.27 to 13.10.27 ...	22.11.27
<i>51 Baltic</i> ...	White, E. R., R.D., Commr., R.N.R.	J. Law, N. E. Banks, N. L. Mackie.	W.T.	White Star ...	W.T. Reg. 29.11.27 to 18.12.27 ...	29.12.27
<i>Bampton Castle</i> ...	Hutchings, A. H. ...	" ...	No. A.	Union Castle ...	Form 911 27.11.27 to 21.12.27 ...	29.12.27
<i>Banbury Castle</i> ...	Swiney, W. A. ...	C. G. Cuthbertson ...	" A.	" ...	" 17.9.27 to 14.10.27 ...	24.10.27
<i>Banffshire</i> ...	Wynne, R. H. ...	W. F. Lockhead ...	" A.	Turnbull Martin ...	" 21.4.27 to 9.5.27 ...	9.6.27
<i>Baradine</i> ...	Rollo, W. ...	B. H. Pollitt, E. Bolton-Smith, G. C. Case, C. B. Roche.	M.L.	P. & O. Branch ...	Met. Log. 1.9.27 to 4.1.28 ...	20.2.28
<i>Barpeta</i> ...	Strachan, J. ...	B. R. Faithfull ...	No. M.	British India ...	Form 911 11.1.28 to 9.2.28 ...	27.2.28
<i>Barrabool</i> ...	Rhodes, H. R. ...	G. S. B. Collard ...	" M.	P. & O. Branch ...	" 13.1.28 to 29.1.28 ...	5.3.28
<i>Baychimo</i> ...	Cornwall, S. A. ...	W. H. Deans ...	" A.	Hudson's Bay Co. ...	" 7.7.27 to 14.9.27 ...	13.10.27
<i>59 Belgenland</i> ...	Morehouse, W. A. ...	F. Good, W. E. Hesketh ...	W.T.	Red Star ...	W.T. Reg. 5.12.27 to 11.12.27 ...	30.12.27
<i>Beltana</i> ...	Allin, C. H. C. ...	D. M. Stafford ...	No. M.	P. & O. Branch ...	Form 911 4.12.27 to 11.1.28 ...	30.1.28
<i>Benalder</i> ...	Fairweather, J. J. ...	" ...	" A.	Ben Line ...	" 3.1.28 to 5.2.28 ...	12.3.28
<i>Benalla</i> ...	Sheepwash, J. ...	S. W. Du Fosse ...	" M.	P. & O. Branch ...	" ...	"
<i>Benlago</i> ...	Nicholl, E. N. C. ...	R. M. Richardson ...	" M.	" ...	" 16.12.27 to 8.1.28 ...	20.2.28
<i>Benfactor</i> ...	Jones, C. W. ...	A. Watson ...	" M.	Harrison ...	" 15.12.27 to 29.1.28 ...	7.2.28
<i>Bengloe</i> ...	McCorquodale, A. ...	J. Davidson ...	" A.	Ben Line ...	" 14.1.28 to 27.1.28 ...	6.2.28
<i>31 Berengaria</i> ...	Rostron, Sir A. H., K.B.E., R.D., Capt. R.N.R.	J. A. Myles, W. C. A. Robson, S. A. T. Bullock.	W.T.	Cunard ...	W.T. Reg. 2.2.28 to 16.2.28 ...	20.2.28
<i>Berrima</i> ...	Short, C. E. ...	A. Hughes ...	No. M.	P. & O. Branch ...	Form 911 7.10.27 to 12.11.27 ...	16.11.27
<i>Bogota</i> ...	Pape, E. R. ...	" ...	" M.	R.M.S.P. Co. ...	" 23.12.27 to 12.1.28 ...	6.2.28
<i>Borda</i> ...	Holland, R. ...	" ...	" M.	P. & O. Branch ...	" 18.2.27 to 28.6.27 ...	7.7.27
<i>Bothwell</i> ...	Rothwell, A. J. ...	- Biggs ...	" A.	Canadian Pacific ...	" 6.3.27 to 14.4.27 ...	20.4.27
<i>Brecon</i> ...	Rothwell, A. ...	E. H. Coleman ...	" A.	" ...	" 5.5.27 to 6.6.27 ...	14.6.27
<i>Brenda</i> ...	Lamont, A. ...	N. Ross ...	" A.	Scottish Fishery Board.	" 1.2.28 to 28.2.28 ...	2.3.28
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	C.C.	Southern Railway ...	Telegraphic Report 15.3.28 ...	15.3.28
<i>British Colonel</i> ...	Taylor, R. J. ...	" ...	No. M.	British Tankers ...	Form 911 3.1.28 to 25.1.28 ...	2.2.28
<i>British Consul</i> ...	Putt, R. O. ...	" ...	" M.	" ...	" ...	"
<i>British Engineer</i> ...	Joures, F. W. ...	W. Evans ...	" M.	" ...	" 11.2.27 to 26.2.27 ...	25.5.27
<i>Bronte</i> ...	Crappier, J. S. ...	J. B. Scott ...	" A.	Lampert & Holt ...	" 25.11.27 to 21.12.27 ...	29.12.27
<i>Bruyere</i> ...	Birch, A. ...	J. C. Turner ...	" A.	" ...	" ...	"
<i>Bulysse M.V.</i> ...	Carey, J. ...	A. J. Clatworthy ...	" M.	Anglo-Saxon Petroleum Co.	" 19.1.28 to 25.2.28 ...	9.3.28
<i>Cambria</i> ...	Copland, C. P. ...	O. W. Ll. Jones ...	C.C.	L.M. & S. Rly ...	Telegraphic Report 15.3.28 ...	15.3.28
<i>Cameronia</i> ...	Gemmell, W. ...	" ...	No. A.	Anchor ...	Form 911 22.2.28 to 11.3.28 ...	16.3.28
<i>Camito</i> ...	Forrester, W. T., O.B.E.	H. H. Dunning, J. McIntyre, C. M. Schofield.	M.L.	Elders & Fyffes ...	Met. Log. 2.8.27 to 26.11.27 ...	15.2.28
<i>Canadian Importer</i> ...	Forson, A. ...	" ...	No. A.	Canadian Gov. Mercantile Marine.	Form 911 22.12.27 to 6.2.28 ...	27.2.28
<i>Canadian Inventor</i> ...	Boulton, F. W. ...	O. D. Alcorn ...	" A.	" ...	" 17.9.27 to 30.10.27 ...	19.11.27
<i>Canadian Scottish</i> ...	Wallace, C. ...	" ...	" M.	" ...	" 26.5.27 to 11.7.27 ...	19.8.27
<i>Canadian Winner</i> ...	Boulton, F. W. ...	" ...	" M.	" ...	" 14.1.28 to 9.2.28 ...	5.3.28
<i>Canonesa</i> ...	Brodie, W. H. ...	F. W. Kent ...	" M.	Furness Houlder ...	" 20.12.27 to 12.1.28 ...	13.1.28
<i>Cape of Good Hope</i> ...	Lamont, J. ...	" ...	No.	Lyle S.S. Co. ...	" ...	"
<i>35 Carmania</i> ...	Brown, F. G., R.D., Capt., R.N.R.	W. M. Stewart, P. L. Williams, D. E. Sibson.	W.T.	Cunard ...	W.T. Reg. 20.2.28 to 9.3.28 ...	15.3.28
<i>Carnarvon Castle</i> ...	Strong, H., R.D., Commr., R.N.R.	H. A. Deller, E. Fullick, W. G. Smith, J. B. McReynolds.	M.L.	Union Castle ...	Form 911 7.8.27 to 26.8.27 ...	30.8.27
<i>34 Caronia</i> ...	Hossack, W. H., R.D., Capt., R.N.R.	H. G. Hayward, D. McMillan, T. Parry.	W.T.	Cunard ...	W.T. Reg. 6.2.28 to 25.2.28 ...	2.3.28
<i>Casanare</i> ...	Steidelmann, H. ...	R. O. Jones ...	No. A.	Elders & Fyffes ...	Form 911 6.2.28 to 26.2.28 ...	2.3.28
<i>Cavina</i> ...	Riseley, A. D. ...	R. L. Stevenson ...	" A.	" ...	" 25.6.27 to 11.9.27 ...	16.9.27
<i>52 Cedric</i> ...	Smith, R. G. ...	S. S. Fieldwood, D. W. Chamberlain, J. Smith.	W.T.	White Star ...	" 29.1.28 to 3.3.28 ...	7.3.28
<i>53 Celtic</i> ...	Berry, G. ...	A. Thompson, D. K. Crawford, A. R. Stevens.	"	" ...	W.T. Reg. 5.12.27 to 25.12.27 ...	29.12.27
<i>Centaur</i> ...	Rose, A. F. ...	L. Johnstone, E. D. Potts, N. L. Thompson.	M.L.	A. Holt & Co. ...	Form 911 4.2.28 to 4.3.28 ...	8.3.28
<i>Ceramic</i> ...	Roberts, J., C.B.E., D.S.O., R.D., Capt., R.N.R.	" ...	No. A.	White Star ...	W.T. Reg. 13.2.28 to 4.3.28 ...	7.3.28
<i>Change</i> ...	Gambrill, F. C. ...	- Thomas, A. Johnston, - Baigent.	M.L.	Yuill & Co. ...	" 11.3.27 to 20.8.27 ...	11.1.28
<i>Changuinola</i> ...	Thorburn, R. A., R.D., Commr., R.N.R.	W. G. Chanter ...	No. A.	Elders & Fyffes ...	Met. Log. 16.8.27 to 9.12.27 ...	1.2.28
<i>China</i> ...	Sudell, F., R.D., Commr., R.N.R.	L. Porter ...	" M.	P. & O. ...	Form 911 24.1.28 to 25.2.28 ...	29.2.28
<i>Chindwin</i> ...	Esslemont, C. ...	" ...	" A.	Henderson ...	" 25.7.27 to 11.8.27 ...	8.10.27
<i>Chirripo</i> ...	McColm, F. ...	H. Rawston, R. Laycock ...	" A.	Elders & Fyffes ...	" 4.9.27 to 16.11.27 ...	5.12.27
<i>City of Baroda</i> ...	McMillan, J. ...	A. Beaton, - Hodgkinson, W. A. Lambert.	M.L.	Ellerman ...	Met. Log. 22.1.28 to 26.2.28 ...	5.3.28
<i>City of Benares</i> ...	Anderson, W. W. ...	F. Forsyth ...	No. A.	" ...	Met. Log. 17.11.27 to 1.2.28 ...	8.2.28
<i>City of Brisbane</i> ...	Seaborne, F. O., D.S.C.	D. W. F. Reilly ...	" A.	" ...	Form 911 2.10.27 to 18.1.28 ...	6.2.28
<i>City of Canterbury</i> ...	Bremner, D. M. ...	R. H. Hodgson ...	" A.	" ...	" 28.9.27 to 30.10.27 ...	4.11.27
<i>City of Carlisle</i> ...	Mordue, J. A. ...	" ...	" A.	" ...	" 24.1.28 to 25.2.28 ...	12.3.28
<i>City of Chester</i> ...	Letton, F. W. ...	C. C. Duncan, A. J. Barnett, R. Mowbray.	M.L.	" ...	" 20.12.27 to 12.1.28 ...	16.1.28
<i>City of Edinburgh</i> ...	Wyper, J. ...	G. Hummell ...	No. M.	" ...	Met. Log. 28.4.27 to 22.9.27 ...	28.10.27
<i>City of Hong Kong</i> ...	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	" ...	" A.	" ...	Form 911 25.11.27 to 18.12.27 ...	9.1.28

