

VOL. VI. No. 69.

THE MARINE OBSERVER.

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Tracks of Severe Cyclones in the Bay of Bengal, **September** during the years 1891-1923.Currents on the Tracks to South Australia, **August, September** and **October**.

## INFORMATION OF CURRENT AND SAFE AND ECONOMICAL NAVIGATION.

The loss of a number of ships through stranding in recent years has been attributed by Courts of Inquiry to their being set out of their course by current. To mention one of these, that of the loss of *S.S. Tuscan Prince* on February 15th, 1923, on Village Island, Barkley Sound, British Columbia. The Court found this stranding to be due to an abnormal current setting to the northward during weather conditions so bad as to be almost unprecedented in those waters. On this occasion no less than four steamers piled up within a few miles of each other on the same day. The existence of this abnormal current setting to the northward at  $2\frac{1}{2}$  knots was confirmed by the drift of a water logged derelict. The position at which *Tuscan Prince* stranded differed 50 miles from her dead reckoning.

This was an exceptional case; it illustrates the need of the navigator for information of current and his need for means of fixing his position in thick weather. Experience and knowledge tend to make us more careful and always to remember the four *Ls*. Generally, data of current obtained at the time of strandings is not suitable for establishing actual set and drift, for had reliable observations been obtainable no stranding would have occurred.

Ever since the *MARINE OBSERVER* was published we have been advocating or dealing with the study of Ocean Currents almost month by month and it will be in the general interest if we repeat briefly what our aims are for navigators, and for the information of all concerned with meteorological and oceanographical research.

The set of a current is the true direction to which it flows, its drift is its velocity either expressed in knots or in nautical miles per day.

The greatest amount of data of ocean currents has been obtained from and is being obtained from the difference in the Observed and Dead Reckoning positions of ships after runs. The amount of data obtained by other methods is small by comparison.

The set and drift of current obtained on a run between observed and Dead Reckoning positions from noon to noon is valuable, but over the distance traversed by a fast ship in 24 hours there may be entirely different sets. Stellar navigation is most valuable for current observation and probably the best observations of set and drift can be obtained on runs between twilight fixes. It is not generally advisable to obtain the set and drift during a short interval by difference between observed and Dead Reckoning positions when one observed position is a Stellar fix and the other observed position a running fix from sun's position lines (such for example as between stars at dawn and noon) because a small error of position which may easily occur in a running fix will give an appreciable error in the set and drift determined in so short an interval. Of recent years the Corps of Voluntary Marine Observers has improved current observation tremendously.

Current observation acts as an incentive to careful navigation and good steering and should therefore be generally encouraged.

It is not always realised how accurate modern navigation generally is, while on the other hand there are some who do not sufficiently appreciate that under certain conditions it may not be possible to place a ship's position by D.R. when sights are impossible within many miles of where she may really be.

The observation of set and drift of current must be subject to the judgment of the master for no one knows better than he how his ship may behave under different conditions and he and his officers are in the best position to judge of the reliability of their sights and Dead Reckoning. We can only give advice based on general experience and the particulars required and notes given in the Meteorological Log and Marine Observers Handbook are for general guidance. Stellar navigation and the determination of current in fine weather are amongst the most fascinating of a navigator's duties at sea.

With current observations returned in the Meteorological Log and Ships Meteorological Report Form 911 information of the general set and drift of current in each locality and its variations are compiled and thus collective past experience is provided on Charts and in articles in this Journal and in the Sailing Directions for the navigator.

This information gives the navigator an idea of what may be expected, but it does not give him information of what current there actually is in a locality he is about to navigate; that can only be provided by means of W/T communication by ships on the spot who have taken and recorded careful observations of set and drift of current.

With the statistical data of Ocean Currents provided by logs etc. we are charting the mean set and drift and the variations of current along all the main trade ocean routes of the world in the MARINE OBSERVER and each year publishing a review of this information. These sectional route charts are intended for conversion into Atlases of Currents for each ocean on a uniform plan and scale.

In charting the current on the trade routes of the Atlantic we found by experience that we had not used the most suitable scale. Since then a scale of ten degrees of longitude to two inches, with rose arrows in which two inches represent 100 per cent. of frequency have been found to be the best and the current charts are now being constructed on that scale.

In time we shall have up to date published information and charts of currents for all the trade routes in all Oceans based on observation since 1910.

As these charts and information are compiled much is being established about Ocean currents and all concerned in the work are gaining knowledge from it. It is desirable in the interests of safe and economical navigation that the published information should reach as many navigators as possible and therefore the Agents and Corps of Voluntary Marine Observers are asked to bring this to the notice of as many as possible. This work involves observation and record at sea and computation and research ashore in the Marine Division. The data is exchangeable with other Meteorological and Hydrographic services by means of a form ruled for the purpose. In the British service we do not use the Hollerith System for data of ocean currents.

It is the more necessary to emphasise that current observation must be subject to the judgment of the master of each ship in these days of Wireless communication.

The organisation of "Selected Ships" for routine Meteorological Wireless Telegraphy has been the means of providing reliable information to ships at sea who desire to know what current exists in a locality they are approaching. With an observation such as current which requires skill and judgment to make and discretion and judgment to decide whether the information should be included in the routine report to be broadcast to all Ships, it is in the interests of both safety and economy that this should be done by selected ships; moreover the organization of "Selected Ships" will ensure that this information is available to all ships at sea with the least amount of Wireless Communication and the maximum benefit derived. A chapter in WIRELESS AND WEATHER AN AID TO NAVIGATION is devoted to the method of using these

Wireless reports containing the set and drift of current experienced by "Selected Ships."

Marine Observers are doing splendid work in this connection, in fact there is no branch of **The Work** in which they have made better progress in post-war years. Our knowledge of Ocean Currents and how to predict changes of set and drift is very imperfect. More work in special research ships particularly below the surface in the depths is necessary before the Laws which govern Ocean Currents and their changes can be established.

Meanwhile the Corps of Voluntary Marine Observers is not only returning observations of surface current for research work ashore, but they are broadcasting this information for the benefit of all and are in fact carrying out by this means an Ocean survey and self-education which we believe in time will materially aid in making steam and motor navigation safer and more economical.

To mention a few results of recent years.

In 1920 attention having been called by Captain A. Taylor of S.S. *Rotenfels* to a very strong current some 170 miles to the Southward of Sokotra, an investigation of the conditions in the region of Sokotra and Cape Guardafui in the S.W. Monsoon was made. This enabled us to determine the velocity, extent and position of a very strong current usually setting to the E.S.E. in the S.W. Monsoon and to establish the fact that this was a place to be avoided by homeward bounders for there they would encounter not only an adverse current which on occasion had been as much as 7 knots, but very frequently a dangerous confused sea and swell due to the current running athwart the Wind. The recommended homeward routes during the S.W. Monsoon were accordingly modified and since then steamers following these tracks have reported making better weather with fewer miles steamed though greater distance covered over the ground, resulting in economy of fuel and wear and tear to say nothing of added comfort to passengers and crews.

Then regarding the use of set and drift reported with Weather conditions by W/T as an aid to safe navigation. Many will remember strandings on the West Coast of Cape Colony during thick weather. In 1924 with the Charts of the route from Cape Blanco to Table Bay we were able to give the average frequency of sets towards the land between Latitude 32° S. and Table Bay with winds from different directions, also the frequency of Easterly sets near Cape Verde with some typical atmospheric pressure distributions when these Easterly sets had occurred. I had as a young officer, when officer of the watch, made Cape Verde Light outward bound on the Starboard bow, so that the risk of stranding through being set in by an unexpected current had been impressed upon my mind in a way which can only come through such an experience.

In 1922 upon the receipt of a report from Captain J. B. HALL of S.S. *Tudor Star* of the current being reversed near St. Paul Rocks upon investigation we found that the Equatorial current in certain conditions changed its position with the Doldrums and in 1925 when the Charts for the route Cape Blanco to the Brazils were published we were able to provide a curve giving the East and West component of current with wind, and as the Charts are published each year we are giving all possible authentic information which will help the navigator to make better use of his own observations and those received by Wireless to guard against sets which might if not allowed for when approaching the land place him in an awkward position.

Then as regards information of general interest to the navigator, the geographer and in fact everyone, this system of charting the main trade routes for currents has enabled us to determine the seasonal variations of velocity of the main circulation of the surface water of the North Atlantic and to compare the seasonal variations of the Equatorial Current in the Atlantic and Pacific Oceans. The first time, we believe, that such measurements and comparisons have been possible.

MARINE SUPERINTENDENT.

London.

June 1st, 1929.



## THE MARINE OBSERVER'S LOG.

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

Responsibility for statements rests with the Contributor.

## CURRENT.

## Near Alboran Island, Mediterranean.

THE following is an extract from the Meteorological Log of S.S. *Arracan*, Captain W. M. F. MACFARLANE, Mediterranean Ports, Observer Mr. J. MORRISON.

"2nd September, 1928, 7.19 p.m. to 11 p.m. off Alboran Island in Latitude 35° 55' N., Longitude 3° 02' W. Strong S.E. currents were experienced whilst in the vicinity of the above Island. From a position with Alboran Island bearing 282° distant 12 miles to a position with Alboran Island bearing 043° distant 11 miles, the current experienced was found to be S.54°E. 6 miles (av. 2.2 knots), whilst from the first position (obtained at 7.19 p.m.) until 11 p.m., when Alboran Island bore 062° distant 20 miles, the current was found to be S.52°E. 7½ miles (av. 1½ knots). The visibility during this period was exceptionally good. Cape Tres Forcas Light was seen 29 miles distant."

## CURRENT DRIFT.

## West Indies.

THE following is an extract from the Meteorological Report of S.S. *Changuinola*, Commander R. A. THORNBURN, R.D., R.N.R., Avonmouth to West Indies, Observer Mr. W. G. CHANTER, 2nd Officer.

"At 11 a.m. on September 6th, 1928, 20 miles S.W. of St. Nicholas Mole, Haiti, a broken piece of heavy step-ladder 4 ft. by 2ft. was jettisoned. At 3.30 p.m. on September 13th when 5 miles S.E. of Plum Point Light, Kingston, this broken ladder was encountered and identified; having traversed a distance of 210 miles in a little over 7 days; nearly 30 miles per day. The ladder floated with a face of only 4 ins. above the surface of the water so that only a little of this drift can be credited to the wind as during this time the wind reported was never more than force 2, mostly N.E. and E. It is unlikely in such a short time that it touched land anywhere. Steaming from Plum Point to Morant Point the ship encountered a westerly set of over 1 knot with Light Airs and a smooth sea."

## BROKEN WATER.

## Coast of Sumatra.

THE following is an extract from the Meteorological Report of S.S. *Alipore*, Captain H. ELLIOTT SMITH, Bombay to China, Observer Mr. C. H. STOKES, 4th Officer.

"September 6th, 1928, 0050 G.M.T. Latitude 5° 24' N., Longitude 97° 22' E. Course true N. 80° W., Speed 9½ kts., Wind W'ly force 3/4. Passed through a belt of breakers about one hundred yards in width extending from the coast of Sumatra to the horizon in a S.S.W'ly to N.N.E'ly direction. At the time only a slight W.N.W'ly swell was running, but when the disturbance was reached light water was shipped over the forecastle while passing through it. On either side the water was smooth.

"Twenty minutes afterwards another similar belt was crossed not extending in length as far as the first one, inasmuch that it did not reach the coast at one extreme or the horizon at the other, the extremes being visible from the bridge. The direction of this belt corresponded to the first.

"Probably the cause of this was the meeting of the Westerly Wind and Westerly current usually experienced in this region."

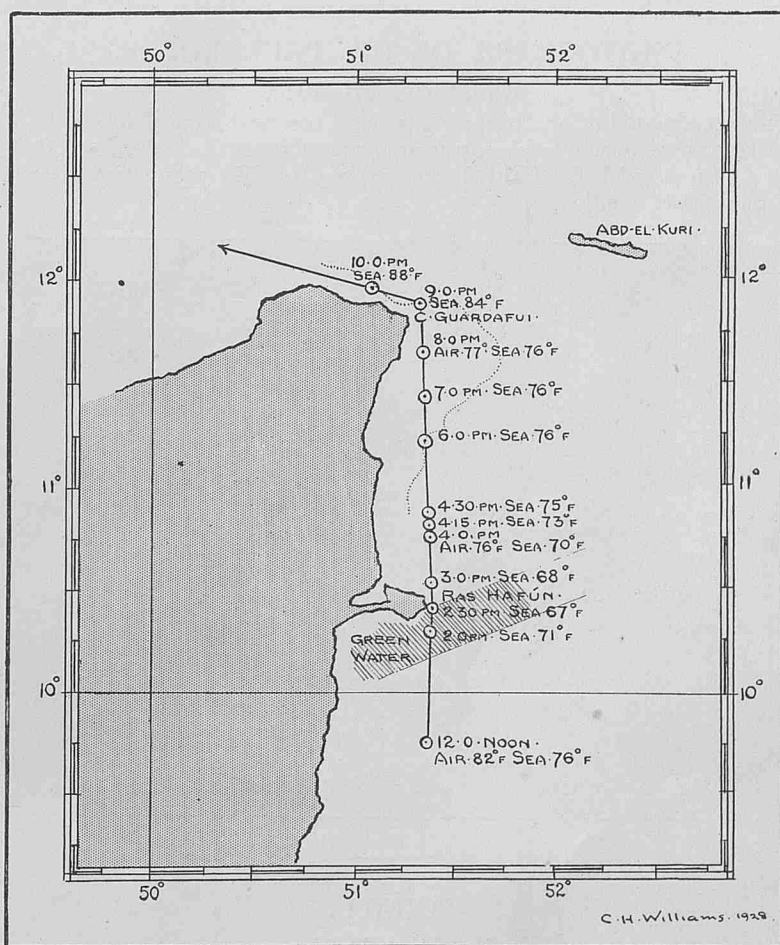
## SEA TEMPERATURE.

## Near Cape Guardafui.

THE accompanying chart and remarks were received with the Meteorological Log of S.S. *Llandovery Castle*, Captain C. E. STUART, R.D., R.N.R., Mombasa to Aden, Observer Lieutenant C. H. WILLIAMS, R.N.R., 2nd Officer.

Chart shows the changes in sea temperature experienced when passing Ras Hafun and Cape Guardafui on Thursday, 13th September, 1928.

The sea temperatures were read and recorded in the Engine Room from a thermometer kept constantly standing in the circulating water inlet 10 feet below water line.



## PHOSPHORESCENCE.

## Red Sea.

THE following is an extract from the Meteorological Report of S.S. *Knight Companion*, Captain A. L. DAVIS, Port Said to Padang, Observer Mr. J. H. ISHERWOOD, 3rd Officer.

"On September 18th, 1928, between 7.45 p.m. and 8.15 p.m. in Latitude 15° 52' N., Longitude 41° 22' E., steering S.35°E. True and in sight of Jebel Teir Lighthouse, the ship entered an area of remarkable phosphorescence. Not only were the crests of the waves and the ship's wake brilliantly luminous, but to the Eastward and stretching in a N.N.W. direction for about two or three miles was a long band of brightly phosphorescent water so straight and unbroken that it

had the appearance of broken water. About 8.15 p.m. this phenomenon disappeared. During this time a very hot breeze was blowing from the Eastward and there was a large quantity of sand in the air. (Stars and planets were not visible lower than 25° or so owing to this sand haze.) There was also a considerable difference in the temperatures of the sea and air, the sea being 92° and the air 86°."

### Off South Africa.

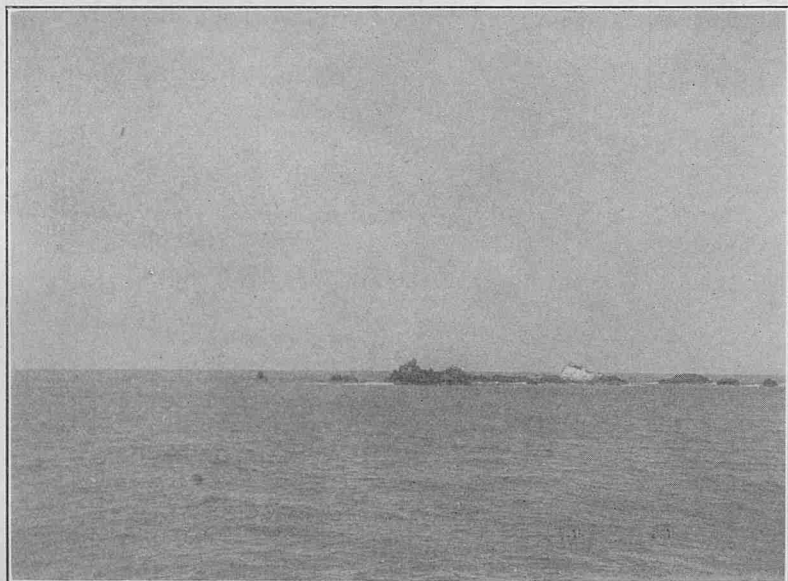
THE following is an extract from the Meteorological Log of S.S. *Port Melbourne*, Captain T. KIPPINS, Durban to Dover, Observer Mr. W. E. SIMPSON, 3rd Officer.