LIST OF VOLUNTARY OBSERVING SHIPS

iii

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
<i>City of London</i> ...	Parker, F. W., R.D., Commr., R.N.R.	H. D. Asher	No. A.	Ellerman	Form 911 28.9.27 to 22.12.27... ..	29.12.27
<i>City of Rangoon</i> ...	Jones, P.	E. R. Wildermath, R. W. May, R. H. Stewart.	M.L.	"	Met. Log. 4.7.27 to 5.1.28	1.2.28
<i>City of Venice</i> ...	Lee, A.	"	No. A.	"	Form 911 18.2.28 to 1.3.28	12.3.28
<i>City of Yokohama</i> ...	Singleton, J. G. ...	R. Willott Leese	" A.	"	" 2.2.28 to 15.2.28	2.3.28
<i>Clan Alpine</i> ...	Lyall, A. B.	K. M. Banks	" A.	Clan	" 25.1.28 to 14.2.28	12.3.28
<i>Clan Lamont</i> ...	Urquhart, P., D.S.O.	P. de Gruchy	" A.	"	" 19.11.27 to 26.12.27	16.1.28
<i>Clan Lindsay</i> ...	Giles, H. J., R.D., Commr., R.N.R.	E. P. Smith	" A.	"	" 13.1.28 to 6.2.28	27.2.28
<i>Clan MacBean</i> ...	Worthington, J. H. ...	"	No.	"	"	"
<i>Clan Macbeth</i> ...	Pagan, C. C.	T. A. Watkinson	" A.	"	" 1.2.28 to 27.2.28	14.3.28
<i>Clan Macfadyen</i> ...	Stenson, F. J., R.D., Capt. R.N.R.	C. M. B. Cumberlege ...	" A.	"	" 7.9.27 to 23.12.27	4.1.28
<i>Clan Macfarlane</i> ...	Redford, —	"	" A.	"	"	"
<i>Clan Macgillivray</i> ...	West, W. F.	R. W. Roberts	" A.	"	" 27.4.27 to 24.5.27	20.6.27
<i>Clan Macindoe</i> ...	West, W. F.	D. McAllister	" A.	"	" 20.11.27 to 20.12.27	2.1.28
<i>Clan Mackellar</i> ...	Smith, W. P.	G. A. A. Grant	" A.	"	" 24.12.27 to 23.1.28	13.2.28
<i>Clan Macphie</i> ...	Gourlay, J. B.	D. S. Rae, A. F. Martin, W. A. Shewan.	M.L.	"	Met. Log. 14.5.26 to 2.5.27	9.6.27
<i>Clan Macnaughton</i> ...	Simpson, A. W.	D. D. Ingram	No. A.	"	Form 911 11.12.27 to 12.2.28... ..	14.2.28
<i>Clan Macnagart</i> ...	Makepeace, F.	E. A. Hewson	" A.	"	" 8.1.28 to 1.2.28	27.2.28
<i>Clan Macwhirter</i> ...	Waterhouse, J.	W. A. Robbie, E. A. Brown, D. Timms.	M.L.	"	Met. Log. 11.2.27 to 15.8.27... ..	23.8.27
<i>Clan Malcolm</i> ...	Neill, G. A.	D. A. Stark, H. V. Wightman, M. Carlton.	"	"	" 28.8.27 to 24.12.27... ..	11.2.28
<i>Clan Morrison</i> ...	Porterfield, W. M. ...	"	No. A.	"	Form 911 2.1.28 to 13.1.28	23.1.28
<i>Clan Murdoch</i> ...	Miller, W.	H. F. M. Preston	" A.	"	" 18.12.27 to 12.1.28... ..	15.2.28
<i>Clan Randal</i> ...	Laird, C.	F. D. Bonney	" A.	"	" 26.11.27 to 8.12.27... ..	29.12.27
<i>Clan Ross</i> ...	Openshaw, L. G. ...	J. R. Elliott	" A.	"	" 28.12.27 to 22.1.28	26.1.28
<i>Clan Sinclair</i> ...	George, L. S.	N. Macleod	" A.	"	" 20.12.27 to 13.1.28	21.1.28
<i>Clan Urquhart</i> ...	Baker, E. W.	W. A. Shewan	" A.	"	" 18.2.28 to 2.3.28	14.3.28
<i>Comorin</i> ...	Borland, J. McI., C.B., D.S.O., R.D., Capt. R.N.R.	E. C. White, R. V. Alexander	No M.	P. & O.	Form 911 30.11.27 to 12.1.28... ..	18.1.28
<i>Concordia</i> ...	Telfer, J. H.	W. Law, L. H. Hobson, A. Banks, J. H. Blackwood.	M.L.	Anchor Donaldson ...	Met. Log. 27.7.27 to 4.1.28	16.1.28
<i>Corinthic</i> ...	Hart, F.	I. A. Macnaughton	" A.	White Star	" 17.9.27 to 8.1.28	10.1.28
<i>Cornwall</i> ...	Wilde, H. J.	H. M. Knight	No. A.	Federal	Form 911 11.12.27 to 11.1.28... ..	12.3.28
<i>Crawford Castle</i> ...	Morgan, A. O., R.D., Commr., R.N.R.	J. A. Wilson	" A.	Union Castle	" 30.10.27 to 1.12.27... ..	15.12.27
<i>Culebra</i> ...	Rathkins, C.E.	P. Cooper, R. N. Fletcher, W. S. Thomas.	M.L.	R.M.S.P. Co.	Met. Log. 5.11.27 to 12.1.28	24.1.28
<i>Cumberland</i> ...	Macmillan, D.	"	No. A.	Federal... ..	Form 911 31.10.27 to 8.12.27... ..	6.2.28
<i>Cuthbert</i> ...	Lee, O. J. P., R.D., Commr., R.N.R.	"	" A.	Booth	" 31.12.27 to 26.2.28... ..	6.3.28
<i>Cyclops</i> ...	Cosker, W.	"	" A.	A. Holt	" 25.12.27 to 28.2.28... ..	16.3.28
<i>Dakotian</i> ...	Robb, J.	"	No. A.	Leyland	"	"
<i>Dardanus</i> ...	Clarke, J. W.	"	" A.	A. Holt	Form 911 21.1.28 to 2.2.28	23.2.28
<i>Darian</i> ...	Masters, W.	"	" A.	Leyland	" 12.11.27 to 24.11.27	5.12.27
<i>Darro</i> ...	Matthews, G. P.	"	" A.	R.M.S.P. Co.	" 30.12.27 to 15.2.28... ..	20.2.28
<i>Demerara</i> ...	Willan, F. G. L., R.D., Capt. R.N.R.	F. Jeyes	" A.	"	" 13.12.27 to 4.2.28	7.2.28
<i>Demosthenes</i> ...	Ogilvy, A.	J. Cruickshank	" M.	Aberdeen	" 18.12.27 to 28.1.28... ..	5.3.28
<i>Desado</i> ...	Hannam, F. S.	L. D. Jennings, A. Barff	" M.	R.M.S.P. Co.	" 7.1.28 to 2.3.28	5.3.28
<i>Desna</i> ...	Green, J.	L. G. Peterson	" M.	"	" 15.11.27 to 5.1.28	11.1.28
<i>Deucalion</i> ...	Melling, C. F.	R. Wilson... ..	" A.	A. Holt	" 5.2.28 to 18.2.28	23.2.28
<i>Dieppe</i> ...	Marmery, S.	Mr. Parsons	C.C.	Southern Railway ...	Telegraphic Report 6.2.28	6.2.28
<i>Dimboola</i> ...	Roy, C. M.	P. W. Rendall	No. A.	Melbourne S.S. Co. ...	Form 911 22.12.27 to 18.1.28... ..	5.3.28
<i>Discoverer</i> ...	Ling, J. T.	H. W. Gostage	" M.	Harrison	" 8.4.27 to 9.7.27	12.7.27
<i>Domala, M.V.</i> ...	Kitson, A. G.	J. G. Wallace	" M.	British India... ..	" 8.7.27 to 18.9.27	10.10.27
<i>Dominia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr., R.N.R.	H. Hutchins, T. J. C. Dexter, J. Dyer.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 4.1.28 to 24.1.28	1.3.28
<i>Dominic</i> ...	Harris, F. C. P.	"	No. A.	Booth	Form 911 2.2.28 to 19.2.28	9.3.28
<i>61 Doric</i> ...	Bolton, S., D.S.O., R.D., Commr., R.N.R.	B. Harrison, A. E. Dyer, G. T. Kavanagh.	W.T.	White Star	W.T.Reg. 30.10.27 to 19.11.27	24.11.27
<i>Dorington Court</i> ...	Clarke, E. J.	"	No. A.	Haldin & Co.	Form 911 30.10.27 to 19.11.27	1.12.27
<i>Dromore Castle</i> ...	MacMahon, J.	D. P. Klasen	" A.	Union Castle	" 28.10.27 to 28.2.28... ..	14.3.28
<i>Dryden</i> ...	Major, T. W.	"	" M.	Lampart & Holt	" 8.10.27 to 20.10.27... ..	12.11.27
<i>Dunaff Head</i> ...	Milner, T. F., R.D., Lt.-Commr., R.N.R.	S. Duff	" A.	Ulster S.S. Co.	" 11.12.27 to 5.1.28	9.1.28
<i>Dundrum Castle</i> ...	Weller, H. E.	H. H. F. Trew	" A.	Union Castle	" 6.12.27 to 14.1.28	13.2.28
<i>Dunluce Castle</i> ...	Gardner, G. F.	F. O. Wilbrabam	" A.	"	" 21.8.27 to 23.9.27	24.10.27
<i>Dunrobin</i> ...	Ramsay, J. D.	C. H. Kendall	" A.	Glen & Co.	" 6.1.28 to 25.1.28	27.1.28
<i>Duquesa</i> ...	Ellis, F., D.S.O.	E. W. Denman	" M.	Furness Withy	" 25.1.28 to 23.2.28	12.3.28
<i>Durenda</i> ...	Beeching, P. H.	"	" M.	British India... ..	" 7.11.27 to 4.1.28	9.1.28
<i>Edinburgh Castle</i> ...	Owen, S.	T. N. McAllen	" A.	Union Castle	" 19.10.27 to 17.11.27	8.12.27
<i>Egori</i> ...	Sola, P., D.S.O.	F. J. Croft	" A.	Elder Dempster	" 5.8.27 to 25.9.27	3.10.27
<i>El Paraguay</i> ...	Fletcher, G.	F. F. Feint, D. Murray ...	" M.	Houlder Bros.	" 8.1.28 to 26.1.28	13.2.28
<i>Elpenor</i> ...	Gordon, A. L.	M. Robertson, C. Kavanagh	M.L.	A. Holt	Met. Log. 23.10.27 to 15.12.27	20.12.27
<i>Elysia</i> ...	Duncan, A. R.	A. Laidlaw, H. C. Fry, D. F. White.	"	Anchor	" 8.9.27 to 23.12.27	4.1.28
<i>Empress of Asia</i> ...	Douglas, L. D., R.D., Lt.-Commr., R.N.R.	R. H. Foley, L. C. Hogg, T. M. W. Golby, M. Fawcett.	"	Canadian Pacific	" 11.11.27 to 14.1.28... ..	25.1.28
<i>Empress of Canada</i> ...	Hailey, A. J.	A. G. Simmons	"	"	" 9.6.27 to 1.10.27	4.11.27
<i>Empress of France</i> ...	Griffiths, E.	O. F. Pennington, E. Roberts, W. Ewens.	"	"	" 30.6.27 to 22.10.27... ..	28.11.27
<i>Empress of Russia</i> ...	Hosken, A. J.	L. C. Barry, R. A. Leicester, J. S. Clarke, J. H. Reich.	"	"	" 30.4.27 to 18.10.27... ..	31.10.27
<i>Endeavour</i> ...	Commr. S. A. Geary-Hill, D.S.O., R.N.	C. S. E. Lansdown	"	His Majesty's Ship ...	" 19.5.27 to 9.11.27	16.12.27
<i>Essequibo</i> ...	Kite, E.	J. H. Lowe	No. M.	R.M.S.P. Co.	" 14.3.27 to 11.7.27	19.7.27
<i>Eumaeus</i> ...	Read, J. W.	"	" A.	A. Holt	Form 911 6.10.27 to 15.11.27... ..	5.12.27
<i>Euripides</i> ...	Collins, P. J., O.B.E.	K. D. Fisher, P. Congdon, A. J. Parry.	M.L.	Aberdeen	Met. Log. 3.8.27 to 1.12.27	8.12.27
					" 17.9.27 to 24.1.28	2.2.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
<i>Euryades</i> ...	Findlay, J. ...	... ..	No. A.	A. Holt ...	Form 911 5.2.28 to 28.2.28 ...	12.3.28
<i>Explorer</i> ...	Ling, J. T. ...	A. M. Hughes ...	" M.	Harrison ...	" 6.8.27 to 4.11.27 ...	15.11.27
<i>Explorer</i> ...	Allan, J. ...	A. Stout ...	" A.	Scottish Fishery Board.	" 2.12.27 to 7.3.28 ...	14.3.28
<i>Ferndale</i> ...	Daniel, F. ...	R. S. Hartrick ...	" M.	Commonwealth Govt.	" 21.12.27 to 23.1.28 ...	5.3.28
<i>Flandria</i> ...	Maars, L. ...	C. Van Otterloo ...	" M.	Holland Lloyd ...	" 27.12.27 to 8.2.28 ...	24.2.28
<i>Francisco</i> ...	Scales, H. ...	F. Elgin ...	" A.	Ellerman Wilson ...	" 24.1.28 to 1.3.28 ...	16.3.28
<i>Freya</i> ...	Angus, W. ...	W. Pirrie ...	" A.	Scottish Fishery Board.	" 1.2.28 to 17.2.28 ...	2.3.28
<i>Gaika</i> ...	Jackson, C. R. ...	L. G. May ...	" A.	Union Castle ...	" 11.9.27 to 4.11.27 ...	7.11.27
<i>Gallymore</i> ...	Yeoman, J. T. ...	... ..	" M.	Furness Withy ...	" 25.9.27 to 24.11.27 ...	1.12.27
<i>Garth Castle</i> ...	Jackson, C. R. ...	W. S. J. Aldous ...	" A.	Union Castle ...	" 28.5.27 to 18.6.27 ...	22.6.27
<i>Gascoyne</i> ...	Johnson, L. ...	... ..	" M.L.	A. Holt & Co. ...	" ... ..	...
<i>Gelria</i> ...	Veldkamp, C. J. ...	... ..	No. M.	Holland Lloyd ...	Form 911 20.1.28 to 8.3.28 ...	12.3.28
<i>Geranium</i> ...	Bennett, H. T., D.S.O., Commr. R.A.N.	... ..	" M.L.	His Majesty's Australian Ship.	" ... ..	...
<i>Glamorganshire</i> ...	Spriddell, F. G., R.D., Commr. R.N.R.	T. G. S. Cairns ...	No. M.	R.M.S.P. Co. ...	Form 911 21.10.27 to 27.11.27 ...	8.12.27
<i>Glenamoy, M.V.</i> ...	Homan, C. E. ...	R. H. Bishop ...	" M.L.	Glen Line ...	" 17.8.27 to 22.10.27 ...	4.11.27
<i>Glenagarry</i> ...	Angier, J. ...	F. C. White ...	No. M.	" ...	" 7.2.28 to 15.2.28 ...	27.2.28
<i>Glenluce</i> ...	Kennett, W. H. ...	H. B. Porter ...	" A.	" ...	" 26.1.28 to 14.2.28 ...	12.3.28
<i>Glenishane</i> ...	Beer, E. ...	... ..	" A.	" ...	" 26.11.27 to 19.12.27 ...	16.1.28
<i>Gloucestershire</i> ...	Robin, E. ...	C. F. Hicks ...	" A.	Bibby ...	" 8.10.27 to 16.12.27 ...	20.12.27
<i>Glochina</i> ...	Pool, F. G. ...	... ..	" A.	Stag Line ...	" 4.2.28 to 19.2.28 ...	9.3.28
<i>Grantully Castle</i> ...	Whitfield, G. T. ...	R. Wren ...	" A.	Union Castle ...	" 3.6.27 to 14.8.27 ...	17.8.27
<i>Greenbrier</i> ...	McColm, F. ...	J. B. Wookey ...	" A.	Elders & Fyfes ...	" 24.7.27 to 28.8.27 ...	5.9.27
<i>Halestus</i> ...	Samuels, C. ...	R. W. Cook, J. Kelly ...	" A.	R. P. Houston ...	" 15.11.27 to 2.1.28 ...	27.1.28
<i>Haliartus</i> ...	Marsh, L. V. ...	W. H. Upton ...	" A.	" ...	" 31.10.27 to 27.11.27 ...	23.2.28
<i>Harmonides</i> ...	Hughes, W. F. ...	S. S. Davidson ...	" A.	" ...	" 10.4.27 to 2.5.27 ...	16.5.27
<i>Hatimura</i> ...	Lane, S. R., R.D., Capt. R.N.R.	... ..	" M.	British India ...	" 27.11.27 to 6.1.28 ...	6.2.28
<i>Hauraki, M.V.</i> ...	Hannafor, J. ...	T. Marshall ...	" M.L.	Union S.S. Co., N.Z. ...	Met. Log. 25.3.27 to 1.11.27 ...	21.1.28
<i>Henry Holmes, C.S.</i> ...	Bicker Caarten, A. ...	M. A. Green ...	No. M.	W. I. & Panama Telegraph Co.	Form 911 13.12.27 to 20.1.28 ...	13.2.28