"On September 16th, 1928, C. Agulhas bearing 285° distant 30 miles from 8 p.m. to 8.30 p.m. A.T.S (1830-1900 G.M.T.) passing through water which on the slightest disturbance showed up vividly phosphorescent—when still, nothing was seen. Forepart of ship lighted up and smallest ripples produced 'fire.' For half hour this took place when a line of lighter coloured water was seen ahead running in a North to South direction, and, on passing through this, all phosphorescence disappeared. Weather conditions calm, smooth sea slight W.S.W. swell. Occasional thin stratus clouds. Barometer 1021.6 mb. Visibility exceptional. Loom of Agulhas seen for 35 miles and later on at 11 p.m. Point Danger Light at 40 miles."

### PHOTOGRAPH OF ST. PAUL ROCKS.

#### Equatorial Atlantic.

THE accompanying photograph has been received from Captain J. F. McCHRISTIE, S.S. *Glensloy*, and was taken on 26th September, 1927, at 1.26 p.m. with St. Paul Rocks bearing S.50°E. (magnetic) distant a quarter of a mile.



### SQUALL.

#### North Atlantic Ocean.

THE following is an extract from the Meteorological Report of S.S. *Mississippi*, Captain J. T. J. WYLIE, London to New York, Observer Mr. W. M. SHOOSMITH, 3rd Officer.

"September 26th, 1928, in Latitude 42° 25' N., Longitude 55° 08' W. Barometer 29.65 in. Temperature 66°F. At 1900 hours a heavy bank of Nimbus was observed working up from S.W. with a good deal of lightning. At 1940 hours a line-squall formation was visible to the S.W. extending about 35°-40°. At 2015 squall struck ship, heeling vessel over about 15°. Wind which had been S.S.E. force 6 very suddenly veered to S.W. and increased to force 9 accompanied by heavy thunder and lightning and torrential rain. Barometer fell to 29.58 in. and temperature to 62°. At 2045 hours squall passed over and wind suddenly veered to W.N.W. and decreased to force 5. Weather at 2115, wind N.W. force 5, blue sky, Alto-Cumulus Clouds 3. Barometer 29.62 in. rising. Temperature 66°F. high confused sea and swell, visibility 8."

### HURRICANE WEST INDIES.

11th to 13th September, 1928.

REPORT from C. S. *Henry Holmes*, Captain A. BICKER CAARTEN, Observing Officer Mr. M. A. GREEN. At St. Thomas.

"On the 11th September, 1928, at 6.0 p.m. (L.M.T.) St. Thomas, West Indies, received by Wireless, warning of Tropical Disturbance of considerable intensity centred about 300 miles East of Guadeloupe and apparently moving in a W.N.W. direction; great caution advised.

"During the day a moderate to fresh breeze was blowing from an E.N.E. direction until 4.0 p.m. when the wind backed to NE. force 4; the clouds having now changed to Upper, St.-Cu., Lower, Nb. and the bar: 29.90 Temp. 86°F. At 6.30 p.m. I compared my weather data, both local and received, with Captain W. O. SIMMONS, Harbour Master, and we arrived at the conclusion it was advisable to prepare for a Hurricane within the next 24 hours. 12th September, 6 a.m., received Hurricane warning from Captain W. O. SIMMONS, Harbour Office, St. Thomas. At 8.0 a.m. the wind was N.E. force 3-5 bar: 29.902 in. Temp. 85°F. Clouds Cu-Nb. 6, bc. Throughout the day the weather was heavy squalls and rain at intervals, with the barometer falling slowly, until at 4.0 p.m. the squalls increased in force and the sky became more cloudy, changing from Cumulo-Nimbus to Nimbus only. By this time thought it advisable to move the ship from the dock to moorings in the harbour. The wind was still N.E. 3-6 and the bar: 29.810 in.

"At 4.40 p.m. left West India Dock and proceeded out into the harbour and commenced to moor the ship to a large buoy which was anchored with two 6 ton anchors. While doing this the sky became more overcast, the wind increased in violence to force 6-8 and heavy rain set in. At 5.45 p.m. the Hurricane Signal was fired by the guns at the Fort, the wind was blowing at a Fresh Gale with blinding rain squalls. By 7.0 p.m. the ship was securely moored to the buoy by the two anchor cables shackled to ring bolts on the buoy; also one 6 in. Manila with the end passed back on board and secured to the bollards; and two grappling ropes 6 x 3 secured from the cable engine. The weather had by now settled down to a light breeze from the N.E. the barometer standing at 29.740 in. Temp. 80°F. the sky overcast and a steady rain falling. One hour later the wind began to increase and by 10.0 o'clock it was squally and increasing in force and the squalls becoming more frequent as time passed on.

"13th September, 1928, at 00.35 a.m. the wind changed to E.N.E. force 8. the barometer had fallen to 29.67 in. and there was a continuous heavy deluge of rain. The weather conditions were much the same until 5.0 a.m. when a fresh gale was blowing from the E.N.E. and the barometer was 29.50 in.; it continued so until 7.0 a.m. when the force of the wind had increased to a strong gale and the barometer had fallen to 29.46 in. At 8.0 a.m. it was blowing a Whole Gale from an E.N.E. direction; the Temp. having fallen to 76°F. and the bar: 29.44 in. About half-an-hour after this the ship was steaming slow ahead on both engines to relieve the strain on the moorings. When 9 o'clock arrived the wind had reached hurricane force and 10.0 a.m. the Hurricane was at its height; wind E.N.E. 12. Bar: 29.36 in. Temp. 70°F. During the whole period the barometer was watched very carefully and at 1.0 p.m. the barometer registered 29.32 in. remaining steady for about 20 minutes, when began pumping with an inclination to rise; until at 2.0 o'clock the wind changed from E.N.E. to East which caused a "Lull" for about ten minutes, during which time the rain ceased and the sky partly cleared, the barometer having risen to 29.42 in. At 2.10 p.m. the sky once more became overcast with the wind increasing and heavy deluge of rain, ten minutes later the wind had again reached hurricane force but from the East this time and continued so until 5.0 p.m. when the wind veered one point and blew Hurricane Force from an E. by S. direction. Bar: 29.50 in. Temp. 76° F. Visibility 2.

"At 6.0 p.m. the wind was E.S.E. force 7; moderating and the weather becoming once more squally, the bar: 29.54 in. visibility 3-5. One hour later the wind had moderated to force 6, but still squally and accompanied by heavy rain, the conditions remained the same until 11.0 p.m. when the storm had passed and the squalls were less frequent.

"At midnight the wind changed to S.E. and came in heavy squalls of gale force; the barometer having now risen to 29.70 in. Temp. 77°F. which remained steady until 3.0 a.m. the 14th September.



"It seemed that by this time the storm was well passed and the barometer rising gradually back to normal; the rain still continued to pour heavily and at 11.0 a.m. the sky was overcast and a

"While the ship was in San Juan, Porto Rico, 29th August, 1928, a "Corona" of large diameter was seen around the Moon and very distinct. One similar was seen about 2 weeks before the Hurricane in October, 1916."

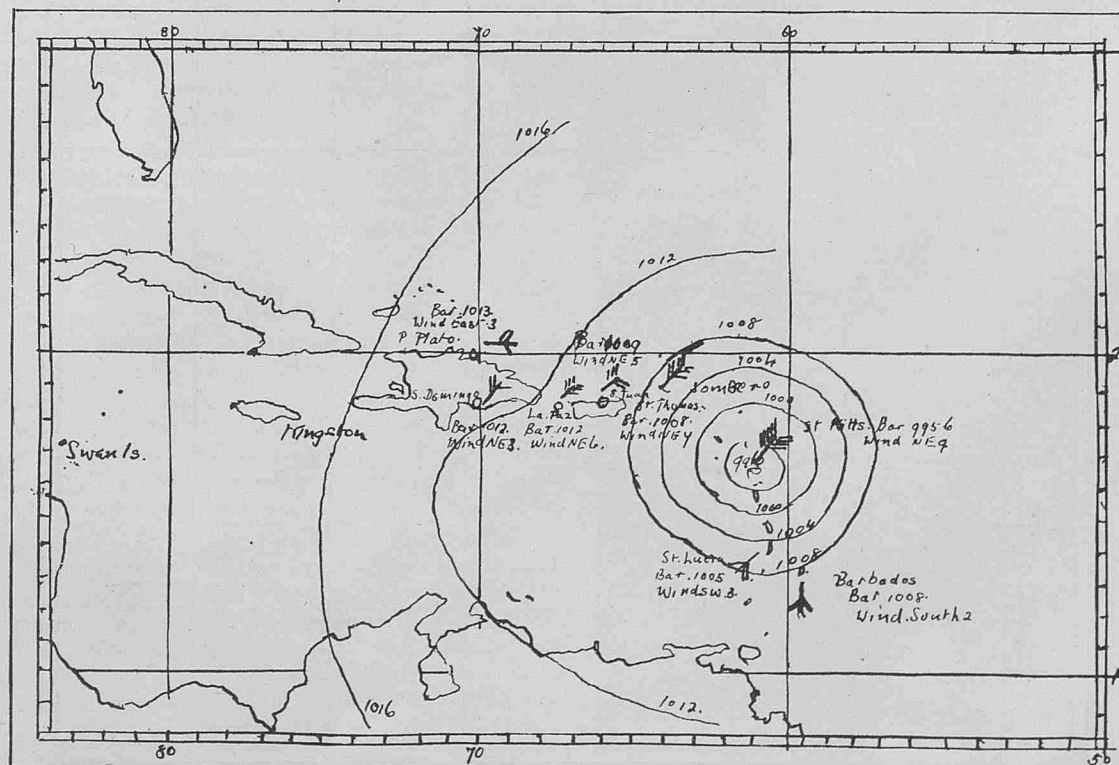
## West Indies.

A hand-drawn map of the Caribbean Sea and surrounding regions, including parts of North and South America. The map features a coordinate grid with latitude lines at 10°N, 20°N, and 30°N, and longitude lines at 80°W, 70°W, and 60°W. A storm system is depicted with isobars labeled 1016, 1012, and 1008. The center of the storm is marked with a large 'L' and labeled 'Bar 1004'. Weather data from various stations is recorded, including barometric pressure, wind direction, and wind speed. The stations and their data are as follows:

- Bar 1016**: Wind East 11, 7 Flats
- Bar 1014**: Wind North 12, 3 Down
- La Paz**: Bar 1014, Wind NE 4
- Bar 1013 1/2**: Wind NE 11, 3 up
- St. Thomas**: Bar 1011, Wind NE 5
- Samborombon**: Bar 1008, Wind NE 6
- St. Martin**: Bar 1007, Wind NE 6
- St. Kitts**: Wind NE 5, Bar 1007
- St. Lucia**: Bar 1008, Wind NE 12
- Barbados**: Wind SW 3, Bar 1007
- Trinidad**: Wind SW 1, Bar 1010

Other geographical features labeled include 'Swan Is.', 'Kingston', and '1016' (likely a reference to the 1016 isobar). The map is a historical weather chart, likely from the early 20th century, showing the path and intensity of a tropical storm or hurricane.

g.d.R. 3/0



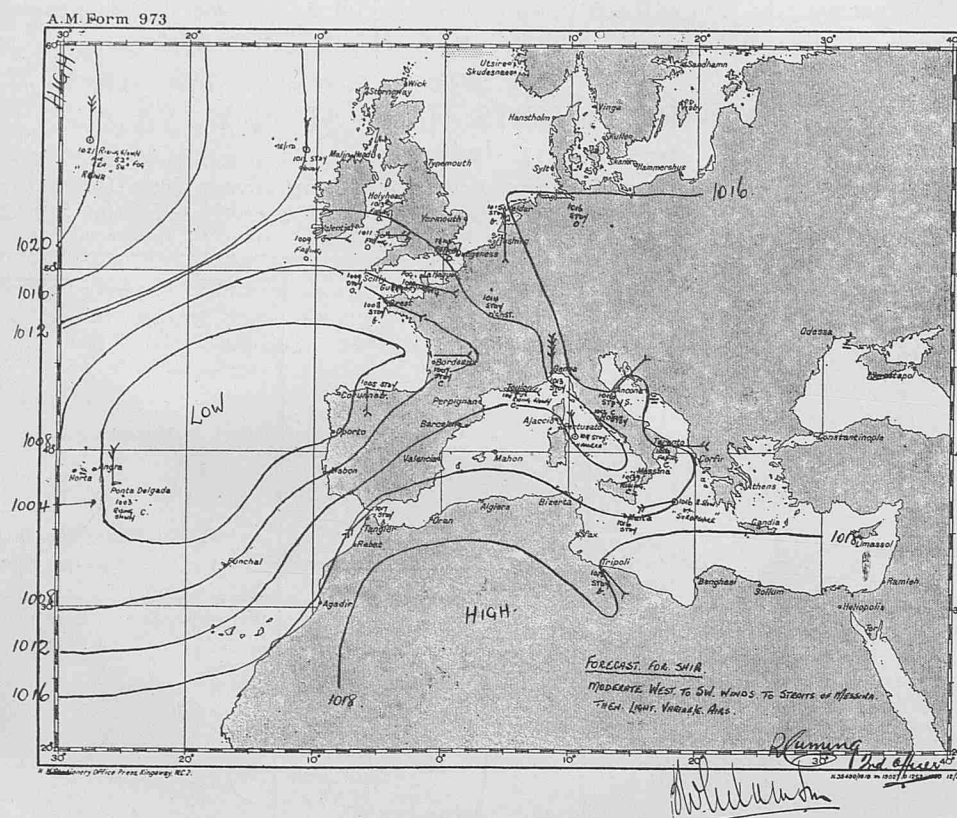
JDR 3/0

## WEATHER CHARTS MADE AT SEA.

## Mediterranean Sea.

Weather Chart made at sea on board S.S. *Shropshire*, Captain B. W. ADAMSON, Port Said to Marseilles, by Mr. R. CUMING, 2nd Officer

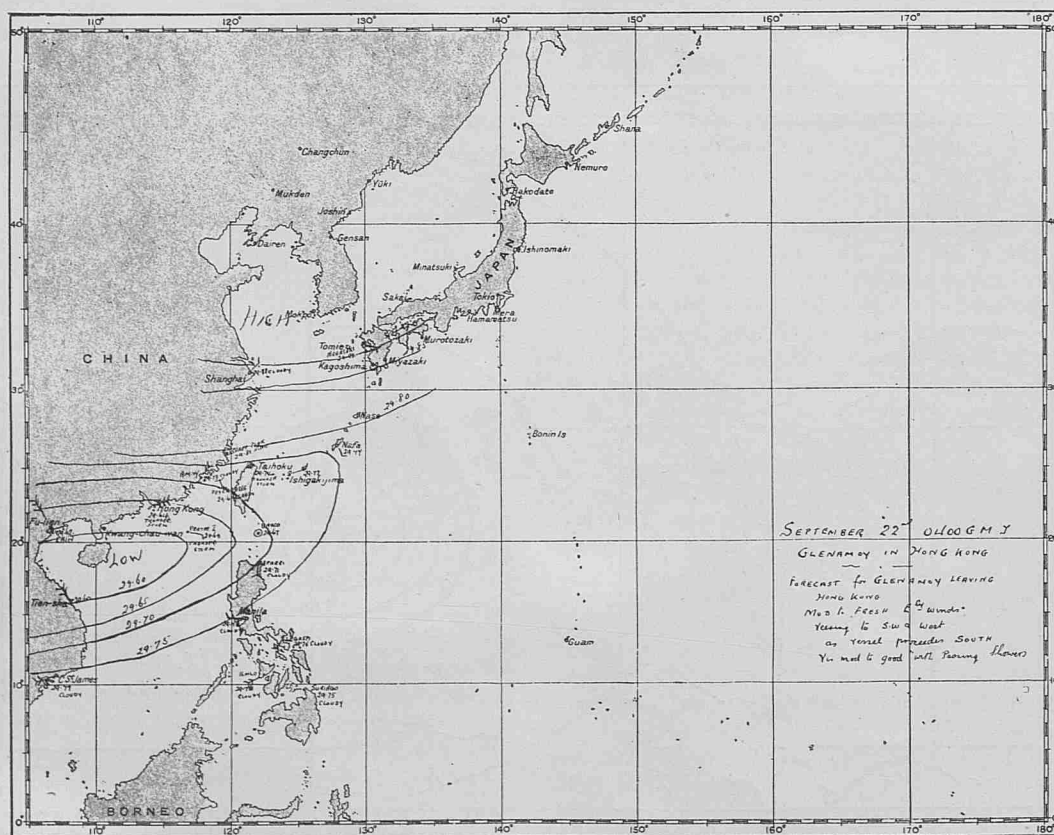
27th Sept. 1928. 0700 G.M.T. Lat.  $36^{\circ} 53' N.$ , Long.  $18^{\circ} 30' E.$  Course  $296^{\circ}$ . 13 knts.