<i>Herald</i> ...	Haselfoot, F.E.B., Capt. R.N.	D. G. V. Williams ...	" M.L.	His Majesty's Ship ...	Met. Log. 18.10.27 to 19.11.27 ...	31.1.28
<i>Herefordshire</i> ...	Mann, R. P. ...	M. D. Louttill ...	No. A.	Bibby ...	Form 911 1.10.27 to 9.12.27 ...	12.12.27
<i>Hermindus</i> ...	Roberts, T. V. ...	D. W. MacGregor ...	" A.	Shaw, Savill & Albion ...	" 17.1.28 to 4.2.28 ...	27.2.28
<i>Herschel</i> ...	Watson, W. W. ...	J. F. Maurey ...	" A.	Lampport & Holt ...	" 24.7.27 to 11.1.28 ...	20.1.28
<i>Hertford</i> ...	Urquhart, D. ...	... ..	" A.	Federal ...	" 13.12.27 to 3.1.28 ...	13.2.28
<i>Hibernia</i> ...	Roberts, W. Ivor, M.B.E.	R. Woodall, A. Marsh ...	" C.C.	L.M. & S. Railway ...	Telegraphic Report 14.3.28 ...	14.3.28
<i>Highland Laddie</i> ...	Jones, T. J. ...	N. F. Seaton ...	No. A.	Nelson ...	Form 911 24.10.27 to 11.12.27 ...	23.12.27
<i>" Piper</i> ...	Collings, D. ...	S. E. Jackson, R. G. Owen, A. Southgate.	" M.L.	" ...	Met. Log. 13.5.27 to 4.11.27 ...	1.12.27
<i>" Pride</i> ...	Robinson, R. H. ...	... ..	No. A.	" ...	Form 911 16.12.27 to 11.2.28 ...	14.2.28
<i>" Prince</i> ...	Marshall, J. ...	J. Harrison ...	" A.	Prince ...	" 13.1.28 to 1.2.28 ...	6.3.28
<i>" Rover</i> ...	Ashby Graves, F. ...	C. C. Legg ...	" A.	Nelson ...	" 17.7.27 to 3.9.27 ...	22.9.27
<i>Hildebrand</i> ...	Maddrell, J. ...	A. G. Malcolm ...	" A.	Booth ...	" 16.11.27 to 30.12.27 ...	2.1.28
<i>Hobson's Bay</i> ...	Kydd, O. J. ...	R. Pearce, H. Benson, K. McKenzie.	" M.L.	Commonwealth Govt.	Met. Log. 4.10.27 to 7.1.28 ...	13.1.28
<i>Holbein</i> ...	Leicester, F. S. ...	C. E. Legg, A. J. Corney ...	No. A.	Lampport & Holt ...	Form 911 27.10.27 to 15.1.28 ...	13.1.28
<i>54 Homeric</i> ...	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	H. G. Morgan, S. B. Morfee, W. T. Poustie.	" W.T.	White Star ...	W.T. Reg. 12.1.28 to 25.1.28 ...	8.2.28
<i>Horvata</i> ...	Holland, E. ...	A. E. Bamforth ...	No. A.	New Zealand S.S. Co.	Form 911 29.10.27 to 8.3.28 ...	12.3.28
<i>Hubert</i> ...	Evans, L. ...	W. H. Cross ...	" A.	Booth ...	" 23.12.27 to 11.1.28 ...	13.1.28
<i>Huntingdon</i> ...	Ashworth, W. ...	H. G. Letts ...	" A.	Federal ...	" 29.11.27 to 21.12.27 ...	6.2.28
<i>Huntsman</i> ...	Russell, H. ...	J. Richardson ...	" M.	Harrison ...	" 6.12.27 to 14.2.28 ...	23.2.28
<i>Huruni</i> ...	Upton, E. C. S. ...	J. Oxnard, F. Longheed, G. R. Hogg, K. Goldsworthy.	" M.L.	New Zealand S.S. Co.	Met. Log. 12.8.27 to 5.2.28 ...	10.2.28
<i>Hydaspes</i> ...	Williams, — ...	... ..	No. M.	R. P. Houston ...	" ... ..	...
<i>Ingoma</i> ...	Barrow, R. K. ...	D. G. Russell ...	" M.	Harrison ...	Form 911 16.12.27 to 2.2.28 ...	6.2.28
<i>Inkum</i> ...	Meetham, J. T. ...	H. Johnson ...	" A.	J. H. Welsford ...	" 7.1.28 to 21.1.28 ...	24.1.28
<i>Iris, C.S.</i> ...	Hughes, H. R. ...	W. Oliver, D. Bruce, D. Macdonald, T. Vickers.	" M.L.	Pacific Cable Board ...	Met. Log. 17.11.26 to 24.3.27 ...	11.10.27
<i>Iroquois</i> ...	Jackson, A. L., Commr. R.N.	H. L. Jenkins ...	"	His Majesty's Ship ...	" 2.8.27 to 21.11.27 ...	31.1.28
<i>Ixion</i> ...	Reed, G. C. ...	... ..	No. A.	A. Holt ...	Form 911 20.11.27 to 2.1.28 ...	7.2.28
<i>Japanese Prince</i> ...	Naylor, E. ...	W. Venn ...	" A.	Prince ...	" 20.11.27 to 21.11.27 ...	13.2.28
<i>Jervis Bay</i> ...	Chaplin, W. R. ...	R. W. Laycock ...	" M.	Commonwealth Govt.	" 10.12.27 to 19.12.27 ...	9.1.28
<i>Justin</i> ...	Bush, H. ...	A. Blewett ...	" A.	Booth ...	" 4.1.28 to 20.1.28 ...	25.1.28
<i>Kaisar-i-Hind</i> ...	Manley, G. ...	R. H. Hand ...	" M.	P. & O. ...	" 27.11.27 to 17.1.28 ...	20.1.28
<i>Kalyan</i> ...	Cornwall Jones, B. ...	S. Kenans ...	" M.	P. & O. ...	" 26.11.27 to 13.1.28 ...	13.2.28
<i>Kamo Maru</i> ...	Enya, S. ...	... ..	" A.	Nippon Yusen Kaisha	" 19.11.27 to 22.12.27 ...	8.2.28
<i>Kangaroo</i> ...	(Buckeridge, G. ... Turner, J. E. ...)	E. Hutchinson, J. Kavanagh, H. Brackenridge.	" M.L.	State Service Australia.	Met. Log. 4.5.27 to 5.9.27 ...	25.10.27
<i>Karapara</i> ...	Miller, A. C. ...	... ..	No. M.	British India ...	Form 911 16.1.28 to 4.2.28 ...	20.2.28
<i>Kashmir</i> ...	Mallalae, R., R.D., Lt.-Commr. R.N.R.	A. J. McHattie ...	" M.	P. & O. ...	" 13.1.28 to 1.2.28 ...	27.2.28
<i>Kenilworth Castle</i> ...	Chave, Sir B., K.B.E.	R. C. Longman, L. A. J. Keeble, W. Dryden, W. Wyeth.	" M.L.	Union Castle ...	Met. Log. 18.4.27 to 8.8.27 ...	19.10.27
<i>Kent</i> ...	Matthews, C. ...	W. C. Wilkinson ...	No. A.	Federal ...	Form 911 21.12.27 to 24.1.28 ...	31.1.28
<i>Khiva</i> ...	Cooper, C. P., O.B.E., R.D., Capt. R.N.R.	G. W. Wood, D. Meakle, E. Allen, V. A. Nicolls.	" M.L.	P. & O. ...	Met. Log. 8.6.27 to 14.8.27 ...	19.8.27
<i>Khyber</i> ...	Hester, C. W., R.D., Commr. R.N.R.	C. S. Pirie, J. D. Hornidge, H. T. Toon.	"	P. & O. ...	" 29.7.27 to 6.11.27 ...	16.11.27
<i>Knight Companion</i> ...	Cox, B. T., D.S.O. ...	J. H. Isherwood ...	No. M.	A. Holt ...	Form 911 23.8.27 to 26.1.28 ...	31.1.28
<i>Koolinda, M.V.</i> ...	Buckeridge, J. ...	... ..	" M.	State Service, Australia.	" 12.2.27 to 20.12.27 ...	23.1.28
<i>Kovno</i> ...	Dossor, W. A. ...	A. Snowden, S. N. Stokes, N. W. Glendenning, S. Butcher.	" M.L.	Ellerman Wilson ...	Met. Log. 18.6.27 to 20.12.27 ...	6.1.28
<i>37 Laconia</i> ...	Britten, E. T., R.D., Commr. R.N.R.	J. Ashcroft, E. W. Connell, J. O. Chambers.	" W.T.	Cunard ...	W.T. Reg. 2.1.28 to 8.1.28 ... Form 911 1.1.28 to 7.1.28 ...	25.1.28 26.1.28

V

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
Laguna	Mander, T.	R. H. A. Clark	No. A.	Pacific S.N. Co.	Form 911 29.11.27 to 14.12.27	2.1.28
Lahore	Pigott, L. D.	E. B. Elcoate	" M.	P. & O.	" 10.12.27 to 22.12.27	2.1.28
Lalande	Hamill, H.	A. E. Warburton	" A.	Lamport & Holt	" 5.11.27 to 27.1.28... ..	20.2.28
Lancashire	Crumplin, W. E.	R. Allen	" A.	Bibby	" 6.11.27 to 12.1.28	17.1.28
36 Lancastria	Oram, B.B., R.D., Commr., R.N.R.	R. P. Cambell, L. R. Sharp, F. G. Russell.	W.T.	Cunard	W.T. Reg. 16.12.27 to 7.1.28	13.1.28
Laomedon	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	H. A. Standfield	No. A.	A. Holt... ..	Form 911 21.1.28 to 17.2.28	27.2.28
La Paz, M.V.	Benson, C. W.	D. Beamer	" M.	Pacific S.N. Co.	" 30.11.27 to 19.12.27	4.1.28
Laplace	Hickman, V. G.	A. L. Murray, R. D. Cottam	" A.	Lamport & Holt	" 15.4.26 to 28.6.27	30.8.27
55 Lapland	Thomas, A. J.	B. Harries, F. Wills, L. A. Williams.	W.T.	Red Star	W.T. Reg. 26.12.27 to 10.2.28... ..	15.2.28
64 Laurentic	Trant, E. L., R.D., Commr., R.N.R.	J. W. Peters.	"	White Star	Form 911 21.1.28 to 10.2.28	13.2.28
Lavtaro, M.V.	Dunn, R. E., O.B.E....	E. Sandon	No. M.	Pacific S.N. Co.	" 2.1.28 to 28.1.28	27.2.28
Leicestershire	de Legh, P.	R. S. Evans H. G. Walton, J. K. Gemmell, G.W. Hunter.	M.L.	Bibby	Met. Log. 29.6.27 to 25.7.27	8.9.27
Leighton, M.V.	Lindesay, J. M.	R. L. Hagley	No. A.	Lamport & Holt	" 18.12.27 to 22.2.28... ..	7.3.28
Leitrim	Kemp, E. R.	C. R. Brown	" A.	Dowie, J., & Co.	Form 911 4.1.28 to 21.1.28	9.2.28
Lepanto	Williams, J. C.	G. W. Revell	" A.	Ellerman Wilson	" 2.11.27 to 17.11.27... ..	23.11.27
Llandaff Castle	Morton Betts, W.	R. Bayer	" A.	Union Castle	" 6.1.28 to 16.2.28	23.2.28
Llanfowery Castle	Kerbey, J. H.	C. H. Williams, G. Moon, E. M. Betts.	M.L.	" "	" 29.12.27 to 15.1.28... ..	14.2.28
Loch Katrine	Buret, T. J. C.	R. A. Stenhouse	No. A.	R.M.S.P. Co.	Met. Log. 15.12.27 to 20.2.28... ..	1.3.28
London Commerce	Young, H. J., D.S.C....	W. Edmonds	" A.	Furness Withy	Form 911 11.11.27 to 3.2.28	16.2.28
London Importer	Frost, C. R.	H. J. Anstice, J. H. Metcalfe, J. G. Freeman.	M.L.	" "	Met. Log. 19.8.27 to 19.9.27	26.9.27
Lori Antrim	Jarvis, F. E.	L. G. Kirwan	No. A.	Ulster S.S. Co.	" 8.9.27 to 13.2.27	13.12.27
Loriga, M.V.	Clapham, E. C.	R. W. Gill	" A.	Pacific S.N. Co.	Form 911 27.4.27 to 10.5.27	23.5.27
Losada, M.V.	Ross, J.	J. T. Denley	" M.	" "	" 23.12.27 to 17.2.28... ..	20.2.28
Macedonia	Potter, H. W., R.D., Commr., R.N.R.	C. J. L. Hayward	" M.	P. & O.	" 29.6.27 to 1.10.27	13.10.27
Macharda	Tyers, W. O.	W. Spencer	" M.	Brocklebank	" 22.1.28 to 9.2.28	12.3.28
Maharani	Elliot, G. F.	M. Haslett	" M.	Asiatic S.N. Co.	" 10.11.27 to 6.12.27... ..	12.12.27
Mahia	McIntosh, A.	" "	M.L.	Shaw, Savill & Albion	" 14.10.27 to 23.12.27	16.1.28
Mahronda	Addy, M. J.	" "	No. M.	Brocklebank	" " " " " " " " " "	" " " " " " " "
Maihar	Charlton, W. L.	C. Shaw, C. Cadwallader, S. S. Slade.	M.L.	" "	Met. Log. 1.10.27 to 25.12.27... ..	2.1.28
Maimyo	Smith, G. C.	H. M. Drummond	No. A.	Burns Philp	Form 911 16.7.27 to 8.10.27	11.10.27
Maiwara	Blain, A. W.	W. W. Pearson, L. Thompson,	M.L.	White Star	Met. Log. 1.3.26 to 27.4.26	29.2.28
58 Majestic	Metcalfe, G. R.	W. T. Fitz Gerald	W.T.	" "	W.T. Reg. 5.1.28 to 19.1.28	21.1.28
Makambo	Brown, T. M.	F. C. Vogelmann, R. W. Holmes, T. MacRae.	M.L.	Burns Philp	Met. Log. 15.3.27 to 15.8.27	11.10.27
Makura	Mawson, J.	A. Champion, D. Burgess, W. J. Weber, A. Gell.	"	Canadian-Australasian	" 16.6.27 to 30.9.27	28.11.27
Malabar	Hillman, E. J.	N. Grayson	No. M.	Burns, Philp & Co.	Met. Log. 11.5.27 to 22.11.27... ..	29.2.28
Malakuta	Adamson, F. L.	R. Humble	" M.	Brocklebank	Form 911 6.2.28 to 25.2.28	5.3.28
Malancha	Whitham, F.	S. G. James	" M.	British India	" 30.1.28 to 27.2.28	9.3.28
Malda	Gray, T. N.	A. D. Dennis	" M.	P. & O.	" 26.12.27 to 31.1.28... ..	27.2.28
Maloja	Warner, S. C.	" "	" M.	" "	" 22.12.27 to 26.1.28... ..	31.1.28
Malwa	Norman, W. A.	P. Campbell	" M.	" "	" " " " " " " " " "	" " " " " " " "
Mamari	Falconer, H.	W. S. Eustance	" A.	Shaw, Savill & Albion	" 19.7.27 to 22.9.27	27.9.27
Manchester Brigade	Stott, C. H.	" "	M.L.	Manchester Liners	" 10.1.28 to 18.2.28	23.2.28
Manchester Corporation	Williams, H.	" "	No. A.	" "	" 16.1.28 to 2.3.28	19.3.28
Manchester Hero	Riley, J. E.	H. Anderton, J. H. Emmett, A. W. Hanchett.	M.L.	" "	Met. Log. 6.9.27 to 18.2.28	23.2.28
Manchester Producer	Struss, F.	" "	No. A.	" "	" " " " " " " " " "	" " " " " " " "
Manchester Regiment	Foale, J. R.	P. D. Barr	" A.	" "	Form 911 4.2.28 to 9.3.28	14.3.28
Maniwar	Cochran, G. N.	R. Penston, G. B. Falconer	No. M.	Brocklebank	" 23.1.28 to 21.2.28	12.3.28
Maniwar tee	Steidelmann, H.	" "	M.L.	Elders & Fyffes	" " " " " " " " " "	" " " " " " " "
Manora	Hudson, H. T. R.D., Commr., R.N.R.	" "	No. M.	British India... ..	Form 911 4.11.27 to 28.11.27... ..	6.1.28
Mantua	Randell, G. G.	D. B. Leader, H. Tee	" M.	P. & O.	Form 911 6.8.27 to 29.9.27	3.10.27
Marrella	Mortimer, S.	A. G. Hill, R. Duddell, A. G. Thomas.	M.L.	Burns Philp	Met. Log. 4.5.27 to 28.9.27	28.11.27
Marengo	Curle, J.	H. Bryan, J. Ford, F. Barnard,	"	Ellerman Wilson	" 2.12.27 to 12.3.28	16.3.28
Maresfield	Jones, T. E.	" "	No. A.	Woods, Tyler & Brown	Form 911 14.1.28 to 14.2.28	9.3.28
Margha	Baird, S. K.	P. Wright, H. E. Evans, C. C. Hughes, C. G.	M.L.	British India... ..	Met. Log. 6.11.27 to 4.2.28	15.2.28
Marquesa	Smiles, R. S.	" "	No. M.	Furness Houlder	Form 911 13.11.27 to 12.1.28	17.1.28
Matakana	Thurston, H. P.	J. Hart, J. Dickson, C. E. Mayer.	M.L.	Shaw, Savill & Albion	Met. Log. 17.10.27 to 27.2.28... ..	2.3.28
Mataroa	Kershaw, W. A. R.	T. T. Oliver, J. J. Nicoll, J. Worrall.	M.L.	Shaw, Savill & Albion	Met. Log. 19.8.27 to 5.12.27	10.12.27
Matheran	Ison, W. A.	L. Jeans, H. Simpson, J. Richardson	No. M.	Brocklebank	" 7.6.27 to 4.1.28	10.1.28
Matiana	Green, F. V.	J. R. Precious	No. M.	British India... ..	Form 911 20.12.27 to 12.2.28... ..	20.2.28
Matra	Cornish, N. P.	" "	" M.	Brocklebank	" " " " " " " " " "	" " " " " " " "
Maunganui... ..	Davey, A. H.	F. Gibson, V. Knight, H. Kemp.	" M.	Union S.S. Co. of N.Z.	" 29.4.27 to 22.7.27	5.9.27
32 Mauretania	McNeil, S.G.S., R.D., Capt., R.N.R.	J. A. Quarrie, G. Duguid, C. B. Osborne.	W.T.	Cunard	W.T. Reg. 9.2.28 to 27.2.28	6.3.28
Medic	Jones, W. H.	W. Nicoll... ..	No. A.	White Star	Form 911 10.3.27 to 18.4.27	21.4.27
Megantic	Trant, E. L., R.D., Commr., R.N.R.	" "	" A.	" "	" 30.7.27 to 20.8.27	24.8.27
22 Melita	Stewart, A.	J. Shearer	W.T.	Canadian Pacific	W.T. Reg. 5.2.28 to 21.2.28	29.2.28
Memnon	Dougall, W. T.	J. A. C. MacGregor	No. A.	A. Holt... ..	Form 911 10.2.28 to 28.2.28	7.3.28
21 Metagama	Freer, A., Capt., R.N.R.	A. M. Watt, J. Haines	W.T.	Canadian Pacific	W.T. Reg. 29.1.28 to 17.2.28	23.2.28
Middlesex	MacRae, A., D.S.C., Lt.-Commr., R.N.R.	C. Roberts	No. M.	Federal... ..	Form 911 10.11.27 to 26.11.27	1.12.27
Minna	Mackenzie, G. G.	A. M. Campbell	" A.	Scottish Fishery Board.	Form 911 23.1.28 to 20.2.28	23.2.28
Minnesota	Finch, E.	R. Everard	No. M.	Atlantic Transport... ..	" 12.12.27 to 31.12.27	4.1.28
Minnetonka	Gates, T. F., C.B.E..	A. C. Clay	" M.	" "	" 13.2.28 to 3.3.28	7.3.28
Minnewaska	Claret, F. H., C.B.E., Commr., R.N.R.	F. J. Mummery	" M.	" "	" 30.1.28 to 18.2.28	23.2.28
Mirror, C.S.	Gibson, L.	A. G. Watts	" M.	Eastern Tel. Co.	" 8.3.27 to 17.3.27	8.4.27
Mississippi	Wylie, J. T. J.	" "	" M.	Atlantic Transport	" 6.11.27 to 15.11.27	26.11.27
Modona	Gilchrist, J. W.	R. E. T. Parsons	" M.	British India	" " " " " " " " " "	" " " " " " " "