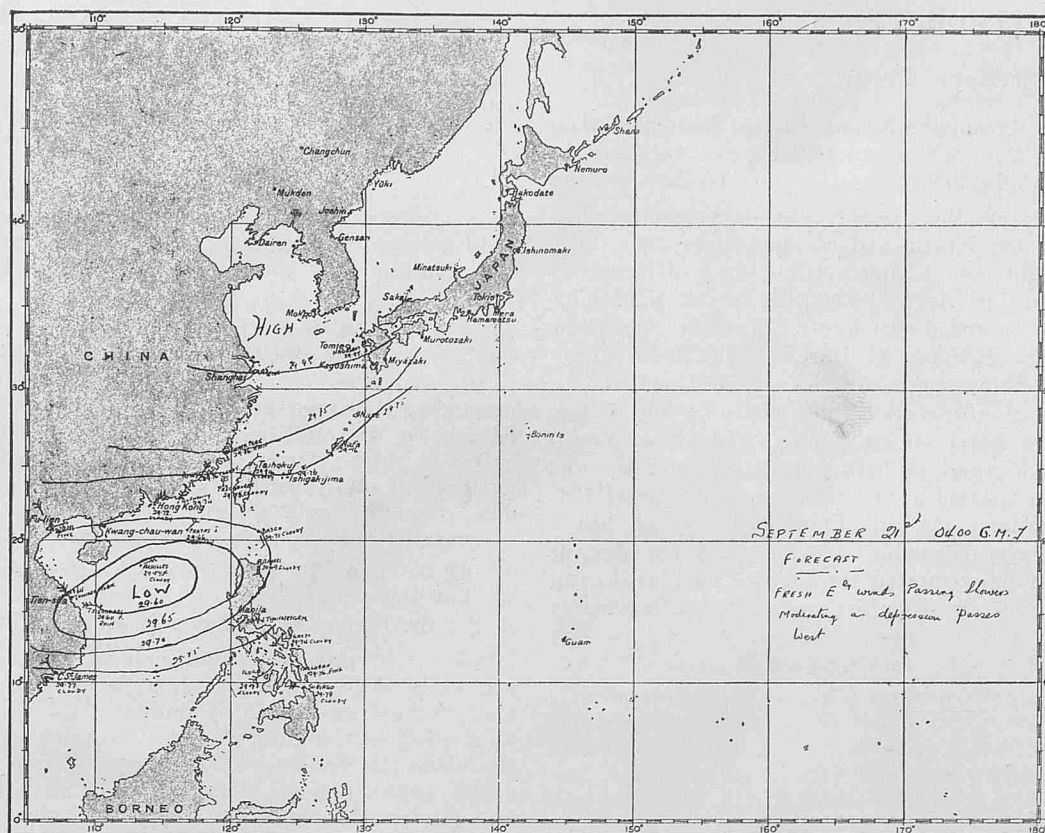
According to *Shropshire's* Meteorological Log the wind was S.W. by W., force 4 to 5, until after 4 p.m. when it fell light and variable.

## China Seas.

Weather Charts made at sea on board S.S. *Glenamoy*, Captain C. E. HOMAN, Shanghai to Hong Kong, by Mr. R. W. EMERSON.







## HALO PHENOMENA.

### Panama Canal.

THE following is an extract from the Meteorological Report of S.S. *Glamorganshire*, Captain A. PURVIS, North American West Coast to United Kingdom, Observer Mr. R. A. STENHOUSE.

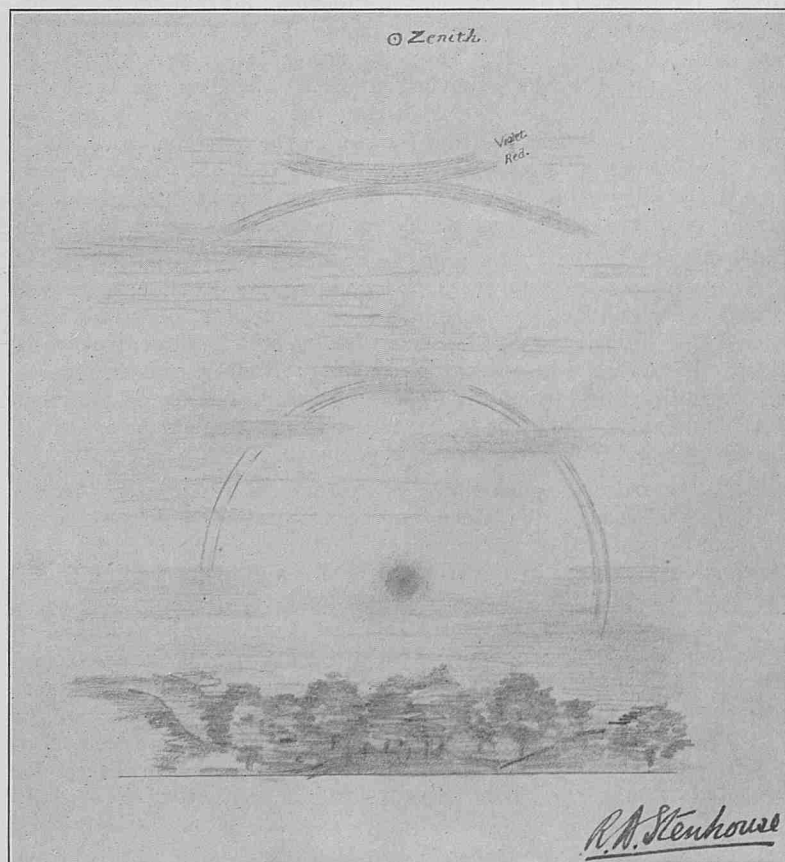
"29th September, 1928, in Gatun Locks, Panama Canal, Latitude  $9^{\circ} 16' N.$ , Longitude  $79^{\circ} 56' W.$ , 4.15 p.m. The sun was  $21^{\circ}$  above the horizon. Upper clouds, Ci-St. (dense) and Ci-Cu., travelling slowly in a Southerly direction. The  $22^{\circ}$  halo appeared about one hour beforehand, colours being faintly visible.

"At 4.15 p.m. (Panama Canal Zone Time) an Arc of Upper Contact to the  $46^{\circ}$  halo appeared, and for 15 minutes was very brilliant, the colours of the spectrum showing plainly. At the most brilliant phase of this arc a portion of the  $46^{\circ}$  halo appeared for about five minutes; this, however, was very faint.

"At 4.30 p.m. the arc of upper contact commenced to fade, and at 4.50 p.m. had completely vanished. The  $22^{\circ}$  halo followed shortly after, the sun having descended into a bank of dense A-St cloud, formed apparently from the Ci-St. Barometer 29.86 in. Temperature  $82^{\circ} F.$

"In the forenoon the weather had been thundery, with heavy rain storms; the wind light and variable, force 3 at times. About 1 p.m. the weather improved, the sky remaining partly overcast with Ci-St. and A-St. cloud."

NOTE.—The upper arc shown in the drawing is often called the arc of upper contact to the halo of  $46^{\circ}$ , but it has been shown that it sometimes does not quite make contact with this halo. Also, as during part of the above observation, it may be seen without the halo of  $46^{\circ}$ . It is strictly called the circumzenithal arc, and, as this name implies, is centred on the zenith. It can never be seen as a complete circle. It has been shown that it is produced by hexagonal ice crystals floating with their bases horizontal. Brilliant colouring is characteristic of this phenomenon.



## VISIBILITY

## Off Cape Verde.

THE following is an extract from the Meteorological Report of S.S. *Abinsi*, Captain H. E. MILLSON, Liverpool to West Coast of Africa, Observer Mr. G. M. DE LA COUR, 3rd Officer.

"Unusual visibility during the voyage was experienced when making Cape Verde from the Northward on September 12th, 1928, when the loom of the light was plainly visible at a distance of forty-seven miles, time 9.00 p.m. A.T.S. Latitude 15° 31' N., Longitude 17° 30' W. Course 180°, speed 12.4 knots. Weather conditions were as follows. Wind S x E, force 4. Barometer 29.73 in. Temperature 78°F. Sea moderate, confused. Sky almost completely covered with Cirro-Stratus clouds, stars at high altitudes not visible, while lower clouds were a patch of cumulus moving from South extending from S.E. to S.W. and at 10.00 p.m. A.T.S. a few spots of rain fell. The light was passed at 00.50 a.m. on a course of 176° distant six and a half miles. Almadi Point light, which has a visibility of ten miles, was plainly visible at 11.25 p.m. A.T.S. distant seventeen miles, which may be accounted for by the fact that during the tornado season excellent visibility is experienced after heavy rain."

## MIST ON THE EQUATOR.

## Pacific Ocean.

THE following is an extract from the Meteorological Log of S.S. *Ruapehu*, Captain A. W. McKELLAR, R.D., R.N.R., Wellington to Balboa, Observer Mr. L. F. MALCOURONNE, 3rd Officer.

"8 a.m., 26th September, 1928, in Latitude 1° 50' S., Longitude 85° 30' W. (500 miles west of West Coast of S. America). Temperature, Air Dry Bulb 65°F., Wet Bulb 62°F., Sea 66°F. Wind S, force 2. Overcast St/Nb. Barometer 1015.2mb., normal range. Since 4.00 a.m. passing through extensive banks of wet mist, visibility at times reduced to one mile. These patches of mist were similar to those well known banks experienced often when approaching the S.W. coast of the British Isles during the early summer months. As the air received warmth from the sun so the mist increased, until after noon, when a sudden rise of 8° in the temperature of the sea marked the dispersing of the mist, also the termination of a cold current from the southward which for the past 24 hours had been setting north 1 knot.

"The air and sea temperatures 'crossing the line' between the Galapagos Island and S. American Coast are invariably of a cool order, 65°-70°F. being quite common. The area of low temperature is often no more than a belt two or three hundred miles wide in a north and south direction, depending on the S'ly winds and the cold current which flows north along the S. American Coast. Can it be said that this vicinity is the coldest part of the equator?"

NOTE.—According to such charts of average sea temperatures as are available the equatorial eastern Pacific is somewhat colder than the equatorial Atlantic during the greater part of the year by about 5° F. The equatorial regions of the Western Pacific and of the Indian Ocean are the warmest. The relatively low temperature is not confined to the region near the South American coast, but extends westward to about Longitude 130° W. As regards air temperatures the equatorial Atlantic and Indian Oceans are on the average roughly 10° F. warmer than the entire equatorial Pacific Ocean for the greater part of the year. The shape of the isotherms in the two former oceans are, however, irregular, so that the above statement is not always correct for restricted areas.

## DUST FOG.

## Red Sea.

THE following is an extract from the Meteorological Log of S.S. *Actor*, Captain E. HAYLETT, Liverpool to Calcutta. Observer, Mr. G. MORRICE, 3rd Officer.

"September, 11th, 1928, at 6.30 p.m. in Latitude 16° 02' N., Longitude 41° 20' E. the wind which had previously been N.W. force 3 suddenly veered to N.N.E. and increased to force 4, bringing with it a fine dust haze which reduced the visibility from 8 to 7.

"Shortly after 8.0 p.m. the visibility improved to about 8, the wind was then N.E. force 5 and rather squally, the sky being completely overcast with St.-Cu/Cu. The wind which was comparatively cool after the heat of the afternoon sun was streaked and interlaced with pockets of hot dry air which could be distinctly felt on the face and hands for several seconds at intervals of about half a minute. These pockets in all probability contained minute particles of sand dust blown off the adjoining coast of Arabia. This dust, though barely discernible to the eye, could be felt beneath the parallel rules when working on the chart.

"At 9.0 p.m. the temperature by the dry bulb thermometer was 89° but the temperature of the hot pockets must have been about 93°F.; the barometer was steady at 1003.5 mb.

"By 9.30 p.m. the wind had moderated to force 3 and then gradually decreased until at 10.30 p.m. it was calm. At 11 p.m. a slight haze set in and by midnight the visibility had deteriorated to 6. Between midnight and 9.25 a.m. on the following morning the visibility was reckoned to be 3. High Island in the Abu Ail group could just be discerned at 8.25 a.m. distant half a mile and during the preceding hours the lights of an overtaking vessel one mile astern could not be seen.

"During the whole of this time, between 10.30 p.m. on the eleventh and 9.25 a.m. on the twelfth a calm prevailed and the barometer was steady with a normal diurnal range. The dry and wet bulbs which were reading 88.8° and 83.5° respectively at midnight were reading 90° and 81° at 8.0 a.m., a decrease in the relative humidity of approximately 12 per cent.

"At 9.25 a.m. the vessel had cleared the Abu Ail channel and was off the East Coast of Jebel Zukur in Latitude 13° 57' N., Longitude 42° 51' E. when suddenly the wind sprang up from the S.S.E. and in a few minutes had increased to force 5. Almost immediately the visibility improved to 7 in the Southward and shortly afterwards was 7 in all directions."

## DUST HAZE.

## Port Darwin and Vicinity.

THE following is an extract from the Meteorological Log of S.S. *Marella*, Captain S. MORTIMER, Singapore to Melbourne via Torres Straits. Observer, Mr. A. G. HILL, 2nd Officer.

"12th—15th September, 1928, from 4 p.m. on the 12th to noon 15th, visibility had been bad on account of haze. Stellar observations impracticable, and solar observations exceedingly unreliable.

"At 6.30 p.m. on 14th September, this haze became so dense as to render all stars below an altitude of 35 degrees invisible. Position D.R. Latitude 10° 44' S. Longitude 133° 42' E.

"6 a.m. 15th. Position D.R. Latitude 10° 45' S. Longitude 135° 51' E. Haze still thick and of yellowish appearance. Fine dust, yellow in colour, was deposited thinly upon the ship last night. Noon, 15th September. Haze cleared up. Good latitude obtained. Wind, light airs on 12th September, E.S.E., force 3-4 on 14th and 15th September. The colour of the dust was a reddish brown and of an extremely fine nature, about the consistency of finely sifted talcum powder. Another peculiar feature of the phenomenon was that the Company's M.V. *Malabar* passed at approximately 10 a.m. 15th about seven miles to Southward of ship and although she experienced the same conditions of visibility as the *Marella* no traces of dust were seen.



### Hillsborough Channel and Queensland Coast.

THE following is an extract from the Meteorological Log of H.M.A.S. *Moresby*, Commander D. A. HENDERSON, R.N. Observer, Lieutenant G. A. GOULD, R.A.N.

"24th to 27th September and 3rd-7th October, 1928. During the two periods mentioned, and particularly so on the second occasion, a thick haze was experienced which restricted visibility on occasions to  $1\frac{1}{2}$  miles and is most exceptional. The haze was caused by a very fine greyish dust which, although unnoticeable while in suspension, covered everything stationary with a thin layer. At times it could be tasted also. Although the wind was variable during both periods, it generally blew from seawards, particularly so during the first period when S. and Easterly winds up to force 5 were encountered during the first two days.

"On the first occasion the haze descended overnight and gradually cleared. On the second, it developed from visibility 7 at 0800 to 5 at 1000. The sky could not be seen during the days of worst visibility, but as the sun shone constantly, though very weakly, it was assumed that the sky was clear."

### METEOR.

#### North Indian Ocean.

THE following is an extract from the Meteorological Report of S.S. *Kalyan*, Captain B. CORNEWALL JONES, London to China. Observer, Mr. W. R. B. NOALL, 4th Officer.

"29th September, 1928, 1505 G.M.T. in Latitude  $5^{\circ} 54'$  N., Longitude  $88^{\circ} 53'$  E. Observed a large and bright meteor, light green in colour, above the northern horizon, altitude about  $30^{\circ}$  when first seen, bearing E.N.E. It attained its maximum brilliancy when bearing N.N.E. thereafter waning until it finally disappeared bearing, approximately, N.N.W. In its wake which was visible for a few

seconds after the disappearance of the large meteor, were two small meteors of the same colour. The duration of passage was about 17 seconds.