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
Moldavia ...	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	W. L. Dobbin ...	No. M.	P. & O. ...	Form 911 27.11.27 to 9.2.28 ...	15.2.28
Mongolia ...	Furlong, G. H. S., R.D., Capt., R.N.R.	... ..	" M.	" " " " " "	" " " " " "	"
Mongolian Prince	Edwards, W. ...	V. E. Palmer ...	" A.	Prince ...	Form 911 24.12.27 to 19.1.28 ...	7.2.28
24 Montcalm ...	Hamilton, G. ...	H. McFadyen ...	W.T.	Canadian Pacific	W.T. Reg. 1.1.28 to 20.1.28 ...	24.1.28
25 Montclare ...	Griffiths, J. N. ...	A. Mansey, F. E. Bevis, C. Draper.	"	" " " " " "	" " " " " "	15.3.28
27 Montnairn ...	Notley, A. H., R.D., Commr., R.N.R.	K. Hutchings, E. A. Shergold, W. S. Roberts.	W.T.	Canadian Pacific	W.T. Reg. 20.2.28 to 8.3.28 ...	14.3.28
Montoro ...	Williams, D. J. ...	J. Campbell ...	No. A.	Burns, Philp & Co. ...	Form 911 18.2.28 to 8.3.28 ...	12.3.28
26 Montrose ...	Landy, E. ...	A. Watt ...	W.T.	Canadian Pacific	Form 911 13.12.27 to 17.1.28 ...	5.3.28
20 Montroyal	Sibbons, H. ...	R. Antrobus ...	"	" " " " " "	W.T. Reg. 25.12.27 to 12.1.28 ...	17.1.28
Moresby ...	Edgell, J. A., O.B.E., Capt., R.N.	W. H. Martin ...	M.L.	His Majesty's Australian Ship.	Met. Log. 27.9.27 to 8.11.27 ...	12.11.27
	Henderson, D. A., Commr., R.N.				29.8.27 to 15.12.27 ...	23.1.28
Morvada ...	Mills, T. L., O.B.E., R.D., Commr., R.N.R.	D. S. Johnston ...	No. M.	British India ...	Form 911 20.7.27 to 16.10.27 ...	24.10.27
Mulbera ...	Steadman, W. R. ...	N. Clarkson ...	" M.	" " " " " "	" " " " " "	13.2.28
Nagara ...	Foster, E. ...	C. K. Brown ...	" M.	R.M.S.P. Co. ...	" " " " " "	26.1.28
Nagoya ...	Bedwell, L. A. ...	T. A. Sergeant ...	" M.	P. & O. ...	" " " " " "	9.1.28
Naldera ...	Dayas, C. T. E. ...	C. H. Hand, W. T. Banks, H. M. Askin.	M.L.	" " " " " "	Met. Log. 19.11.27 to 23.2.28 ...	29.2.28
Nardana ...	Moth, F. L. ...	F. G. Shay ...	No. M.	British India ...	Form 911 18.12.27 to 26.1.28 ...	5.3.28
Nellore ...	Hignett, A. H., R.D., Lt.-Commr., R.N.R.	A. J. Brown ...	" M.	P. & O. ...	" " " " " "	16.1.28
Nerbudda ...	Williams, B. N. ...	J. H. Robotham ...	" M.	British India ...	" " " " " "	5.3.28
Nestor ...	Houghton, G. K. ...	J. Milhench, G. Shennan, N. Anderson.	M.L.	A. Holt ...	Met. Log. 16.7.27 to 5.11.27 ...	10.11.27
Newby Hall	Storey, J. K. ...	" " " " " "	"	Ellerman ...	" " " " " "	1.12.27
Newfoundland	Westgarth, W. A., D.S.C.	R. F. Handley, E. Sainty, E. B. Burke.	"	Furness Withy ...	" " " " " "	29.2.28
Niagara ...	A. C. Showman, T. V. Hill.	R. N. Turner, D. Rollo, V. Knight.	"	Canadian-Australasian	" " " " " "	10.1.28
Ningchow ...	Beale, H. E. ...	M. H. Vincent ...	No. A.	A. Holt ...	Form 911 6.1.28 to 24.1.28 ...	12.3.28
Norfolk ...	Robinson, F. W. ...	E. M. Foster ...	" A.	Federal ...	" " " " " "	9.2.28
Norna ...	Wright, J. W. ...	T. R. Ness ...	" A.	Scottish Fishery Board	" " " " " "	29.2.28
Norseman, C.S.	Douglas, W. ...	R. W. Greenfield ...	" M.	Western Tel. Co. ...	" " " " " "	23.2.28
Northumberland	Upton, H. L. ...	" " " " " "	M.L.	Federal ...	" " " " " "	"
Nova Scotia	Furneaux, S. ...	" " " " " "	No. A.	Furness Withy ...	Form 911 8.2.28 to 9.3.28 ...	12.3.28
Nowshera ...	Schleicher, J. W. ...	W. D. L. Reeves ...	" M.	British India ...	" " " " " "	8.12.27
Nubian ...	Watmough, T. M. ...	" " " " " "	" A.	Leyland ...	" " " " " "	11.11.27
Nuddea ...	Morrison, N. C. ...	" " " " " "	" M.	British India ...	" " " " " "	"
Oaklands Grange	St. Clair, C., D.S.C. ...	C. F. Foxwell ...	" A.	Houlder Bros. ...	Form 911 13.12.27 to 11.1.28 ...	13.1.28
57 Olympic ...	Marshall, W., C.B., D.S.O., A.D.C., R.D., Commadore, R.N.R.	A. Fisher, H. J. C. Day, A. E. Weller.	W.T.	White Star ...	W.T. Reg. 16.2.28 to 1.3.28 ...	5.3.28
					Form 911 16.2.28 to 1.3.28 ...	5.3.28
Orama ...	Matheson, C. G., D.S.O., R.D., Capt., R.N.R.	H. Tanner, W. Elliot, C. K. Blake.	M.L.	Orient ...	" " " " " "	1.3.28
Oranion ...	Hoskins, W. ...	" " " " " "	No. A.	Leyland ...	" " " " " "	15.2.28
Orbita ...	Dominy, R. H., C.B.E., Commr., R.N.R.	J. Lloyd Jones ...	" M.	R.M.S.P. Co. ...	" " " " " "	25.1.28
Orcoma ...	Pearse, A. W. ...	W. M. Horsfall, J. N. Laylor, D. L. Jones.	M.L.	Pacific S.N. Co. ...	Met. Log. 21.9.27 to 16.2.28 ...	27.2.28
Orduna ...	Daniel, T. ...	R. D. Eckford ...	No. M.	R.M.S.P. Co. ...	Form 911 11.10.27 to 22.12.27 ...	29.12.27
Orestes ...	Flynn, G. A. ...	" " " " " "	" A.	A. Holt ...	" " " " " "	14.11.27
Orlta ...	Duncan, E. E. ...	D. W. Hutchinson, F. Carter, H. D. Griffiths.	M.L.	Pacific S.N. Co. ...	Met. Log. 20.6.27 to 1.12.27 ...	8.12.27
Ormonde ...	Rice, W. V., D.S.O., D.S.C., Commr., R.N.	H. P. Price ...	"	His Majesty's Ship ...	" " " " " "	28.11.27
Ormonde ...	Sarson, M. J. ...	" " " " " "	No. M.	Orient ...	Form 911 8.10.27 to 30.10.27 ...	5.12.27
Oronsay ...	Shelford, W. S., Lt.-Commr., R.N.R.	Burnand, C., R. S. Hawker, J. D. Archer.	M.L.	" " " " " "	Met. Log. 16.10.27 to 17.1.28 ...	21.1.28
Oroya ...	Ridyard, A. ...	C. H. Ray ...	No. M.	Pacific S.N. Co. ...	Form 911 22.11.27 to 31.1.28 ...	9.2.28
Orsova ...	Cameron, E. P., R.D., Commr., R.N.R.	H. Schofield, L. J. Vesty, A. Croft Cohen, H. A. Whittle, A. Addison.	M.L.	Orient ...	Met. Log. 21.8.27 to 23.11.27 ...	26.11.27
Orvieto ...	O'Sullivan, F. R. ...	G. L. Carter, T. Fox Russell, R. C. Warner.	"	" " " " " "	" " " " " "	29.12.27
Osterley ...	McRitchie, W. M., O.B.E., R.D., Lt.-Commr., R.N.R.	R. J. Galpin ...	No. A.	" " " " " "	Form 911 3.1.28 to 1.2.28 ...	7.2.28
Otaki ...	McNish, R. ...	J. McBulloch ...	" A.	New Zealand S.S. Co.	" " " " " "	13.2.28
Otira ...	Wood, C., D.S.C. ...	S. Winton ...	" M.	Shaw, Savill & Albion	" " " " " "	5.3.28
Otranto ...	Staunton, H. G., C.B.E., R.D., Commr., R.N.R.	O. C. Davies ...	" M.	Orient ...	" " " " " "	23.12.27
Oxfordshire	Foster, W. L. ...	" " " " " "	" A.	Bibby Bros. ...	" " " " " "	12.1.28
Pacific Shipper, M.V.	Campbell, H. ...	" " " " " "	" A.	Furness Withy ...	" " " " " "	5.12.27
Pacure ...	Sapsworth, S. A. ...	V. R. Watkins ...	" A.	Elders & Fyffes ...	" " " " " "	24.1.28
Pakeha ...	W. P. Clifton Mogg ...	E. T. Baker, R. E. Nicholson, G. Lindsay	M.L.	Shaw, Savill & Albion	Met. Log. 23.7.27 to 17.12.27 ...	23.12.27
Panaras ...	Peregrine D. ...	" " " " " "	M.L.	Booth ...	" " " " " "	"
Pareora ...	Evans, J. O. ...	A. J. Ellis ...	No. A.	Hain S.S. Co. ...	Form 911 6.7.27 to 2.8.27 ...	15.9.27
Paris ...	Cook, C. L. ...	Mr. Biles ...	C.C.	Southern Ry. ...	Telegraphic Report. 31.7.27 ...	31.7.27
Patia ...	Makepeace, S. ...	J. Kinsley ...	No. A.	Elders & Fyffes ...	Form 911 19.6.27 to 23.7.27 ...	3.8.27
Peisander ...	Slater, H. ...	D. L. Hoare ...	" A.	A. Holt ...	" " " " " "	29.12.27
65 Pennland ...	Harvey, H. ...	C. J. Murray, E. Cornellie ...	W.T.	Red Star ...	" " " " " "	11.1.28
Peshawur ...	Wilding, H. G. ...	J. C. Mellonie, J. K. Crone, R. G. Wood.	M.L.	P. & O. ...	Met. Log. 27.4.27 to 28.9.27 ...	5.10.27
Piako ...	Kettlewell, C. R. ...	P. J. Connolly, T. K. McDonald, H. N. Lawson.	"	New Zealand S.S. Co.	Met. Log. 3.7.27 to 5.12.27 ...	12.12.27

vii

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 18.3.28.	Date Received.
<i>Polycarp</i> ... <i>Port Adelaide</i> ...	Jackson, T. H. ... Swan, L. H. ...	C. W. Smethurst ... E. N. Rogerson, F. J. Lavers, L. H. Potter.	No. A. M.L.	Booth ... Commonwealth & Dominion.	Form 911 22.12.27 to 3.1.28 ... Met. Log. 20.8.27 to 17.12.27 ...	2.3.28 28.1.28
<i>Fort Albany</i> ... " <i>Auckland</i> ...	Needham, R. ... Durham, R. S. ...	G. W. Horton ... G. L. Hazlewood, C. F. Post, J. H. Sloan, H. E. Braine.	" "	" " " "	" 1.6.27 to 25.11.27 ... " 10.9.27 to 25.1.28 ...	8.12.27 15.2.28
" <i>Bowen</i> ... " <i>Campbell</i> ... " <i>Caroline</i> ...	Hearn, G. W. ... Reynolds, P. J. ... Hoad, A. C. ...	W. R. Johnston ... G. T. C. Harris ... A. E. Fishwick, C. A. Hodson, J. Stannard.	No. A. M.L.	" " " " " " " "	Form 911 28.10.27 to 15.12.27 ... Met. Log. 6.7.27 to 5.11.27 ...	6.1.28 10.11.27
" <i>Darwin</i> ...	Sawbridge, I. R. ...	S. Hearn, E. M. Fenton, J. S. Moore.	"	" " " "	" 13.8.27 to 9.1.28 ...	13.1.28
" <i>Denison</i> ...	Ferris, J. ...	E. T. N. Lawrey, G. W. B. Lovegrove, P. J. Howe, L. W. Cady.	"	" " " "	Form 911 23.7.27 to 25.2.28 ...	28.2.28
" <i>Dunedin</i> ...	Farmar, F. ...	E. G. Jones, H. M. Post, N. M. Muzzell.	"	" " " "	Met. Log. 5.11.27 to 1.3.28 ...	14.3.28
" <i>Fremantle</i> ... " <i>Gisborne</i> ... " <i>Hobart</i> ...	Kearney, F. J. ... Hutchinson, T. ... Craven, R. ...	A. G. Rhind ... R. Carter, L. Copeland, G. G. Langford, C. L. Webb.	No. A. " A. M.L.	" " " " " " " " " " " "	Form 911 31.12.27 to 2.2.28 ... " 21.8.27 to 13.12.27 ... Met. Log. 27.7.27 to 6.11.27 ...	7.2.28 2.1.28 14.11.27
" <i>Hunter</i> ...	Cottell, S. C. ...	A. Cooper, A. McClounan, J. T. Weldin.	"	" " " "	" 22.6.27 to 6.10.27 ...	11.11.27
" <i>Huon</i> ... " <i>Melbourne</i> ...	Compton, J. ... Brown, A. H. ...	J. A. Fairbairn ... D. G. H. Bradley, L. H. B. Bloye, P. H. Pedrick, C. J. Gale.	No. A. M.L.	" " " " " " " "	Form 911 3.12.27 to 6.1.28 ... Met. Log. 31.3.27 to 12.10.27...	20.2.28 19.10.27
" <i>Napier</i> ... " <i>Nicholson</i> ...	Jones, C. N. ... Jack, J. ...	J. G. Lewis, G. L. H. Dean, A. G. Newbury, W. B. Hopkins.	No. A. M.L.	" " " " " " " "	Form 911 25.2.27 to 12.4.27 ... Met. Log. 17.9.27 to 17.1.28 ...	21.4.27 6.2.28
" <i>Pirie</i> ... " <i>Sydney</i> ...	Kippins, T. ... Higgs, W. G. ...	T. L. Kidwell, E. E. Roswell, K. D. Morgan.	" "	" " " " " " " "	" 26.3.27 to 2.9.27 ... " 21.9.27 to 3.3.28 ...	13.9.27 8.3.28
" <i>Victor</i> ...	Williams, R. ...	R. Stannard, J. B. Watson, A. Brown.	"	" " " "	" 16.7.27 to 28.11.27...	15.12.27
" <i>Wellington</i> ... " <i>President Jackson</i> ... " <i>President Jefferson</i> ... " <i>Protea</i> , H.M.S.A.S.	Jones, C. ... Griffith, J. ... Nichols, F. R. ... Woodhouse, A. F. B., Lt.-Commr., R.N.	D. F. Morgan ... J. A. Cartwright ... C. H. Moen, S. Hansson ... R. J. Whitley ...	No. A. " A. " A. M.L.	Pacific Mail S.S. Co... Admiral Oriental Line South African Naval Service.	Form 911 19.10.27 to 22.11.27 ... " 15.10.27 to 15.12.27 ... " 5.1.28 to 29.1.28 ... " 30.7.27 to 7.11.27 ...	9.1.28 23.1.28 20.2.28 20.12.27
" <i>Protesilaus</i> ... " <i>Pyrrhus</i> ...	Nelson, T. B. ... Elford, W. J. ...	... R. E. Wilks.	No. A.	A. Holt ... " ...	Met. Log. 8.4.27 to 7.9.27 ... Form 911 17.1.28 to 23.2.28 ...	11.10.27 5.3.28
" <i>Rancher</i> ... " <i>Ranpura</i> ... " <i>Rawalpindi</i> ... " <i>60 Regina</i> ...	Gibbings, W. ... King, A. M., D.S.C. ... Thornton, E. J. ... Davies, E. J. ...	... E. J. Spurling ... A. G. Stansfield ... F. W. Laws, H. C. Gray, J. C. Boyce.	No. " M. " M. W.T.	Harrison ... P. & O. ... White Star-Do- minion (	" ... " ... W.T. Reg. 6.2.28 to 26.2.28 ... Telegraphic Report 23.2.28 ...	2.2.28 27.2.28 29.2.28 29.2.28
" <i>Reindeer</i> ... " <i>Remuera</i> ... " <i>Rhecnor</i> ... " <i>Rhodesian</i> ... " <i>Transport</i> ...	... Cameron, J. J. ... Stout, G. I. ... Bullock, F. W. H. ...	... D. Hughes ... A. Yarwood ... F. D. Betts	C.O. No. A. " A. " A.	G.W. Railway ... New Zealand S.S. Co. A. Holt... Houlder Bros. ...	Form 911 30.9.27 to 19.1.28 ... " 15.12.27 to 28.12.27 ... " 16.7.27 to 29.10.27...	24.1.28 23.1.28 3.11.27
" <i>Rimutaka</i> ...	Hemming, F. A. ...	H. A. Fryer, M. A. D. Stewart, G. O. Saul, H. Vernon.	M.L.	New Zealand S.S. Co.	Met. Log. 10.6.27 to 19.10.27...	25.10.27
" <i>Risaldar</i> ... " <i>Rona</i> ...	Matthews, E. G. ... Wallis, J. A. ...	R. H. Friedlander	No. M No.	Asiatic S.N. Co. Colonial Sugar Re- fining Co.	Form 911 4.11.27 to 19.11.27 ... " ...	12.12.27 ...
" <i>Rother</i> ... " <i>Rotorua</i> ...	Woodhead, T. H. ... Hunter, J. L. B. ...	... E. Lawrence, F. Cooke, H. Cockerill.	No. A. M.L.	Goole Steam Shipping New Zealand S.S. Co.	" 3.2.28 to 10.3.28 ... Met. Log. 3.9.27 to 15.12.27 ...	14.3.28 19.12.27
" <i>Royal Fusilier</i> ...	Dawson, J. ...	J. Fraser ...	No. A.	London & Edinburgh S.S. Co.	Form 911 19.5.27 to 7.7.27 ...	11.7.27
" <i>Royal Transport</i> ... " <i>Ruapehu</i> ...	Dove, J. ... McKellar, A. W., R.D., Capt., R.N.R.	R. W. Wass ... A. Landles, W. J. Glass- borow, W. J. Newton.	" A. M.L.	Houlder Bros. ... New Zealand S.S. Co.	Met. Log. 7.5.27 to 15.8.27 ... " 9.9.27 to 5.1.28 ...	19.8.27 10.1.28
" <i>St. Albans</i> ...	Smith, G. L., Commr., R.A.N.R.	R. S. Millington, J. Kavanagh, R. L. Harry.	"	Eastern and Aus- tralian.	" 1.7.27 to 27.9.27 ...	17.11.27
" <i>St. Helier</i> ... " <i>St. Julien</i> ... " <i>St. Andrew</i> ... " <i>Salaga</i> ... " <i>38 Samaria</i> ...	... Bearpark, E. W. ... Jones, W. ... Malin, R. G., Lieut.- Commr., R.N.R.	C. Bell ... C. Joy ... H. W. Smith ... C. V. Evans ... C. S. Williams, A. B. Fastig, W. B. Tanner.	C.O. " A. " A. W.T.	G.W. Railway ... Rankin Gilmour ... Elder Dempster ... Cunard ...	Telegraphic Report 25.10.27... Form 911 2.2.28 to 27.2.28 ... " 19.3.27 to 4.6.27 ... " 16.1.28 to 23.1.28 ... W.T. Reg. 31.10.27 to 20.11.27 ...	14.3.28 14.3.28 15.6.27 13.2.28 24.11.27
" <i>Sardinian Prince</i> ... " <i>Saxon</i> ... " <i>Scholar</i> ... " <i>Scotia</i> ... " <i>33 Scythia</i> ...	Brown, J. F. ... Gardner, G. F., O.B.E. Egerton, J. J. ... Prichard, S.D., M.B.E. Prothero, W. ...	W. O. Young ... R. May ... G. W. Laurey ... W. T. Griffith ... G. Overton, G. H. Morris, J. G. Bradley	No. A. " A. " M. " C.O. W.T.	Prince ... Union Castle ... Harrison ... L.M. & S. Railway ... Cunard ...	Form 911 14.12.27 to 27.12.27 ... " 20.1.28 to 11.3.28 ... " 29.1.28 to 16.2.28 ... Telegraphic Report 25.2.28 ... W.T. Reg. 5.12.27 to 22.12.27...	16.1.28 14.3.28 23.2.28 25.2.28 31.12.27
" <i>Sheaf Mount</i> ... " <i>Sheaf Spear</i> ...	Groves, C. V. ... Whitfield, G. A., O.B.E.	W. Thomson ... S. J. Dring, T. B. Fishley	No. A. M.L.	W. A. Souter ... " ...	" 5.6.27 to 14.7.27 ... Met. Log. 4.2.27 to 25.7.27 ...	20.7.27 17.9.27
" <i>Shropshire</i> , M.V. ...	Adamson, B. W. ...	W. L. Whiteside, R. Cuming, W. H. Brittain, L. McDermott.	"	Bibby ...	" 31.12.27 to 9.3.28 ...	13.3.28
" <i>Socrates</i> ... " <i>Somerset</i> ... " <i>Spero</i> ... " <i>Statesman</i> ... " <i>Stephen</i> ... " <i>Stockwell</i> ... " <i>Surrey</i> ... " <i>Suva Maru</i> ... " <i>Sylvacfield</i> , M.V.	Taylor, F. C. ... Howell Price, J. ... Montgomery, H. ... Mowat, J. ... Evans, L. G. ... Thowless, E. ... Lamb, C. B. ... Gotoh, M. ... Biddick, E. ...	W. E. Jordan ... W. Redwood ... D. Millward G. G. Roberts ... R. A. Kneen ... S. C. Bradley	No. A. " A. M.L. No. M. No. A. " A. " A. " A. " A.	Lampport & Holt ... Federal... Ellerman Wilson ... Harrison ... Booth ... Brocklebank ... Federal... Nippon Yusen Kaisha Hunting & Son	Form 911 1.10.27 to 21.12.27... " 16.11.27 to 20.12.27 ... Met. Log. 9.7.27 to 31.12.27 ... Form 911 25.12.27 to 12.2.28... " 4.1.28 to 20.1.28 ... " 26.1.28 to 3.3.28 ... " 27.11.27 to 25.12.27 ... " 1.2.28 to 20.2.28 ...	27.1.28 11.1.28 6.1.28 16.2.28 30.1.28 12.3.28 30.12.27 23.2.28
" <i>Tainui</i> ... " <i>Tahiti</i> ... " <i>Taiping</i> ...	Elford, H. C. ... Aldwell, B. M. ... Frame, A. M. ...	... G. M. Coote ... F. Stratford, S. Moore, A. C. Kennedy, R. Bargent.	" A. " A. M.L.	Shaw, Savill & Albion Union S.S. Co. of N.Z. Yull & Co.	" 10.12.27 to 15.1.28... " 30.11.27 to 19.1.28... Met. Log. 11.6.27 to 4.11.27 ...	2.3.28 7.2.28 4.1.28
" <i>Takada</i> ... " <i>Talithybius</i> ... " <i>Tamara</i> ...	Baird, S. K. ... Hatfield, J. ... Hartman, W. H. ...	... G. D. Jones ... F. W. Lutyens	No. M. " A. " M.	British India... A. Holt... Shaw, Savill & Albion	Form 911 19.10.27 to 19.12.27 ... " 21.1.28 to 26.2.28 ...	9.1.28 5.3.28