"The sky, at the time, was totally covered with cirro-stratus, no stars or planets being visible. The moon, which was visible through the thin clouds, was surrounded by a white halo of  $22\frac{1}{2}$  degrees radius."

### WATERSPOUT PASSES OVER SHIP

#### Off Coast of Portugal.

THE following is an extract from the Meteorological Report of S.S. *Maloja*, Captain J. B. BROWNING, R.D., R.N.R., London to Australia. Observer, Mr. A. D. DENNIS, 3rd Officer.

"September 23rd, 1928, 1140 G.M.T., Latitude  $37^{\circ} 52'$  N., Longitude  $9^{\circ} 33'$  W. True Course  $159^{\circ}$ , speed 14 knots. Observed small waterspout bearing S.S.W. and moving swiftly in a N.N.E'ly. direction towards the ship. All attempts to get out of the way failed, and, at 1150 apparently slightly altering its course it passed across the foredeck of the ship, within 30 feet of the bridge.

"The spout completely disappeared on its passage across the ship, commencing again about two seconds after clearing the lee rail—and in its course it carried away the solid teak lid of a huge deck-box, breaking the hinges and heavy brass hasp. The wind before and after was E.N.E. force 4 to 5 and barometer steady at 29.85 in., but when the waterspout was nearest to the bridge the wind increased to force 8 or 9, and seemingly coming from all directions at once. Clouds were, low, cumulo-nimbus travelling swiftly in an E.N.E'ly. direction, upper, strato-cumulus and stationary. It will be seen in the report that we experienced thick fog at 0600 G.M.T. the same morning."

### OLD TIME MARINE OBSERVER'S LOG.

Below are reproduced extracts of records and sketches made at sea over fifty years ago. Marine Observers of the present day are invited to compare these with their own experience, and should they know of surviving old time Marine Observers whose remarks appear, it is hoped that they will bring these to their notice.

#### LOSS OF THE SHIP "WARRIOR QUEEN."

THE following is an extract from the Meteorological Register No. 3506<sup>a</sup> kept on board the Ship *Sydney Dacres*, 1369 tons, Captain E. J. BLAKE, from Liverpool to San Francisco under date 19th-20th March, 1874.

"At 7 a.m. got on green water, the temperature fell  $7^{\circ}$ . Divers and land birds about.

"At 6 p.m. hove to and took a cast of the lead; had 25 fathoms sand and dark pebbles which gave the position of the ship W.N.W. 2 miles off Point Reyes. At 7.30 filled on the main yard and stood S.W.; at 8 p.m. had 25 fathoms, could then hear the fog whistle on Point Reyes bearing East. At 9 p.m. had 38 fathoms mud, at 10 had 46 fathoms, mud, the whistle then bearing about E.N.E. At 11, hove to with the main topsail to the mast, the whistle bearing N.E. x E. sounded every two hours and kept the fog horn going.

"At 5 a.m. bore away, the weather not so thick; at 8 it commenced to clear up and at 11.30 received a pilot from No. 3 Schooner. At 3.45 p.m. came to an anchor off San Francisco.

"While hove to off Point Reyes a ship called the *Warrior Queen*, from Otago to San Francisco, passed under my stern running under easy canvas. I gave him my soundings, but he soon disappeared in the fog. At 7.30 I fancied I heard the breakers, also I saw something like broken water, so I filled on the main yard and stood out until 11 p.m. At daylight, or rather when it cleared next morning, I could not see anything of the vessel. I began to think something

must have happened to her. On my arrival I reported speaking her 2 miles W.N.W. of Point Reyes. I had not been on shore two hours before the Captain of the *Warrior Queen* and his crew landed in their boats and reported the ship had gone on shore about a mile to the North of Point Reyes (she afterwards became a total wreck). Her Captain thought I said 65 fathoms instead of 25. The Pilots inform me that there is a strong set to the Northward during the fall of the year."

#### The Barometer and Weather near Cape Horn.

THE following notes are also taken from the above log:—

"A few remarks upon the use of the barometer as a guide to the weather in the neighbourhood of Cape Horn may not be amiss, although being a stranger to that part of the world my opinion may differ from that of others who are constantly going round the Horn.

"I find that the barometer will fall steadily whilst the wind is to the northward and westward; should it rain and the gale increase about N.W. most likely it will suddenly shift to the S.W. during a heavy shower, the barometer having commenced to rise a little before the change of wind, and the sky will rapidly clear. Should the wind die away at North you are very likely to have light airs from several directions, barometer steady; then the breeze will freshen up from

about S.S.W. with thick rain, after an hour or two the wind will haul S.W. or more Westerly with a clear sky, barometer rising a trifle, but if the barometer soon commences to go down the wind will back to the northward of west.

"When there is going to be a moderately quick shift from N.W. to S.W. you will often notice the thin clouds come up from the S.W. an hour or two before the wind shifts, but if it is very sudden you will generally see a small clear spot or else an arch. Generally speaking the harder the N.W. wind blows the more sudden the shift and heavier the blow from S.W.

"The barometer stands much higher some months than others, for on our outward passage (winter) west of the Horn the wind was mostly from the northward and westward, but the barometer ranged much higher than it did on the homeward one (summer) about the same locality, although the winds then were mostly to the south of west. Only once or twice did I notice the quicksilver to go down whilst the wind was hauling to the Southward, but we generally had rain or else it blew hard from the South, when the mercury soon rose again.

"Heavy fogs with much dampness also have a tendency to depress the mercury. I find a very low barometer is generally the precursor of a strong Southerly gale which soon rises the glass. If the mercury rises rapidly and goes up towards 30.00 in. the Gale will continue to blow for some time.

"Between 50° S. and 40° S. to the eastward of the Falklands with a moderate breeze from the westward the barometer stands about 29.700 in.; should the barometer fall a little you will have the wind going to the northward of west and will hang in that quarter until the mercury has ceased to fall. Soon after it commences to rise the wind backs to the south of west and will continue to blow until the quicksilver falls again a few tenths. With moderate winds between W.N.W. and W.S.W. the mercury rises before the wind hauls southerly and falls before it goes northerly. I always found the mercury to precede the wind.

"I have no doubt if you had registers enough for all the months of the year in the vicinity of Cape Horn you would find that the barometer ranged highest during the winter."

### INTERESTING REMARKS.

The following extracts are taken from the Meteorological Registers No. 3596 and 3596a kept on board the Ship *Dunatistair*, Captain H. P. WRIGHT, from England to Calcutta and back commencing 12th November, 1874.

#### A Sudden Land Fall.

"THURSDAY, 7TH JANUARY, 1875.—Position at noon, Latitude 38°28' S., Longitude 75°20' E. Shaped course to pass fair midway between the Islands. At 5 p.m. came on dense fog. Felt very anxious on account of sights not being very good (bad horizon). 9.15 p.m. Came suddenly upon the island of Amsterdam. Fog having for not more than five minutes lifted when it came on again as dense as possible. I never remember a more miraculous escape for as we were going we must have struck the South end. I am very much at a loss to account for it, we had good sights at 4 p.m. and for the last two days have experienced a southerly current. When close to the island we had a hot wind or fancied we had though too much occupied to note the thermometer—and two or three flashes of lightning in the direction of the island. Not until next day's sight were we able to determine which of the islands it was."

#### Heavy Squall.

"SATURDAY, 22ND MAY, 1875.—Position at noon, Latitude 33° 36' S., Longitude 28° 00' E. At 3 a.m. Made out outline of land and large bush fire. 10 a.m. Ship struck with a terrific squall which we saw approaching and appeared to be like the base of a waterspout. It appeared from its motion a whirlwind but we only experienced the blast from East or E.N.E. Wind decreased after half an hour

to strength 5; it also appeared when quite close to ship about 250 or 300 yards in diameter. The weather has quite the doldrum appearance. I feel quite sure that had this wind caught us aback we should have lost our masts, as it was we only got the yards braced round just in time."

#### Meteor.

"WEDNESDAY, 16TH JUNE, 1875.—Position at noon, Latitude 1° 09' S., Longitude 23° 11' W. At 3 a.m. Extra large Meteor commencing from 45°, shooting towards the West, showing very red fiery light. After falling a few degrees it appeared to burst in a shower of blue falling stars. The 2nd Officer who reports this and apprentice, both declare they heard it crack, i.e., give report when it burst."

#### Phosphorescence.

"THURSDAY, 1ST JULY, 1875.—Position at noon, Latitude 13° 03' N., Longitude 33° 27' W. Shortly after midnight the sea became quite lighted up in streaks or patches of glaring white light. I can only remember ever seeing anything like it once on the Bank of Agulhas. It was brightest about 1 a.m. and lasted until about 4 a.m., while passing over one of the patches I noticed the fiery animalculae was very small, not larger than a pea, we tried to catch some in a bucket but could not make anything of it. We did not notice any variation in the sea temperature though we tried it several times."

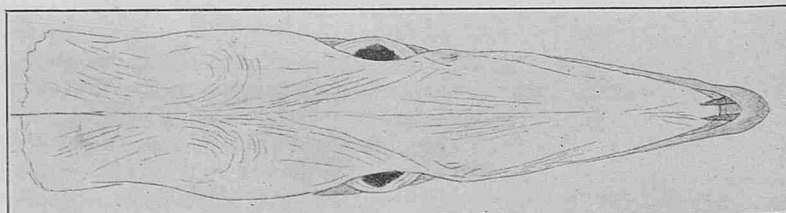
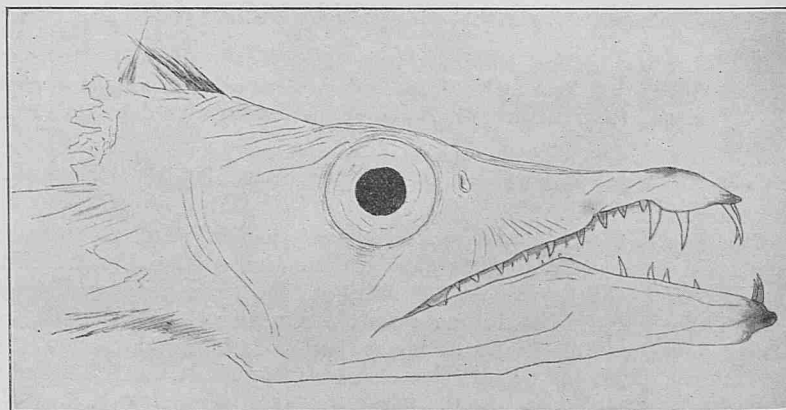
"WEDNESDAY, 4TH AUGUST, 1875.—Noon position, Latitude 48° 08' N., Longitude 6° 30' W. Boarded a Dutch Bark 185 days out from Java, crew in a deplorable state with scurvy and dysentery."

### FISHES' HEADS AND CRUSTACEA.

The following sketches and remarks are extracts from the Meteorological Register No. 3607 kept on board H.M. Surveying Vessel *Nassau*, 877 tons, Captain FRANCIS I. GRAY, R.N., when at anchor off the mouth of the Roouma River, East coast of Africa.

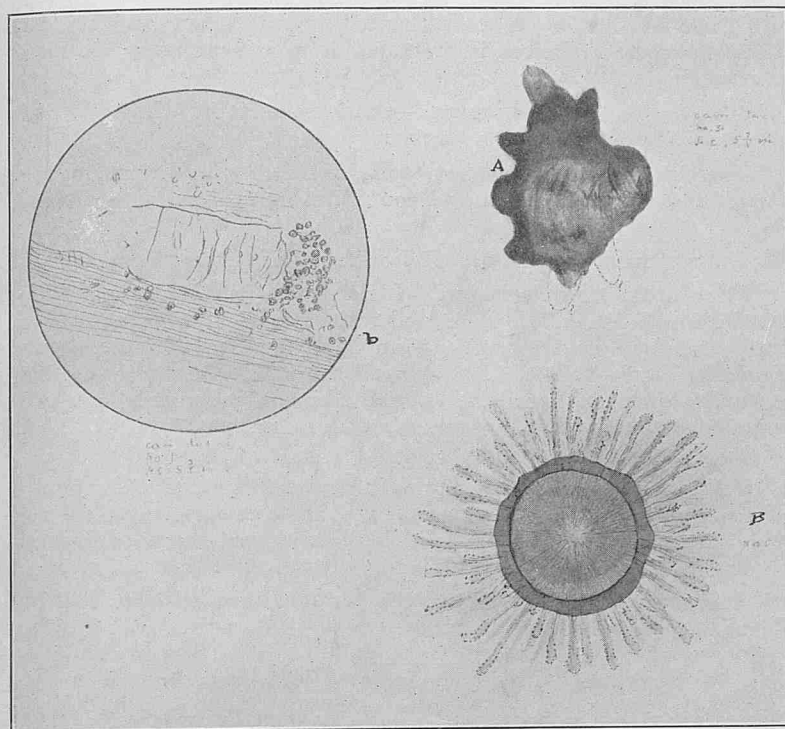
"SEPTEMBER 28TH, 1874.—A young shark measuring in length 31 inches and having three rows of teeth one of which was well developed, was caught but was not the only prisoner, for a fish had been beforehand with the bait and his head was drawn up on the same hook minus the body. The shark was opened but the stomach was found empty.

"The accompanying is a sketch of the head drawn as near as possible the natural size, the second view looking down upon the head is natural size."





OCTOBER 7TH, 1874.—Under this date the accompanying sketches and remarks appear in the log.



- A. Drawn by microscope under Camera Lucida. (This was alive but do not know to what order it belonged. It appeared of a soft jellylike substance.)  
 B. A species of *Valletta* caught alongside. (Natural size)  
 C. One of the small spots (suckers?) at the extremes of the tentacles, drawn under the Camera Lucida.

### WORKING THROUGH THE DOLDRUMS.

THE following extract is taken from the Meteorological Register No. 3611a of the Wooden Ship *Rajmahal* of Liverpool, Captain R. J. BALDERSTON, 1,302 tons register from Calcutta to Liverpool, July 22nd, 1875.

"Noon position, Latitude  $10^{\circ} 56' N.$ , Longitude  $28^{\circ} 15' W.$  Fine weather throughout with just enough wind to keep the ship going from one to two knots but sometimes less.

"I begin to think we have made a huge mistake in coming through Square 3 at all. I think that if we had crossed the Equator in  $26^{\circ}$  West and passed through the corner of Square 3 so as to have been  $30^{\circ}$  West when in  $5^{\circ}$  North we should now have been some hundreds of miles nearer to our journey's end. The South Easterly current (with such light winds) is a great drawback to the apparently short cut from Latitude  $3^{\circ}$  or  $4^{\circ} N.$ , Longitude  $23^{\circ} W.$  to Latitude  $10^{\circ} N.$ , Longitude  $25^{\circ} W.$  I think the Southerly set might be escaped by going well West while the S.E., South, and S.W. winds last and I believe that the winds to the Westward of  $30^{\circ}$  West are always fresher and steadier than those to the East of  $30^{\circ}$  West.

"I hope that when you commence to work upon Square 4, you will be able to show that the homeward bound East Indiaman is not losing time or going out of her way by getting into square 4 as quickly as she can from Longitude  $25^{\circ}$  or  $26^{\circ}$  West on the Equator. I think you will also be able to show that the North Westerly current which would assist the homeward bound vessel, greatly predominates there over any other and especially over Easterly ones."

NOTE.—On completion of the work referred to above, Captain TOYNBEE, the then Marine Superintendent of the Meteorological Office, in his remarks on the best monthly routes across the Equator states:—

"In the month of July, ships bound to the Northward may be guided very much by the longitude in which they approach the Equator; those from the Eastward may cross between  $20^{\circ}$  and  $25^{\circ} W.$ , as the Southerly winds are slightly stronger on the Eastern than on the Western side of Square 3, but they should be in  $25^{\circ} W.$

when in  $10^{\circ} N.$  so as to get a better N.E. Trade than that which exists further E. Ships from the Westward would do well to cross the Equator and stand to the Northward in about  $30^{\circ} W.$ "

### THE NEW HEBRIDES GROUP OF ISLANDS.

THE following remarks are extracted from the Meteorological Register No. 3672 of H.M.S. *Pearl*, Commodore J. G. GOODENOUGH, R.N. under date 22nd April to 11th May, 1875.

"Most of these Islands appear to be of volcanic origin, their centres rising to high peaked cone shaped mountains of from 500 to 600 feet in height. The weather East and S.E. sides are clothed with thick forests from base to summit but the N.W. and West sides in many of them have but a thin sprinkling of trees the slopes being covered with a thick grass.

"Nearly every island of the Hebrides and Banks Groups show signs of an upheaval. Of those on which it was most clearly marked may be mentioned:—

"**Fanna Island.**—This island has the appearance of having undergone a gradual upheaval, the tongues of rock which jut out from the coast line are water worn; evidently at one time they were awash but are not from 15 to 30 feet above the present high water line; where the coast consists of abrupt cliffs it shows signs of having been undermined at various levels, the excoriations run horizontally along the whole face of the Cliff; there are several caves and irregular holes in them. Lumps of coral were observed on the terraces on the West coast a short distance inland.

"**Erromangol Island.**—Five clearly defined ridges were distinguishable along the South Coast as far as the eye could reach, which formed steps at the points. This side of the island was densely wooded, with bare spots of white lime-stone rock here and there showing out between the trees.

"**Sandwich Island.**—Has numerous low points and rises in successive terraces to the base of the Volcanic mountains in the interior. There are large mushroom shaped coral rocks high up inland, old coral rock crops up in all directions even on the highest levels.

"**Deception, Hat, Lopevi, Star Peak, Mota and Saddle Islands.**—These islands are similar in their formation, the first terrace being formed by the comparatively low points that stretch out from the high land.

"**Pentecost Island.**—On this island the marks are not so clear when seen from seaward but on landing they are noticeable; it has also old coral rock at a great elevation. The absence of barrier reefs round these islands is a remarkable characteristic; is it due to the gradual upheaval?

"The island have generally a short fringe reef surrounding them, if the above theory is correct these will in course of time form another step of elevation. The black volcanic rock that shows out from the limestone cliffs at various heights seems to uphold this idea as this rock must form the base upon which the coral has grown."

WEATHER.—As a rule during the whole of the time that the *Pearl* was cruising amongst the islands of this group the sky was overcast.

RAINFALL.—No rain fell whilst the ship was to the south of Two Hill Island up to the 2nd May; north of this island and in the Banks group between the 2nd and 9th of May not a day passed without rain falling the greatest fall registering 2.07 inches. Total for the seven days was 5.005 inches. The rainy season appears to be much later amongst the islands of the Banks group than in the Southern part of the New Hebrides. The months of April and May are said to be wet ones at Mota, Banks Group. After getting to the Southward of Two Hill island on the ships return no rain of any consequence fell.

BAROMETER.—The extreme range between the 22nd of April and the 11th of May was 29.682 to 29.942 inches.

THERMOMETER.—The temperature of the air registered from  $75^{\circ}$  to  $85^{\circ}$ . The temperature of the sea water from  $77^{\circ}$  to  $83\frac{1}{2}^{\circ}$ . The low reading of  $77^{\circ}$  was taken off Aneiteum, the high one of  $83\frac{1}{2}^{\circ}$  was observed in Port Pattison.

The difference between the damp and dry bulb ranged from  $1^{\circ}$  to  $7.5^{\circ}$  these observations were taken every four hours.

**HYDROMETER.**—The Specific Gravity of the sea water was 1.024 in the southern portion of the group and 1.023 in the Northern. In Port Pattison it was 1.020 and at the anchorage in Dillon Bay it was as low as 1.018 at a temperature of 79.5 but this was affected by the fresh water river.

**WIND.**—There was no steady S.E. trade felt. The winds were variable, the most prevalent ones being from E.S.E. to N.E. winds with westing in them were experienced on three days. Squalls were frequent when near high land but they generally gave ample warning.

**CURRENT.**—The current was found to run with the prevailing wind, but was generally noticed before the beginning of any change, to run in the direction opposite to the coming breeze.

On the passage both to and from the New Hebrides, the set experienced when clear of the 'Southerly Coast Stream' was to the N.W. During the 14 days during which it was found, the total set was N. 29° W. 185 miles, giving an average of 13.2 miles per day, the wind was from the S.E. with a high lumpy sea on.

In April and May, 1874, the *Pearl* in passing over nearly the same ground had Easterly and S.E. currents at the rate of about 10 miles per day; but the wind was from the North and West. On all other occasions the general run of the current has been to the N.W.

### WEST INDIAN HURRICANE.

The following remarks are extracted from the Meteorological Register of the Barque *Sorata*, Captain J. I. PRICE, at Jamaica under date 12th September, 1875.

"**Falmouth, Jamaica.**—During a breeze from North which commenced Sunday morning at 8 a.m. and freshened gradually to force 7 at 10 p.m. the barometer fell to 29.830 inches with heavy sea and a rise of 3 feet more water than ordinarily. At midnight the wind dropped for about an hour when it came from South with squalls (7) and light winds alternately lasting until 5 p.m. Monday.\*

"For two days previously the water had been about eighteen inches to two feet lower than ordinary, *an infallible sign of bad weather in this port*. What is the reason of this? Is it that a low pressure at some distance causes a rise of water in its vicinity, thus robbing the sea of a portion of water away from its locality?

"Since writing the above, some two or three vessels having come in crippled by the gale, I have picked out all that I could from their logs referring to it, only one of these vessels had a barometer, which was broken during the storm.

"Extract from log of Barquentine *Lizzie Merry*, from Kingston to Falmouth, Jamaica.

"**SATURDAY, 11TH SEPTEMBER.**—6.30 a.m., off Port Royal discharged Pilot, stood along the land, light air from South, heavy swell from East. At 4 p.m. Port Royal bearing N.W., wind shifted suddenly to N.E. Took in light sails. 10 p.m. Weather clear, set light sails.

"**SUNDAY, 12TH SEPTEMBER.**—Comes in fresh breeze and clear. 2 a.m. Weather looking bad, took in all light sails. 3 a.m. Reefed upper topsail. 6 a.m. Wind and sea increasing, furled upper topsail, closed reefed mainsail and set in. Middle part, fresh gale with heavy rain squalls. 1.30 p.m. Wind and sea increasing, took in foresail, 2.30 split mainsail, wore ship and stood to Southward and Eastward. Wind hauled to S.W. blowing fearfully with heavy rain squalls. Lay to under bare poles.

"**MONDAY, 13TH SEPTEMBER.**—Comes in fresh gale. 6 a.m. Wind and sea moderating, stood to the westward with wind S.S.E.; middle part moderate. 6.30 p.m. Sighted land, Morant Point W. by N. 16 miles. Longitude by a/c at midnight, Sunday, 75° 26' W., Latitude 17° 50' N. By this vessel's position on Monday p.m. she must evidently have run a long way to the Eastward with the Westerly part of the gale, her position therefore may not be very correct.

"Extract from log of Brigantine *Empress* from Kingston to Inagua.

"**SATURDAY, 11TH SEPTEMBER.**—4 p.m. commenced to shorten sail, 8 p.m. closed reefed mainsail and main staysail and took in lower topsail.

"**SUNDAY, 12TH SEPTEMBER.**—Midnight, wind N.N.E. steering West, lay to all night under closed reefed mainsail and fore topmast

\* I took this storm to be an ordinary Norther and the Southerly wind as the land breeze which usually blows from that direction in this port.

staysail, strong gale; 5 a.m. Heading S. x W.; Lat. at noon 19° 23' N., Long. 74° 06' W. steering W.S.W.; 2 p.m. strong gale from N.E. with heavy sea, ship under reefed main staysail hove to; 8 p.m. ship hove on her beam ends, hauled trysail down and set fore staysail to get her before it, but blew it away, cut away the masts to right her.

"**MONDAY, 13TH SEPTEMBER.**—Gale moderating, Lat. by a/c 19° 03' N., Long. 74° 57' W. at noon.'

"The Captain remarked that owing to the distress he was in, compasses and everything lost, he could not notice courses or winds much."

"Extract from log of Brig *Chilion* from Kingston to Halifax.

"**SATURDAY, 11TH SEPTEMBER.**—Light winds and heavy sea. Bar. 29.20in. and falling fast, shortened sail; 8 p.m. Strong gale, stowed jib, fore topsail and foresail; wind N.W. heading N.N.E.; 9 p.m. Gale increasing, stowed lower topsail, hove to. At midnight, Bar. 28.60in., blowing a hurricane; 1 a.m. Ship on beam ends, cut away masts to save ship, Lat. by a/c at time of disaster 17° 40' N., Long. 73° 30' W.'

"The barometer was broken when the vessel capsized, this vessel is a complete wreck, not a ropeyarn left. Same remarks as to observations apply to the Captain of this vessel whose papers and books were all destroyed, the log book being written afterwards.

"The above remarks, though very meagre, are all that could be gleaned from three logs."

### NAVIGATION OF THE ZAMBESI RIVER.

The following remarks are extracted from the Meteorological Register No. 3714 of the Brigantine *Glenesk*, Captain J. T. SUTHERLAND, 191 tons register from Quillimani (Zambesi) to Marseilles under date 11th September, 1875.

"On 11th September, at 3 p.m., we came down the river and brought up off Tangalene Point to await the spring tides in order to cross the Bar outwards. We left the village of Quillimani on the morning of the 8th and were thus three days in getting down owing to the predominance of the sea breezes over the land or morning breeze.

"During the time we lay at anchor discharging our ballast and loading a cargo of produce, the weather was fine and clear with the exception of two overcast forenoons. Some days were very warm, but during the afternoons we always had the fresh sea breeze. The land breeze is said neither to be regular nor to be depended on during neap tides, but are generally said to be fresh during the few days of the Spring tides and both land and sea breezes much stronger in force than during the neap tides; this I found to be correct during our stay in the river. Some days the morning breeze began about or before daylight, beginning at N.E. and towards 10 and 11 a.m. veering to E.S.E. and S.E. until evening, when it would fall calm after sundown and remain so until the morning. At other times the morning winds would begin at North and blow until 9 or 10 a.m., then die away and after an hour or two calm, the fresh sea breeze would come up.

"This is a very awkward place from which to get to sea as loaded vessels can only cross the bar outwards at Spring tides. It is dark in the mornings at high water and during the afternoon the sea breeze is blowing in and merchant vessels of 12 feet draught have laid inside the bar for six or seven months, being unable to get to sea from these causes. So much for the natural facilities of this place. Very few European vessels come here, perhaps two or three annually, to load produce for Marseilles merchants who have two factories or trading stations here.

"The principal trade is in the hands of Parsees and Arab traders, who come here in small schooners bringing goods for barter with the natives and traders of the interior, and who keep stores of every description, both European and East Indian goods. The principal imports are gums, cotton goods, toys and beads, the exports are ivory, skins, beeswax, sesame seed, nuts and cocoa husks. The population at this time numbers about 15 to 20 Europeans (French, Spanish and Portuguese) and several thousand Blacks, half of whom are slaves. Also about 25 or 30 half-caste soldiers. There is a Governor and a few officers in authority to regulate the business of trade, and from these gentlemen we received every kindness."



## THE CLOUDS.

G. AUBOURNE CLARKE.

EVEN the most casual observation will suffice to demonstrate that cloud forms, though infinite in their variety individually, nevertheless group themselves broadly into certain "types" which recur very frequently. Thus, for instance, on one occasion the sky may be covered with a thin uniform veil of "greasy" cloud; on another there may be detached sheets of clouds ribbed or corrugated like the tidal sands on a sea-shore; while at another time huge towering masses of cloud like mountain ranges may be the dominant feature. Nor is it necessary that one type alone should be visible—it is quite common indeed to meet with cases where two distinct forms are visible simultaneously, and when such is the case, careful watching will often prove that the two types are moving from different directions. This fact will at once invest a cloud observation with a special interest, for it will be seen that there must exist a definite reason for this difference of direction. The clouds are borne along by the air currents in which they are situated, and it therefore becomes necessary to assume that the atmosphere is arranged, with increasing height, in a series of horizontal layers, which differ among themselves in the direction and velocity of their movement, and which therefore have probably had different origins. Ascents of registering and pilot balloons have established the correctness of this assumption. It thus becomes reasonable to regard these layers as differing also in their temperatures and in the amounts of moisture they contain in the form of water-vapour. This water-vapour is the origin of all clouds, and is itself produced by the evaporation of water from the surfaces of sea and land by the heat of the sun's rays.

When the air is warm it can hold a very great deal more water-vapour, before becoming saturated, than it can do if it is cold, and therefore, if a mass of warm air, which is nearly saturated, becomes by any cause sufficiently cooled, then the surplus water-vapour condenses out in very small drops of water, and becomes visible as a cloud or as fog.

Broadly speaking, the temperature of the air diminishes with increasing height, and thus the amount of water-vapour present will be much less in the upper layers of the atmosphere than in those near the surface. This accounts for the thin and filmy nature of the high clouds. In our latitudes the maximum height of clouds is on an average about 30,000 feet (about  $5\frac{1}{2}$  miles). At the equator the height is greater, while at the poles it is less.

Summarising the above, it may be said that in general clouds are found as widespread sheets at various levels up to 30,000 feet or thereby. But sometimes a very different arrangement is met with, wherein the clouds are found in detached masses which, instead of being relatively flat or sheet-like, are of great vertical depth, so that they appear as "heaps" of cloud which, in extreme cases, may extend through a vertical depth of over 20,000 feet, or, in other words, through almost the whole range within which cloud is usually formed.

These "heap" clouds possess a special characteristic in the tendency they show to commence forming somewhere about 9 o'clock in the morning, and, after reaching a maximum of development about 2 or 3 p.m., to disperse again during the evening. They are also more in evidence during the summer half of the year. They owe their origin in most cases to the rising upward of those portions of the surface air that have become heated above the temperature of the surrounding air by the power of the sun's rays, and, as the clouds show a sympathetic variation with diurnal range of temperature, they are often referred to as clouds of diurnal ascending currents.

As the heated air rises, it expands on account of the diminution of pressure with height, and the expansion in turn causes a fall of temperature with consequent condensation of the surplus water-vapour into cloud. So long as the rising air remains warmer than the surrounding air in which it finds itself, it will continue rising, and the cloud will steadily increase in height until a point is reached where the temperature difference disappears. When the rising

currents are not very rigorous the clouds thus formed are not of very great depth, and do not give rise to rain, but when these currents are strong and well developed, the clouds grow to large dimensions and produce heavy showers of rain or hail, and are often accompanied by thunderstorms.

In order to identify, for entry in the meteorological log, the different types of cloud that may be observed, a standardised nomenclature has been devised, based partly upon the form of the cloud and partly upon its apparent height. The classification is by no means perfect, and it is at times a matter for conjecture whether the cloud should be entered as one particular type or another one; but on the whole, the system of classification is fairly satisfactory, and, having the merit of simplicity, is likely to yield fairly concordant observations over a large body of observers.

The classification depends, as regards form, upon the appearance of the cloud, *i.e.*, whether the sheet is uniform, or whether it is broken up into separate units (or cloudlets), while as regards height, it depends upon the apparent size of the individual cloudlets in the case of a discontinuous sheet, or upon apparent density where the sheet is uniform. Generally speaking, it is fairly easy in practice to subdivide the sheet clouds into three conventional sections, an upper, an intermediate and a lower. The heap clouds are always included as lower clouds, because, no matter how high their summits may reach, their bases are usually found at no great altitude.

As a result of the deliberations of an international conference some 30 years ago, the following classification was agreed upon:—

- A. *Upper Clouds*: average altitude 30,000 feet.
  - (a) Cirrus. (b) Cirro-stratus.
- B. *Intermediate Clouds*: altitude between 10,000 and 23,000 feet.
  - (a) Cirro-cumulus, Alto-cumulus. (b) Alto-stratus.
- C. *Lower Clouds*: altitude below 7,000 feet.
  - (a) Strato-cumulus. (b) Nimbus.
- D. *Clouds of diurnal ascending currents*.
 

Cumulus, base about 4,500 feet, top about 6,000 feet.

Cumulo-nimbus, base about 4,500 feet, top 10,000 to 26,000 feet.
- E. *High Fogs* under 3,300 feet.
 

Stratus.

In this classification the various types of clouds are arranged in descending order of average height. All divisions except D are sheet clouds; the subdivisions (a) and (b) shown under A, B and C, indicate that the clouds in subdivision (a) are in detached units, while those in (b) are in uniform sheets, and generally cover the whole sky completely. The Stratus under division E is usually complete and uniform, but may at times be in detached masses, as will be described later. The clouds in subdivisions (b) are usually found associated with cyclonic conditions and rain.

In the accompanying plate there are shown typical examples of eight out of the ten cloud types. The following descriptive remarks may help observers to identify the clouds they see, but it should be remembered that there is often considerable uncertainty when the cloud is a transitional form between any two of the types mentioned. An endeavour will be made in these remarks to mention a few of these indeterminate forms, but observers must use their own discretion as to what name they give to the cloud observed. The clouds will be described in the order they are mentioned in the above classification list.