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 16.3.28.	Date Received.
<i>Tania</i> ...	Pilcher, E. T., Lieut.-Commr., R.N.R.	G. C. Smith, H. Munday, H. E. Nuzum, J. Heddele.	M.L.	E. & A. S.S. Co. ...	Form 911 3.6.27 to 30.8.27 ...	26.10.27
<i>Tarantia</i> ...	Munro, D. ...	... ..	No. A.	Anchor ...	" 21.1.28 to 1.2.28 ...	8.2.28
<i>Tetrestas</i> ...	Wilkinson, W. H. ...	... ..	" A.	A. Holt & Co. ...	" 10.9.27 to 1.1.28 ...	6.1.28
<i>Tekoa</i> ...	Barnett, H. ...	D. J. Murray ...	" M.	New Zealand S.S. Co. ...	Form 911 18.11.27 to 7.12.27 ...	9.1.28
<i>Telamon</i> ...	Willcox, J. H. ...	... ..	" A.	A. Holt ...	" 4.8.27 to 16.8.27 ...	23.11.27
<i>Tetela</i> ...	Bostock, R. J. ...	F. L. Brealy ...	" A.	Elders & Fyffes ...	" 13.11.27 to 19.12.27 ...	29.12.27
<i>Taucer</i> ...	Hodgson, R. N. ...	R. N. Inkster ...	" A.	A. Holt ...	" 24.8.27 to 12.11.27 ...	14.11.27
<i>Themistocles</i> ...	Young, A. D. ...	H. C. Howe ...	" M.	Aberdeen ...	" 20.1.28 to 2.2.28 ...	27.2.28
<i>Thescus</i> ...	Jones, E. ...	W. A. Fyffe ...	" A.	A. Holt ...	" 27.1.28 to 13.2.28 ...	23.2.28
<i>Titan</i> ...	Power, J. ...	D. Hey, D. MacTavish, G. W. Best, C. F. Bailey.	M.L.	" ...	Met. Log. 17.9.27 to 6.1.28 ...	18.1.28
<i>Tongariro</i> ...	Burton, Davies J. ...	F. C. Pretty, A. E. Williams, E. A. Quick, D. Baldwin.	"	New Zealand S.S. Co. ...	Form 911 18.9.27 to 28.1.28 ...	2.2.28
<i>Transylvania</i> ...	Bone, D. W. ...	P. Middleton ...	No. A.	Anchor ...	" 26.1.28 to 4.2.28 ...	9.2.28
<i>Treveller</i> ...	Worthington, B. ...	E. L. Stockley ...	" M.	T. & J. Harrison ...	" 3.12.27 to 29.2.28 ...	5.3.28
<i>Trefusis</i> ...	Cordy, — ...	... ..	No.	Hain S.S. Co. ...	" ...	"
<i>Trematon</i> ...	Evans, B. ...	J. Jenkyn, C. Warren, L. Griffin.	M.L.	Hain S.S. Co. ...	Met. Log. 16.9.27 to 20.12.27 ...	13.1.28
<i>Turakina</i> ...	Hamilton, E. S. ...	A. W. Marshall ...	No. M.	New Zealand S.S. Co. ...	Form 911 19.12.27 to 8.1.28 ...	27.1.28
<i>11 Tuscania</i> ...	Smart, R. W. ...	J. Hamilton ...	W.T.	Anchor ...	" 24.9.27 to 15.10.27 ...	19.10.27
<i>Tyndareus</i> ...	Williams, D. H., Christie, W.	A. G. Phillips, T. R. Phillips, F. H. Gray.	M.L.	A. Holt ...	Met. Log. 14.6.27 to 7.11.27 ...	16.12.27
<i>Ulmara</i> ...	Wylie, W. J. ...	A. N. Robertson ...	No. M.	Huddart Parker, Ltd. ...	Form 911 31.12.27 to 30.1.28 ...	5.3.28
<i>Ulysses</i> ...	Owen, R. D., O.B.E. ...	R. Blakey ...	" A.	A. Holt ...	" 22.12.27 to 9.1.28 ...	13.1.28
<i>Umvolsi</i> ...	Barnes, E. W. ...	... ..	" A.	Bullard King ...	" 16.12.27 to 7.2.28 ...	5.3.28
<i>Valacia</i> ...	Inch, F. ...	G. Meggitt ...	" M.	Cunard ...	" 31.5.27 to 2.12.27 ...	6.2.28
<i>Vardulia</i> ...	Bond, H. A. L. ...	W. H. Barker ...	" A.	" ...	" 20.12.27 to 8.1.28 ...	31.1.28
<i>Vigilant</i> ...	Simpson, E. S. S. ...	J. Hunter ...	" A.	Scottish Fishery Board.	" 1.2.28 to 29.2.28 ...	5.3.28
<i>Waioapu</i> ...	Todd, D. ...	A. J. McKenzie ...	" M.	Canadian - Australasian.	" 4.1.28 to 27.1.28 ...	2.3.28
<i>Wairuna</i> ...	Ryan, J. ...	C. C. Waters, G. H. George, L. B. Ehlert.	M.L.	Union S.S. Co. of N.Z.	Met. Log. 24.4.27 to 13.9.27 ...	28.11.27
<i>Walmer Castle</i> ...	Lang, T. W. ...	A. E. Denn ...	No. A.	Union Castle ...	Form 911 30.9.27 to 20.11.27 ...	22.11.27
<i>Wangaratta</i> ...	Stuart, C. B. ...	T. W. Worthingham, S. R. Millard, A. G. Brooks, M. Harvey.	M.L.	British India ...	Met. Log. 2.10.27 to 29.2.28 ...	2.3.28
<i>Warfield</i> ...	Steel, R. ...	... ..	No. A.	... ..	Form 911 7.1.28 to 1.2.28 ...	5.3.28
<i>War Nizam</i> ...	Moncrieff, T. ...	B. Kieran ...	" M.	British Tankers ...	" 23.12.27 to 1.2.28 ...	14.2.28
<i>Westmoreland</i> ...	Gardner, H. W. ...	C. P. Jackson, A. L. Warren, G. A. Shepherd.	M.L.	Federal ...	Met. Log. 11.7.27 to 16.11.27 ...	22.11.27
<i>William Scoresby, R.S.S.</i> ...	De la Motte, J. B. B., Lieut., R.N.	... ..	"	Falkland Islands Government.	" ...	"
<i>Windsor Castle</i> ...	Chave, Sir B., K.B.E.	A. J. Tweddell, J. Montgomery, P. G. McIver, A. G. Bedwell.	"	Union Castle ...	" 15.10.27 to 5.2.28 ...	15.2.28
<i>Winifredian</i> ...	Harrocks W. ...	A. Crone ...	No. M.	Leyland ...	Form 911 30.10.27 to 22.12.27 ...	6.1.28
<i>Wonganella</i> ...	Suffern, H. ...	G. F. Phillips ...	"	W. Crossby & Sons ...	" 26.9.27 to 8.11.27 ...	20.12.27
<i>Woodarra</i> ...	Reilly, J. V. ...	H. Goater, B. W. Smith D. B. Lattin, G. F. Alexander.	M.L.	British India ...	Met. Log. 26.6.27 to 18.11.27 ...	24.11.27
<i>Yorkshire</i> ...	Millson, G. E. ...	W. M. C. Higginson, R. Allen	No. A.	Bibby ...	Form 911 23.4.27 to 4.7.27 ...	9.7.27
<i>Zent</i> ...	Roberts, — ...	... ..	"	Elders & Fyffes ...	" ...	"
<i>Conway, H.M.S.</i> ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ...	Cadets' M.L.	... ..	Cadets' Met. Log. 18.9.27 to 10.12.27	17.12.27
<i>Pangbourne Nautical College</i> ...	Tracy, A. F., Commr., R.N.	" ...	"	... ..	Cadets' Met. Log. 28.9.27 to 15.12.27	23.12.27
<i>Worcester, H.M.S.</i> ...	Sayer, M.B., C.B.E., R.D., Capt., R.N.R.	" ...	"	... ..	Cadets' Met. Log. 23.9.27 to 14.12.27	19.12.27
<i>Abaco</i> ...	... ..	The Keepers ...	Lighthouse Register.	... ..	Lighthouse Register 1.7.26 to 20.10.26	20.4.27
<i>Cay Lobos</i> ...	... ..	... ..	"	... ..	Lighthouse Register 1.1.27 to 11.7.27	29.9.27
<i>Double Headed Shot</i> ...	... ..	... ..	"	... ..	Lighthouse Register 1.7.26 to 31.12.26	20.4.27
<i>Inagua</i> ...	... ..	... ..	"	... ..	Lighthouse Register 24.1.27 to 3.7.27	29.9.27
<i>Sombrero</i> ...	... ..	... ..	"	... ..	Lighthouse Register 1.7.27 to 31.12.27	7.2.28
<i>Walling Island</i> ...	... ..	... ..	"	... ..	Lighthouse Register 10.9.26 to 30.6.27	29.9.27
<i>Cape Pembroke (Falkland Is.).</i> ...	... ..	... ..	"	... ..	Lighthouse Register 1.7.27 to 31.12.27	21.2.28

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

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., received up to 29.2.28.	Date Received.
<i>Chirripo</i> ...	McColm, F. ...	... ..	Elders & Fyffes ...	Water Samples ...	...
<i>Darro</i> ...	Matthews, G. P. ...	A. F. Walker ...	R.M.S.P. Co. ...	" ...	27.2.28
<i>Desado</i> ...	Hannon, F. S. ...	J. N. Duncan ...	" ...	" ...	2.1.28
<i>Hildebrand</i> ...	Maddrell, J. ...	A. G. Malcolm ...	Booth ...	" ...	7.1.28
<i>Oranian</i> ...	Hoskins, W. ...	... ..	Leyland ...	" ...	...
<i>Zent</i> ...	Roberts, — ...	R. G. E. Genge ...	Elders & Fyffes ...	" ...	4.2.28

May, M.O., 1928.

ADVERTISEMENTS

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

MARINE METEOROLOGY, ATLASES AND MEMOIRS.

CHARTS:—

ATLANTIC:—

Monthly Current Charts for the Atlantic Ocean, from information collated and prepared in the Meteorological Office. (No. 132, 1897) ($22\frac{1}{2} \times 18$ in.) (Published by the Admiralty.)

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

ATLANTIC (NORTH):—

Meteorological Charts of the North Atlantic for each month of the year, giving normals of Pressure, Air and Sea Surface Temperature and Ocean Currents, with Frequencies of Winds, also Ice Limits. (No. 149A, 1923) 1s. each ($35 \times 22\frac{1}{2}$ in.). Sold by J. D. Potter, 145, Minories, E.1.

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

Charts of Meteorological Data for Square 3, Lat. 0° - 10° N., Long. 20° - 30° W. ($20 \times 13\frac{1}{2}$ in.) and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. ($17 \times 16\frac{1}{2}$ in.) (No. 20, 1874). 20s.

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

ATLANTIC (SOUTH):—

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. (No. 159, 1902.) ($27 \times 20\frac{1}{2}$ in.) (Published by the Admiralty.)

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

BAFFIN BAY AND DAVIS STRAIT:—

Monthly Meteorological Charts of Baffin Bay and Davis Strait. (No. 221, 1917.) 8s. ($30 \times 25\frac{1}{2}$ in.)

INDIAN OCEAN:—

Meteorological Charts of the East Indian Seas for each month of the year, giving Normals of Pressure, Air and Sea Temperatures and Ocean Currents, with Frequencies of Winds. (No. 181A, 1923.) 1s. each. ($35 \times 22\frac{1}{2}$ in.) Sold by J. D. Potter, 145, Minories, E.1.

Monthly Current Charts for the Indian Ocean, from information collated and prepared in the Meteorological Office. (No. 124, 1896.) ($20 \times 24\frac{1}{2}$ in.) (Published by the Admiralty.)

CHARTS:—continued.

MEDITERRANEAN SEA:—

Atlas of Normal Monthly Values of the Meteorological Elements for the Mediterranean Sea and adjacent Lands. (No. 224, 1917.) 6s. ($22\frac{1}{2} \times 17$ in.)

PACIFIC OCEAN:—

Quarterly Current Charts for the Pacific Ocean, from information collated and prepared in the Meteorological Office. (No. 134, 1897.) ($26\frac{1}{2} \times 28\frac{1}{2}$ in.) (Published by the Admiralty.)

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. (No. 159, 1902.) ($27 \times 20\frac{1}{2}$ in.) (Published by the Admiralty.)

RED SEA:—

Meteorological Charts of the Red Sea. (No. 106, 1895.) 21s. ($22 \times 13\frac{1}{2}$ in.)

SOUTHERN OCEAN:—

Meteorological Charts of the Southern Ocean between the Cape of Good Hope and New Zealand. (No. 123, 1917.) 7s. 6d. ($12\frac{1}{2} \times 9\frac{1}{2}$ in.)

GEOPHYSICAL MEMOIRS (4to.):—

12. Travel of Circular Depressions and Tornadoes and the Relation of Pressure to Wind for Circular Isobars. By Sir Napier Shaw, F.R.S. (No. 220b, 1917.) 9d.

19. Hurricanes and Tropical Revolving Storms. By Mrs. E. V. Newnham, M.Sc. With an Introduction on "The Birth and Death of Cyclones," by Sir Napier Shaw, F.R.S. (No. 220i, 1922.) 12s. 6d.

28. The Doldrums of the Atlantic. By C. S. Durst, B.A. (No. 254h, 1926.) 1s. 6d.

A Barometer Manual for the use of Seamen. A Text-Book of Marine Meteorology. With an Introduction and Appendices. Tenth Edition, 1925. (No. 61.) 1s. 6d. (8vo.)

The Marine Observer's Handbook. Fourth Edition. 1927. (No. 218.) 3s. (8vo.)

Report (to the Board of Trade) on the work carried out by the S.S. *Scotia*, 1913. (1914.) 4s. 6d. (Fcp.) Maps, charts and diagrams to illustrate the Report. (1914.) 2s. 6d. (Fcp.)

Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope between Lat. 30° and 50° S., and Long. 10° and 40° E. By Capt. H. Toynbee, F.R.A.S. (No. 44, 1882.) 7s. 6d. (4to.)

Weather Map. An Introduction to Modern Meteorology. By Sir Napier Shaw, F.R.S. (Sixth Issue, 1925.) (No. 225i) 1s. 3d. (Royal 16mo.)

The Admiralty Publications are on sale by J. D. POTTER, 145, Minories, London, E.1.

The other Publications mentioned in this list, unless otherwise marked, can be purchased directly from

H.M. STATIONERY OFFICE at the following addresses:—

Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