**Cirrus.**—This, the highest form of cloud, is always of a very delicate structure; in the day-time its colour is pure white, sometimes very faintly seen, but at others quite clear and sharply cut.

About sunrise or sunset, the colour may change into a golden orange, and finally into a delicate rose-pink, the colour remaining visible on the cloud long after the lower clouds have become dark against the sky. Cirrus shows itself in long bands or wisps of a fibrous structure, or sometimes as a bundle of very delicate threads, which at times lie parallel to each other, but at others may be interlaced and crossed in a tangled web. Very typical arrangements are:—

(1) Long bands or lines in which the threads are arranged like feathery plumes; these bands are often hundreds of miles in length. When the whole sky is covered by a series of these bands, the bands themselves seem to spread outwards, or to radiate from one particular point on the horizon, and to meet again at the point diametrically opposite. The bands are of course parallel, but the fan-like arrangement is the result of perspective.

(2) More or less curved wisps or tufts, generally detached and scattered over the sky. This form is very characteristic and has been named "mares' tails" by sailors.

(3) A third rather striking and not uncommon form is that in which two systems of fairly parallel threads cross each other at an angle, and so produce the appearance of a net or web. This form is very prone to increase in density until the web develops into a uniform sheet of cloud which then becomes one of the two main types of Cirro-stratus. At other times the crossing threads develop into very small detached aggregations of cloud, and eventually become Cirro-cumulus.

**Cirro-stratus.**—Appears generally as a uniform sheet varying in density from a hardly visible hazy layer through which the sun shines with only slightly-diminished lustre, to a sheet of intensely white cloud. Sometimes the sheet covers the whole sky, but at others it may show a fairly definite edge, which is occasionally sharply defined and straight, towards some part of the sky. The two chief varieties of Cirro-stratus are:—

(1) The sky may show, as the first appearance of this cloud, a slow, gradual whitening of the normal blue tint, so that eventually the whole sky assumes a milky or pearly tint which in time develops into an obvious layer of white cloud, showing little or no internal structure.

(2) The second variety is generally a development of the normal Cirrus. The separate threads of the Cirrus begin to increase in number and density, gradually closing up the interspaces between them, until the cloud layer becomes more or less complete. Such sheets of Cirro-stratus usually show a definite fibrous structure, the denser fibres being arranged along the lines where previously the bands of Cirrus were found. In cases where the Cirrus was of the form mentioned in (3), the Cirro-stratus layer, when developed, presents a woven structure.

Both varieties of Cirro-stratus give rise to various optical phenomena, which are caused by the refraction and reflection of the Sun's rays by the tiny ice-crystals of which the cloud is composed. Chief among these are solar and lunar halos, mock suns and moons (parhelia and paraselenæ), and sun and moon pillars.

**Cirro-cumulus** is almost always easy to identify by the delicacy of its structure. In colour it is usually dazzlingly white in the daytime, and golden orange or rose-pink when the sun is rising or setting, but sometimes the tiny cloudlets, when they are globular in form, may exhibit very faint greyish shadows. The typical forms of Cirro-cumulus are as follows:—

(1) The transitional form between Cirrus and Cirro-cumulus which appears as very minute ripples of cloud, or small nuclei interspersed with threads. This form is subject usually to very rapid changes from thread to ripple or nucleus and *vice versa*. There is no clear line of demarcation between it and the next form.

(2) The globular form.—Flotillæ of very small pure white globules of cloud, often arranged in a series of lines or ranks. These lines of cloudlets are usually parallel, and are sometimes crossed at an angle by another series of lines, thus exhibiting "double undulation." The globules vary in size throughout the cloud-sheet; being usually small at the edges, but larger towards the middle of the sheet. Occasionally they may be large and dense enough to show very faint shadows, especially when situated in the neighbourhood of the sun so that part of the incident light is transmitted through the cloud sheet.

(3) The wave form.—This form is very common, and is arranged in much the same manner as the globular form, but the globules are replaced by more or less continuous wavelets, sometimes straight but more often curved. The wavelets may be widely separated or closely packed; when the latter condition is present, the wavelets frequently fuse together into a more or less uniform mass towards the centre of the cloud sheet. The wavelets may occasionally show faint shadows in circumstances similar to those mentioned in the case of the globular form. When the wavelets are interrupted by the crossing of another wave system, the appearance produced is that of a flaked or tessellated sheet.

**Alto-cumulus** is a cloud type having all the characteristics of Cirro-cumulus, but, owing to its height being about half that of the latter, the Alto-cumulus is usually a much denser cloud, with the individual cloudlets larger. The forms shown by Alto-cumulus are similar in most respects to those of Cirro-cumulus, but the rounded masses and waves usually show fairly definite shadows. When, however, the cloud is thin, the waves may be white and without shadows, and the tessellated type may show as flattened thin scales.

There is no clear line of demarcation between Cirro-cumulus and Alto-cumulus; the types merge gradually into each other, and it is often difficult to decide upon the correct designation. A Cirro-cumulus sheet may appear as Alto-cumulus in the centre of the sheet where the cloud is thickest, while an Alto-cumulus sheet may be fringed with smaller cloudlets exactly resembling Cirro-cumulus. The main characteristic of the cloud-sheet should, in such cases, serve to establish its correct type.

During thundery weather conditions, Alto-cumulus is often very globular in form, and sometimes may show a vertical structure which resembles in miniature the clouds of the Cumulus and Cumulonimbus types. In fact these latter types usually succeed the appearance of this specialised Alto-cumulus. Cirro-cumulus and Alto-cumulus, when in the wave form, are known as "Mackerel Skies"; the banding of the cloud being likened to the stripes on a mackerel's back.

**Alto-stratus** is the name given to the widespread cloud-layer which almost always completely covers the sky. It resembles Cirro-stratus, except that, instead of being white in colour, it is usually bluish-grey or yellowish-grey. The sun may be discerned, shining weakly through it, but the cloud is usually too dense for actual sunshine, and no shadows are cast by the sun's rays. This cloud is often referred to as the "water sky" partly, perhaps, on account of its almost certain association with approaching rain.

Alto-stratus is a much lower cloud, usually, than Cirro-stratus, but a development of Cirro-stratus into the lower cloud is the rule rather than the exception, and would seem to suggest that condensation was occurring at a steadily decreasing height. Alto-stratus formed in this manner is usually quite structureless, and generally of the bluish-grey colour. But Alto-stratus is formed at times by the degradation and eventual fusing of Cirro-cumulus; in this event the cloud-sheet shows warps of denser cloud running in lines across the cloud-sheet, these may be crossed by another system of warps, giving the cloud a fibrous or web-like structure. The colour of the cloud in this case is often a yellowish-grey.

**Strato-cumulus** is in reality a much heavier, denser, and lower form of Alto-cumulus. It is seldom so regular in its arrangements, and the individual cloudlets are more lumpy and irregular. The colour is usually some tint of grey, ranging from white cloudlets with definitely light-grey shadows to dark-grey masses separated only by brighter lanes and interstices. This latter form is in fact one of the most common sky-types in our latitudes.

Towards evening the Strato-cumulus shows as heavy purple-grey detached rolls and irregular masses of cloud on a comparatively light-blue sky. Sometimes the Strato-cumulus may appear in long rolls, very straight and parallel, stretched right across the sky; it is then known as "roll-cumulus." On other occasions a cloud-sheet resembling a complete layer of Strato-cumulus may exhibit on its under-surface an "inverted" structure, wherein more or less rounded masses of cloud hang downwards from the cloud-sheet, giving it a "festooned" appearance. Such cloud-sheets are known as mammato-cumulus, but for practical purposes it will be sufficient to enter the observation of cloud as "Strato-cumulus" and to make a note in qualification to this effect "under surface mammillated."





**Cirrus**, in curved wisps.



**Cirro-Stratus**, showing clearly defined edge to the cloud sheet.



**Cirro-cumulus**, small waves and flakes.



**Alto-cumulus**, in long thin waves.



**Alto-Stratus**, some detached Strato-cumulus patches below.



**Strato-cumulus**, at edge of heavy sheet.



**Cumulus**, just beginning to form (some slight Cirrus above).



**Cumulo-Nimbus**, during thunderstorm, showing development of "anvil."

**Nimbus.**—This name is given to the heavy indefinite cloud-structure from which more or less continuous rain or snow falls.

Usually, Nimbus is a very composite cloud, the sky when rain is falling being generally covered with a dense layer of Alto-Stratus, below which detached fragments or extensive sheets and masses of broken ragged cloud may be seen moving. At times this lower cloud closes up into a layer which, on account of the rain, appears almost as uniform as the higher Alto-Stratus.

Sometimes, however, the layer may be more of the "heap" type, and may have a cumuliform structure which becomes evident only as the cloud sheet begins to break up and disperse. In some exceptional cases, large Cumulo-nimbus clouds may increase greatly in size and their bases may spread laterally and close up into what appears to be an ordinary Nimbus layer. A Nimbus sheet formed in this way is usually very slow-moving or even stationary, whereas the ordinary true Nimbus of a depression moves very rapidly. Broken "scud" cloud is usually classified as Fracto-nimbus, on account of its torn and ragged appearance.

**Cumulus** is the lesser in size of the two types of heap cloud. In its typical form it appears as a hemispherical or pyramidal mass of condensation, whose base is almost flat. The upper part of the cloud shows a large number of protuberances which are really the heads of the ascending air columns.

According to the position of the cloud with reference to the observer, it shows various aspects. If the cloud is between the observer and the sun, so that the sun's disc is hidden by the cloud, the cloud appears as a fairly uniform dark-grey mass with an edge of dazzling whiteness. If on the side of the observer directly opposite to the sun the cloud is vividly white, with grey shadows round the edges of the protuberant portions. But Cumulus appears at its best when illuminated by sunlight on one side only (that is when the cloud is to right or left of the sun) for then the structure of the cloud is shown in strong relief. Cumulus clouds are usually associated with dry weather unless they continue growing until they develop into the next type, the Cumulo-nimbus.

Sometimes the Cumulus instead of being compact and well formed, is rather broken and ragged, as if torn asunder by wind, or more probably by eddies within the cloud. Such forms are known as Fracto-cumulus, but should be classified as Cumulus.

**Cumulo-nimbus** are greatly exaggerated Cumulus clouds and grow to much greater heights, as has already been mentioned. When developed on a large scale, their appearance is somewhat different from that of the ordinary Cumulus. They may pile up into heavy long banks, having some resemblance to ranges of lofty mountains, in which case the ordinary rounded top is usually predominant, but the most striking forms are found when individual clouds are specially well developed. The forms then assumed are always fantastic, the ascending currents are very vigorous, and rise upwards from out the main mass of the cloud like castellated towers the tops of which sometimes remain domed irregularly rounded, but more often flatten out into a spreading form which strongly resembles an anvil in shape. The edges of this anvil are generally brushed out into filaments which are very much like ordinary Cirrus. This fibrous portion is usually known as "false Cirrus."

Cumulo-nimbus clouds are practically always associated with showers of rain, hail, or snow, and when the clouds are very large the showers may be extremely heavy. Thunderstorms are always the result of heavy development of Cumulo-nimbus. When line-squalls occur, a band of this cloud almost always accompanies the squall. Sometimes the development is sufficient to produce a thunderstorm, but at others only showers accompany the squall, and waterspouts may also be present. The band of Cumulo-nimbus in a line-squall may stretch in an unbroken line for hundreds of miles.

Cumulo-nimbus clouds are, like Cumulus, in themselves, dazzlingly white where illuminated by sunshine, but when in shadow, they appear intensely dark; this is due, of course, to the great bulk of the cloud, and is shown at its best when the base of a large cloud passes overhead. Sometimes, in calm weather on land, the thunderclouds show a coppery or reddish-yellow tint, due to the atmospheric impurities such as dust and smoke being drawn up by

the air in the neighbourhood of the cloud, and forming a veil between the observer and the cloud itself.

**Stratus.**—The international definition of this cloud type is "a uniform layer of cloud-like fog, not lying on the ground." A lifted fog will therefore automatically become a sheet of Stratus. The cloud is usually, though not always, uniform, and of a light to dark grey colour, depending upon its thickness. Usually it can be distinguished from Alto-stratus in that the sun's disc is not visible through it, but in cases when the cloud is thin, the sun's disc can be seen dimly. The best indication is that of apparent height, there is usually little difficulty in making sure that the cloud is at no great altitude. When it becomes thin, the cloud may usually be seen moving fairly rapidly across the sun's disc.

Stratus is not always quite uniform in structure. It may at times be broken up into shreds, as when it disperses, or when it floats round mountain summits; it is then known as Fracto-stratus. At other times the layer disperses by gathering into detached more or less woolly and rounded masses, resembling Cumulus or low Strato-cumulus. The obviously small altitude of such "Stratus-cumuliformis," as it is called, will sometimes be a sufficient guide to its true designation, but often it is quite impossible to say whether the cloud is really low Strato-cumulus, or only the Cumuliform stage of Stratus. In such cases it will be well for the observer to use his discretion, and classify the cloud according to the type its appearance most suggests; true Cumulus may often develop from this Cumuliform Stratus.

#### General Notes on Observations of Clouds.

On all occasions, when any noteworthy or striking feature is shown by the clouds, a short descriptive account may with advantage be made upon it, together with a slight sketch, if possible. There are certain appearances of the sky which are intimately associated with the pressure distribution and one or two of these will now be described.

(1) The upper and intermediate clouds are known sometimes to form in detached sheets and patches which have a strong resemblance to the shape of an airship, a torpedo, an almond, a cigar, or generally to the body of a fish, such as the shark. These forms are known as "lenticular" clouds, and are found best developed in the neighbourhood of mountain ridges, plateaux, or hills, the obstruction of which to the smooth flow of the air gives rise to stream-line effects, which in their turn produce clouds showing the stream-line form. Careful watching will show that these cloud-banks have the peculiarity of remaining almost stationary, though their forms are continually changing. The cloudlets of which the banks are built up may be observed to move with a relatively high velocity, forming at the windward edge of the bank, passing through it and evaporating equally rapidly at the leeward edge.

In view of the effect of the presence of hills upon these cloud-banks, it would be interesting to have detailed information of any observations of this type out over the oceans, where such obstructions to the free flow of the air are non-existent. It has been stated that lenticular cloud-banks are found chiefly on the lateral margins of depressions, but, as these observations have been made almost entirely over land, corroborating evidence from over the oceans would be valuable.

(2) After a *depression* has passed, it is sometimes seen that a layer of upper cloud is passing off, leaving clear sky beyond it. Usually this upper cloud is itself moving from a direction almost at right angles to the surface wind, while at the same time the whole system is passing away. When this occurs, the upper cloud usually exhibits a very sharp, clear-cut edge to windward, and observations or notes of the following data would be of considerable value:—(a) the time of passage of the sharp edge through the zenith; (b) the direction of movement of the upper cloud itself, if obtainable (*i.e.* the direction *from* which it is moving); (c) the orientation of the edge of the upper cloud (*e.g.* S.S.W.-N.N.E., etc.); (d) the latitude and longitude of the place of observation; (e) the type of the cloud and the apparent density of the sheet.

(3) Any sudden change in the cloud character, or any instance where there appears to be a sharp line of demarcation between two portions of the sky as regards cloud type might be noted, and similar particulars given.



**SOUTHERN ICE REPORTS.**  
**During the Years 1917 to 1928.**  
**September.**

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1917	—	No Reports received.				
1921	24	40° 51' S.	14° 47' E.	Berg. Large detached pieces of ice about 1 mile distant.	Berg about 80 feet high .. .. .	S.S. <i>Bergandahl</i> .
1923	12	56° 40' S. 56° 28' S.	136° 49' W. 136° 26' W.	Berg .. .. . 6 or 8 growlers .. .. .	Conical shape, too far off to take dimensions .. .. The larger ones protruding about 6 feet out of water ..	S.S. <i>Port Sydney</i> . do.
1927	8	44° 00' S. 43° 19' S. 43° 27' S. 41° 56' S. 42° 03' S.	58° 50' W. 58° 35' W. 58° 26' W. 57° 55' W. 57° 50' W.	Small berg .. .. . Berg .. .. . Berg .. .. . Small berg .. .. . Small berg .. .. .	Approximately 500 feet long, 40 feet high .. .. . Approximately 7½ miles long, 400 feet high .. .. . Approximately 4 miles long, 400 feet high .. .. . Approximately 300 feet long, 30 feet high .. .. . Approximately 500 feet long, 40 feet high .. .. .	S.S. <i>Matatua</i> . do. do. do. do.
	16	46° 27' S.	57° 00' W.	Berg .. .. .	.. .. .	*S.S. <i>Port Melbourne</i> .
	15	47° 40' S.	56° 59' W.	Berg .. .. .	.. .. .	do.
	16	48° 03' S.	56° 55' W.	2 bergs .. .. .	.. .. .	do.
		45° 39' S.	56° 52' W.	11 bergs .. .. .	Close in on either bow and right ahead .. .. .	do.
		From 45° 38' S. to 45° 19' S.	56° 52' W. 56° 52' W.	22 bergs .. .. .	At various distances on either side from 1½ to 12 miles distant, and at one time at 7.0 a.m. the ship was surrounded by 19 bergs, the nearest being 1½ miles distant, the others 2 to 5 and up to 12 miles distant. The largest berg was 4 to 5 miles long and 1,500 feet high, and several were up to 1,000 feet in height.	do.
		From 45° 19' S. to 44° 31' S.	56° 52' W. 56° 52' W.	10 bergs .. .. .	A quantity of pan and drift ice was passed very close to the ship.	do.
		From 44° 31' S. to 43° 42' S.	56° 52' W. 56° 52' W.	3 bergs .. .. .	Well out to the eastward. The largest being 180 feet high.	do.
		From 43° 42' S. to 42° 53' S.	56° 52' W. 56° 52' W.	8 bergs .. .. .	Passed to the westward .. .. .	do.
	17	40° 33' S.	55° 58' W.	Enormous berg .. .. .	11 miles long, and an even though slightly undulating height of 270 feet, with cliff sides.	do.
		38° 35' S.	55° 06' W.	Berg .. .. .	.. .. .	do.
	13	51° 51' S.	52° 52' W.	4 bergs .. .. .	.. .. .	4 mast barque <i>Parma</i> .
1928	19	54° 54' S.	32° 09' W.	Loose pack ice and small bergs .. ..	Floes of varying sizes and thickness and honeycombed. Largest pieces of pack 4,000 to 5,000 square feet.	R.S.S. <i>William Scoresby</i> .

\* For detailed description of ice observed by S.S. *Port Melbourne* see MARINE OBSERVER, Volume V, No. 57, pages 176-178.

Reports of ice previous to September, 1917, will be found on the back of the Monthly Meteorological Chart of the East Indian Seas,  
August 1917, No. 136.

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

## WEATHER SIGNALS.

## II.—WIRELESS WEATHER SIGNALS.

## WIRELESS WEATHER BULLETINS.

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

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

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

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

## United States of America (Pacific Coast).

(C.W. Issues.)

**San Francisco, California, W/T Station**, approximate Latitude 38° 06' N., Longitude 122° 17' W., call sign **NPG**, broadcasts weather bulletins as follows:—

At 0330 G.M.T., on wavelengths of 7,000 and 34.9 metres (C.W.), and 2776 (I.C.W.) simultaneously, and at 1530 G.M.T., also on wavelengths of 7,005, 2776 and 35 metres (C.W.) simultaneously.

The bulletins commence with the letters **USWB** (U.S. Weather Bureau) and are divided into two parts.

**Part I** is broadcast in special code (United States Meteorological) and contains observations from the stations in the list below, taken at 0100 G.M.T. for the 0330 G.M.T., bulletin and at 1300 G.M.T., for the 1530 G.M.T., bulletin, except as follows, where the observations do not synchronise:—

St. Paul, Juneau, Kodiak and Dutch Harbour, Alaska, observations are taken at Midnight and Noon G.M.T. Observations at remaining Alaskan stations are taken at 1700 and 0500 G.M.T.

Honolulu observations taken at 0630 and 1830 G.M.T.

Guam, Manila, China and Japan observations taken at 2200 G.M.T.

Midway observations taken at 1830 Midway local time of the preceding day.

## First Part.

## Indicator Letters and Stations.

Indicator Letters.	Station.	Position (approx.).	
		Latitude.	Longitude.
<i>Alaska.</i>			
NM	- Nome - - - - -	64° 30' N.	165° 24' W.
SPI	- St. Paul - - - - -	57° 15' N.	170° 10' W.
DH	- Dutch Harbour - - - - -	53° 55' N.	166° 30' W.
TN	- Tanana - - - - -	65° 10' N.	152° 06' W.
EA	- Eagle - - - - -	64° 46' N.	141° 12' W.
KD	- Kodiak - - - - -	57° 47' N.	152° 22' W.
CV	- Cordova - - - - -	60° 32' N.	145° 42' W.
JU	- Juneau - - - - -	58° 18' N.	134° 24' W.

*Canada.*

ED	- Edmonton, Alberta - - - - -	53° 33' N.	113° 30' W.
KA	- Kamloops, B.C. - - - - -	50° 41' N.	120° 29' W.
CY	- Calgary, Alberta - - - - -	51° 02' N.	114° 02' W.
SC	- Swift Current, Sask. - - - - -	50° 19' N.	108° 02' W.
PR	- Prince Rupert, B.C. - - - - -	54° 18' N.	130° 18' W.

*United States, etc.*

TAT	- Tatoosh I, Wash. - - - - -	48° 23' N.	124° 44' W.
SE	- Seattle, Wash. - - - - -	47° 38' N.	122° 20' W.
NH	- North Head, Wash. - - - - -	46° 16' N.	124° 04' W.
PD	- Portland, Oreg. - - - - -	45° 32' N.	122° 41' W.
RO	- Roseburg, Oreg. - - - - -	43° 13' N.	123° 20' W.
EUR	- Eureka, Calif. - - - - -	40° 48' N.	124° 11' W.
RB	- Red Bluff, Calif. - - - - -	40° 10' N.	122° 15' W.
SM	- Sacramento, Calif. - - - - -	38° 35' N.	121° 30' W.
SF	- San Francisco, Calif. - - - - -	37° 48' N.	122° 26' W.
FN	- Fresno, Calif. - - - - -	36° 43' N.	119° 49' W.
SPE	- San Pedro, Calif. - - - - -	33° 44' N.	118° 16' W.

## Indicator Letters and Stations—cont.

Indicator Letters.	Station.	Position (approx.).	
		Latitude.	Longitude.
<i>United States, etc.—cont.</i>			
PAR	- Point Arguello, Calif. - - - - -	34° 35' N.	120° 39' W.
LA	- Los Angeles, Calif. - - - - -	34° 03' N.	118° 15' W.
DI	- San Diego, Calif. - - - - -	32° 43' N.	117° 10' W.
SPO	- Spokane, Wash. - - - - -	47° 40' N.	117° 25' W.
WW	- Walla Walla, Wash. - - - - -	46° 02' N.	118° 20' W.
BA	- Baker, Oreg. - - - - -	44° 46' N.	117° 50' W.
HL	- Helena, Mont. - - - - -	46° 34' N.	112° 04' W.
BS	- Boise, Idaho - - - - -	43° 37' N.	116° 13' W.
LD	- Lander, Wyo. - - - - -	42° 50' N.	108° 45' W.
WM	- Winnemucca, Nev. - - - - -	40° 58' N.	117° 43' W.
R	- Reno, Nev. - - - - -	39° 32' N.	119° 49' W.
SLC	- Salt Lake City, Utah - - - - -	40° 46' N.	111° 54' W.
MD	- Modena, Utah - - - - -	37° 48' N.	113° 54' W.
DV	- Denver, Colo. - - - - -	39° 45' N.	105° 00' W.
GJ	- Grand Junction, Colo. - - - - -	39° 04' N.	108° 34' W.
SA	- Santa Fe, N. Mex. - - - - -	35° 41' N.	105° 57' W.
PH	- Phoenix, Ariz. - - - - -	33° 28' N.	112° 00' W.
YU	- Yuma, Ariz. - - - - -	32° 45' N.	114° 36' W.
HO	- Honolulu, Hawaii - - - - -	21° 19' N.	157° 52' W.
MDI	- Midway Island - - - - -	28° 12' N.	177° 22' W.
FMA	- Manila P.I. - - - - -	14° 35' N.	120° 59' E.
FGM	- Guam. - - - - -	13° 27' N.	144° 53' E.

*China and Japan, etc.*

FHO	- Hong Kong, China - - - - -	22° 18' N.	114° 10' E.
FSH	- Shanghai, China - - - - -	31° 15' N.	121° 29' E.
FBI	- Bonin Island - - - - -	27° 05' N.	142° 11' E.
FKO	- Koshun, Formosa - - - - -	25° 08' N.	121° 45' E.
FNA	- Naha, Japan - - - - -	26° 13' N.	127° 41' E.
FKA	- Kagoshima, Japan - - - - -	31° 34' N.	130° 33' E.
FTO	- Tokio, Japan - - - - -	35° 41' N.	139° 45' E.
FNE	- Nemuro, Japan - - - - -	43° 20' N.	145° 35' E.

The observations from land stations which are preceded by the indicator letters of the station are contained in two or more five-figure groups for each station. Groups one and two give surface observations.

The letter "X" will be substituted for any missing or unavailable data.

*Explanation of groups one and two.*

**First Group.**—1st three figures give the barometer reading corrected in inches and hundredths, the first figure (2 or 3) being omitted. (To convert to millbars, see Table XLVII.)

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

5th figure gives the wind force by Beaufort Scale. The letters W (Whole gale), S (Storm), H (Hurricane), being used for forces 10, 11 and 12 respectively.

**Second Group.**—1st figure gives the present weather (State of weather at surface). (Table XLIV.)

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

3rd figure gives the amount of precipitation during the preceding 12 hours. (Table XLVI.)

4th and 5th figures give the air temperature in even degrees F.



Weather reports from ships in the North Pacific Ocean follow the reports from the land stations in Part I. Ship's observations taken at Midnight G.M.T. being broadcast in the 0330 G.M.T. bulletin and those taken at Noon G.M.T. being broadcast in the 1530 G.M.T. bulletin. They are broadcast in two five-figure groups for each ship, preceded by the W/T call sign of the reporting ship. The first group of numerals gives the ship's position to the nearest degree, the first two figures in this group giving the latitude (north), and the last three figures the longitude (west). The second group of numerals give the barometer reading in inches and hundredths (three figures, initial 2 or 3 not sent), wind direction (one figure) and wind force by Beaufort scale (one figure). To convert barometer reading to mbs. see Table XLVII, and for wind direction figure see Table XLIII.

Part II of the bulletins is in plain language and consists of a summary of general pressure distribution; wind and weather forecasts for ocean zones (see CHARTLET below); storm warnings (for particulars see p. 208), and flying weather forecasts for zones 12, 13 and 14 (see CHARTLET below).

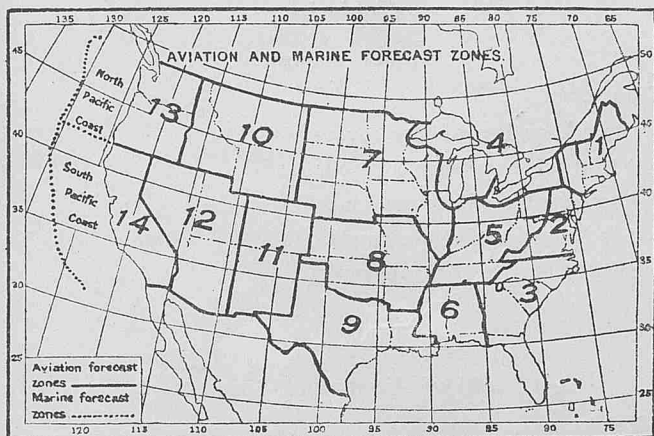
#### Periods covered by Forecasts.

In 0330 G.M.T. bulletins:

Wind and weather forecasts; 24 hours, beginning at 0800 G.M.T.  
Flying weather forecasts; 12 hours, 0800 G.M.T., until 2000 G.M.T.

In 1530 G.M.T. bulletins:

Wind and weather forecasts; 24 hours beginning at 2000 G.M.T.  
Flying weather forecasts; 12 hours, 2000 G.M.T., until 0800 G.M.T.



San Francisco W/T Station also transmits a report of the weather conditions in the Bonita Channel, every four hours, commencing with 0000 G.M.T. Wavelength, 2,776 metres (I.C.W.).

#### Hawaiian Islands.

Honolulu-Pearl Harbour W/T Station, approximate Latitude 21° 12' N., Longitude 157° 58' W., call sign NPM, broadcasts weather forecasts for the Hawaiian Islands and neighbouring ocean areas at 2230 G.M.T., on a wavelength of 5,552 metres (A.C.W.). The station also broadcasts the barometric reading, wind direction and force and state of weather at Honolulu at 0630, 1830 and 2230 G.M.T. on a wavelength of 5,552 metres (A.C.W.).

#### Mexico.

(Spark Issue.)

Chapultepec W/T Station approximate Latitude 19° 25' N. Longitude 99° 11' W. call sign XDA, broadcasts a weather bulletin at 1900 G.M.T. after Time Signal on a wavelength of 2,000 metres (spark).

The bulletin is in two parts.

Part I., in special code, contains the observations of 1300 G.M.T. from the following stations:—

Station.	Position approx.	
	Latitude.	Longitude.
Acapulco - - -	16° 52' N.	99° 50' W.
Chihuahua - - -	28° 32' N.	106° 28' W.
Frontera - - -	18° 35' N.	92° 38' W.
Guaymas - - -	27° 58' N.	110° 48' W.
Leon - - -	21° 01' N.	101° 15' W.
Lerdo - - -	-	-
Manzanillo - - -	19° 00' N.	104° 20' W.
Islas Marias - - -	21° 40' N.	106° 30' W.
Matamoros - - -	25° 53' N.	97° 33' W.
Mazatlan - - -	23° 10' N.	106° 22' W.
Monterrey - - -	25° 34' N.	100° 20' W.
Payo Obispo - - -	18° 29' N.	88° 22' W.
La Paz - - -	24° 10' N.	110° 18' W.
Progreso - - -	21° 16' N.	89° 36' W.
Salina Cruz - - -	16° 17' N.	95° 15' W.
Tacubaya - - -	19° 24' N.	99° 12' W.
Tampico - - -	22° 11' N.	97° 53' W.
Tapachula - - -	15° 10' N.	92° 27' W.
Vera Cruz - - -	19° 12' N.	96° 10' W.

#### Explanation of Part I.

Commencing with the word "Meteorologico," the name of the observation station is sent, followed by two groups of figures, there being five figures in each group.

**First Group.**—1st, 2nd and 3rd figures give the corrected barometric reading in millimetres and tenths, initial 7 omitted. (To convert to mbs, or ins, see Table XLVIII.)

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

5th figure gives the wind force by Beaufort scale, 9 being used for forces 9 and above.

**Second Group:** 1st figure gives the state of the weather at the time of observation. (Table XLIV.)

2nd figure gives the barometric tendency in millimetres for the 2 hours previous to the time of observation. (Table L.)

3rd figure gives the cloud amount. (Table LI.)

4th figure gives the cloud form and speed. (Table LII.)

5th figure gives the direction of movement of the clouds. (Table XLIX.)

When both upper and lower clouds are observed, only the amount, kind, and direction of the lower clouds will be sent. In such cases the amount of the upper clouds, if any, can be determined, approximately, by taking the difference between the tenths of cloudiness interpreted from the figures showing "present weather" and "amount of clouds."

NOTE.—(1) Missing observations replaced by letter "X."

(2) When all the data for a station cannot be supplied, the name of the station will be omitted.

Part II. sent *en clair* (Spanish) gives information concerning the general weather situation, position of centres of High or Low pressure areas, and weather forecasts for 24 hours.

### SPECIAL WEATHER TELEGRAPHY TABLES, NOT INTERNATIONAL CODE.

#### Table XLIII.—Wind Direction (True).

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

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

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

**Table XLV.—Barometric Change during two hours preceding Observation.**

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

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

**Table XLVI.—Amount of Precipitation during previous 12 hours.**

Code Figure.	Code Figure.
0 = no precipitation.	5 = .42 inch to .50 inch.
1 = .01 inch to .10 inch.	6 = .52 inch to .60 inch.
2 = .12 inch to .20 inch.	7 = .62 inch to .70 inch.
3 = .22 inch to .30 inch.	8 = .72 inch to .80 inch.
4 = .32 inch to .40 inch.	9 = .82 inch or more.

**Table XLVII.**  
**To convert Inches to Millibars.**

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

**Table XLVIII.**

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			

**Table XLIX.—Wind Direction True.**

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

**Table L.**

**Barometric change during 2 hours preceding observation.**

Code Figure.
0 = Steady (rise or fall less than 1 mm.).
1 = Rising 1 mm.
2 = Falling 1 mm.
3 = Rising 1.5 mm.
4 = Falling 1.5 mm.
5 = Rising 2 mm.
6 = Falling 2 mm.
7 = Rising 2.5 mm.
8 = Falling 2.5 mm.
9 = Rise or fall 3 mm. or more. (Whether it is an increase or decrease can be determined by the tendency at surrounding stations.)

**Table LI.**

**Cloud amount.**

Code Figure.
0 = 1 tenth or less of sky covered.
2 = 2 to 3 tenths of sky covered.
4 = 4 to 5 tenths of sky covered.
6 = 6 to 7 tenths of sky covered.
8 = 8 to 10 tenths of sky covered.

**Table LII.**

**Cloud Form and Speed.**

Code Figure.
0 = 1 tenth clouds or less (kind not indicated).
1 = upper clouds (cirrus, cirro-stratus, cirro-cumulus, alto-cumulus, or alto-stratus), speed not indicated.
2 = strato-cumulus moving slowly.
3 = strato-cumulus moving rapidly.
4 = cumulus moving slowly.
5 = cumulus moving rapidly.
6 = stratus moving slowly.
7 = stratus moving rapidly.
8 = nimbus or cumulo-nimbus moving slowly.
9 = nimbus or cumulo-nimbus moving rapidly.

## WIRELESS STORM WARNINGS.

United States of America. (Pacific Coast.)

(C.W. and Spark Issues.)

THE following W/T Stations broadcast storm warnings at the times stated below. Ships may request any of the stations mentioned to furnish the latest storm warning. The warnings are for a period of 24 hours beginning at the hour indicated in the messages.



W/T Station and position (approx.).	Call Sign.	Wave-length. metres.	Broad-casting Time G.M.T.	Particulars.
Puget Sound - Lat. 47° 24' N. - Long. 122° 37' W.	NPC	2,939 (I.C.W.)	0100 0400, 1300 1700, 2100	Storm Warnings.
Tatoosh I., Wash. Lat. 48° 23' N. - Long. 124° 44' W.	NPD	800 (Spk.)	0100, 0400 1300, 1700 2100	
Eureka, Calif. - Lat. 40° 42' N. - Long. 124° 16' W.	NPW	2,776 (I.C.W.)	2018	Storm Warnings for the coast of California N. of San Francisco and advices concerning storm warnings for the N. Pacific Coast.
" " -	"	"	0018, 0418 0818, 1218 1618, 2018	Storm Warnings.
San Francisco, Calif. Lat. 37° 39' N. -	NPG	7000, 34.9 (C.W.) 2,776 (I.C.W.)	0330, 1530	Storm Warnings. In Second part of weather bulletin.
Long. 122° 23' W.	"	2,776 (I.C.W.)	0000, 0400 0800, 1200 1600, 2000	Storm Warnings. For N. California coast.
San Diego, Calif. Lat. 32° 42' N. - Long. 117° 15' W.	NPL	2,939 (I.C.W.)	0500, 1630 2200	Storm Warnings. Broadcast on receipt and at times stated.

### III. WIRELESS TIME SIGNALS.

#### United States of America.

For method of transmission of the undermentioned Time Signals see diagram, p. 187, Vol. VI, No. 68.

#### United States of America, Pacific Coast.

(C.W. Issues.)

W/T Station.	Call Sign.	Wavelength metres.	Time of Signal being made G.M.T.	
Astoria, Wash. - Lat. 46° 11' N. - Long. 123° 51' W.	NPE	2,939 (I.C.W.)	h. m. s. h. m. s. 16 55 00-17 00 00	Sent daily.
Eureka, Calif. - Lat. 40° 41' 22" N. - Long. 124° 16' 10" W.	NPW	2,776 (I.C.W.)	19 55 00-20 00 00	Sent daily.
San Francisco, Calif. Lat. 38° 05' 55" N. - Long. 122° 16' 37" W.	NPG	4,543 (C.W.)	{ 5 55 00- 6 00 00 } { 19 55 00-20 00 00 }	Sent daily.

NOTE.—The time signal, broadcast from San Francisco W/T Station, emanates from the Chronometer and Time Station, Mare Island.

#### Hawaiian Islands (C.W. Issue).

W/T Station.	Call Sign.	Wavelength metres.	Time of Signal being made G.M.T.	
Honolulu, Pearl Hbr. Lat. 21° 20' 45" N. - Long. 157° 57' 56" W.	NPM	11,490 (C.W.)	h m s h m s 23 55 00-0 00 00	Sent daily.

NOTE.—These time signals are relayed from the standard clock at Pearl Harbour, which is checked periodically by means of the time signals broadcast from San Francisco. They are not so accurate as the Washington-Arlington time signals explained in this Journal, Vol. VI, No. 68, page 187.

### IV. VISUAL STORM WARNINGS.

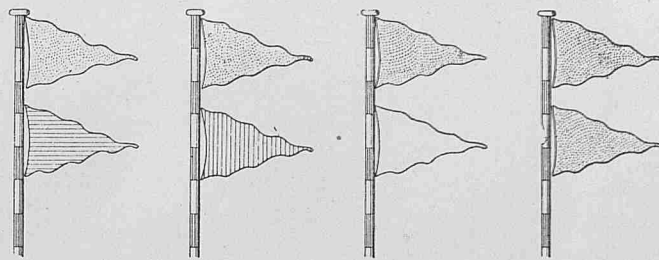
#### United States of America (Pacific).

The United States system of Visual Small-craft, Storm, and Hurricane Warnings as explained on p. 188 of Vol. VI, No. 68, is in operation at a number of stations on the Pacific Coast of the United States.

#### Mexico.

The following system of (1) visual storm and (2) wind signals has been established at ports on the coasts of Mexico.

(1) Storm signals are used to give warning of the existence of cyclonic disturbances whether distant or near, or, of the existence of bad weather outside the port. The storm signals consist of pennants only and their meanings, are as follows:—

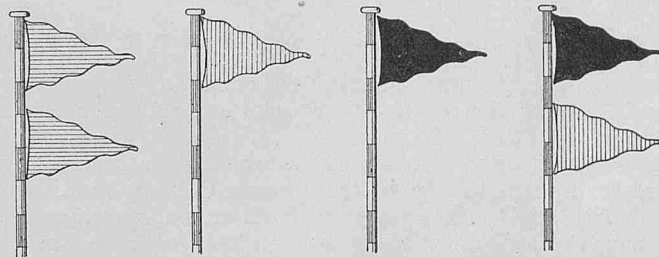


Bad weather  
North of the  
port.

Bad weather  
South of the  
port.

Bad weather  
East of the  
port.

Bad weather  
West of the  
port.



Northerly gale  
from Matamoras  
begun. (Gulf  
ports only.)

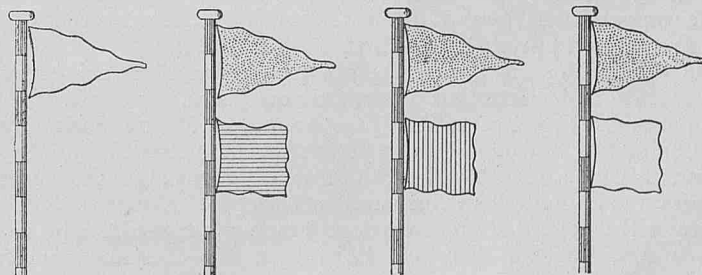
Gulf ports.—  
Cyclone in  
Caribbean Sea.  
Pacific ports.—  
Distant cyclone.

Gulf ports.—  
Cyclone in Gulf  
of Mexico.  
Pacific ports.—  
Cyclone  
close by.

Cyclone at the  
Port, or will  
pass close by  
on that day.

*Night Signals.*—Two red lights, vertical, are hoisted to indicate that navigation may be dangerous.

(2) The following signals consisting of pennants, denoting the strength, and flags the direction of the wind, are used to indicate its probable strength and direction from the time of hoisting the signal until the following 0600. They will be lowered, if necessary, to hoist a storm signal and in the evening when no longer visible:—

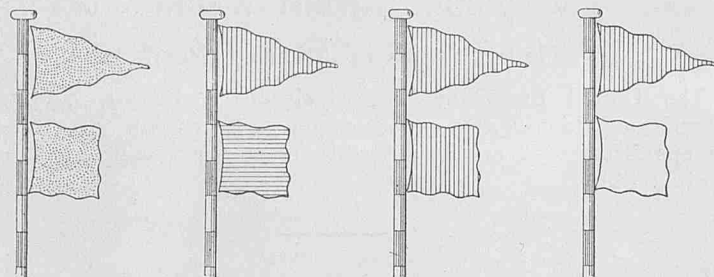


Light or  
moderate  
winds.

Moderate or  
strong North-  
erly winds.

Moderate or  
strong South-  
erly winds

Moderate or  
strong Easterly  
winds.

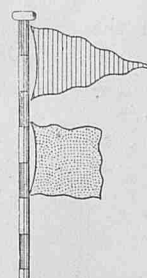


Moderate  
or strong  
Westerly  
winds.

Gale or Hurri-  
cane from the  
North.

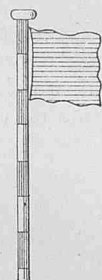
Gale or Hurri-  
cane from the  
South.

Gale or Hurri-  
cane from the  
East.



Gale or Hurri-  
cane from the  
West.

Yellow White Blue Red Black.



Northerly Gale  
expected the  
following day.  
(Gulf Ports  
only.)

## GREAT BRITAIN—AMENDMENT.

### Wireless Weather Bulletins.

#### “Weather Shipping” Bulletin.

VOLUME VI, No. 62, PAGE 45 :—

For Wavelength 4100 metres substitute 4098 metres.

### Wireless Telephony (R/T) Issues.

#### “Weather Shipping” Bulletin.

VOLUME VI, No. 62, PAGE 47, column 2, line 2 :—

For Wavelength 1562'5 metres substitute 1554'4 metres.

## Special Notices Regarding Personnel.

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

### Captain Sir Franke B. Stuart Notley, K.B.E., R.D., R.N.R.

Captain Sir FRANKE NOTLEY, Marine Superintendent of the P. & O. STEAM NAVIGATION Company, has retired after 43 years' service in the P. & O. Company.

Sir FRANKE NOTLEY commenced his sea career at the age of 14, and served his apprenticeship in the DUNDEE CLIPPER Line. In 1886 he joined the P. & O. Company as fifth officer, and passing through the successive grades obtained command in 1905, when he was appointed Master of the *Mongolia*. He later commanded the *Japan* and *Plassy*.

When the *Medina* was launched in 1911 Sir FRANKE was transferred to her and remained in command of this vessel until he was appointed Marine Superintendent in 1916.

He is one of the original hundred who founded the Honourable Company of Master Mariners and was a Mariner Warden of the first Court.

Prior to his appointment as Marine Superintendent Sir FRANKE was a member of our Corps.

### Captain E. Robin.

Captain E. ROBIN, Master of the Bibby Liner *Gloucestershire*, has retired after 49 years' service at sea.

Captain ROBIN commenced his sea career in 1880 when he signed indentures with Messrs. J. B. WALMSLEY & Co., serving the whole of his five years' apprenticeship in their ship *Naiad*.

On completing his apprenticeship he continued in sail as second mate, mate and master for a further nine years.

In 1894 Captain ROBIN, then in command of Messrs. JAMES NOURSE & Company's Barque *Jumna*, transferred to steam, joining the BIBBY Line as fourth officer, and passing through the successive grades was appointed in command in 1903.

He is the holder of the Board of Trade silver medal and also the silver medal of the Liverpool Shipwreck and Humane Society for saving life at sea.

Captain ROBIN has kept no fewer than 28 meteorological logs.

### Captain J. Mcl. Borland, C.B., D.S.O., R.D., R.N.R.

Captain J. MCL. BORLAND of R.M.S. *Comorin* has retired from active service after 45 years service afloat.

Commencing his sea career in June, 1884, in the ship *Loch Sloy*, he continued for 10 years with the LOCH LINE, rising to chief mate. In March, 1894, after obtaining his Extra Masters Certificate, Captain BORLAND joined the P. & O. Company's service, and was commissioned as sub-lieutenant in the Royal Naval Reserve in the following month.

Captain BORLAND served with H.M. Fleet during the Chinese Boxer War of 1900. He also served throughout the Great War with H.M. Fleet, in armed boarding steamers and as Commodore of convoys. He was promoted to Captain R.N.R. in June, 1919, and was a member of the R.N.R. Advisory Committee from 1923 to 1926.

He commanded a number of the P. & O. Company's ships, his last ship being R.M.S. *Comorin*, in the Australian service.

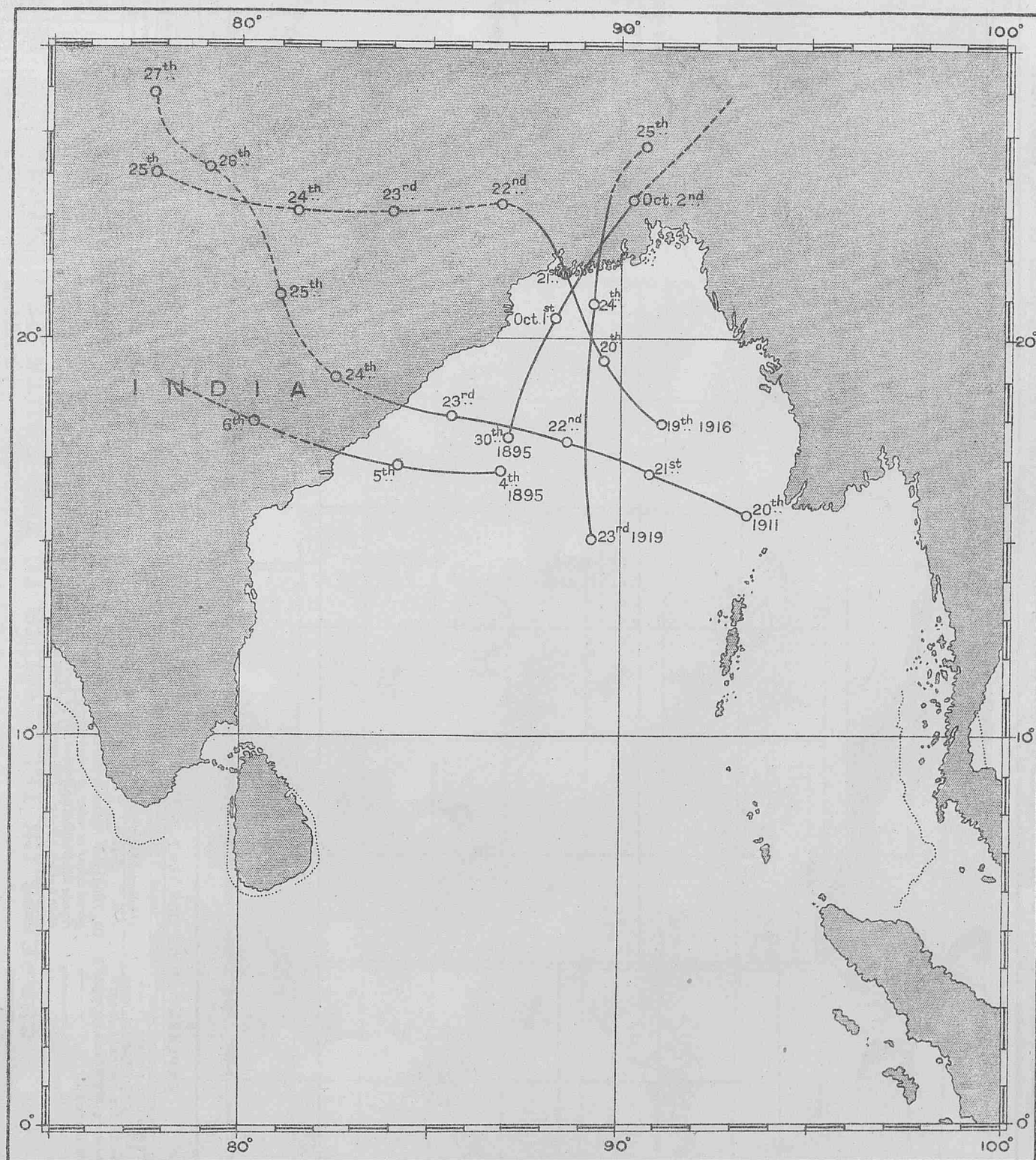
He is a Younger Brother of Trinity House and a member of the Honourable Company of Master Mariners.

He has been a member of our corps during the last three years of his active service afloat.

The Corps of Voluntary Marine Observers and the Marine Division join in wishing these officers long life and the happy retirement which they have so well earned.



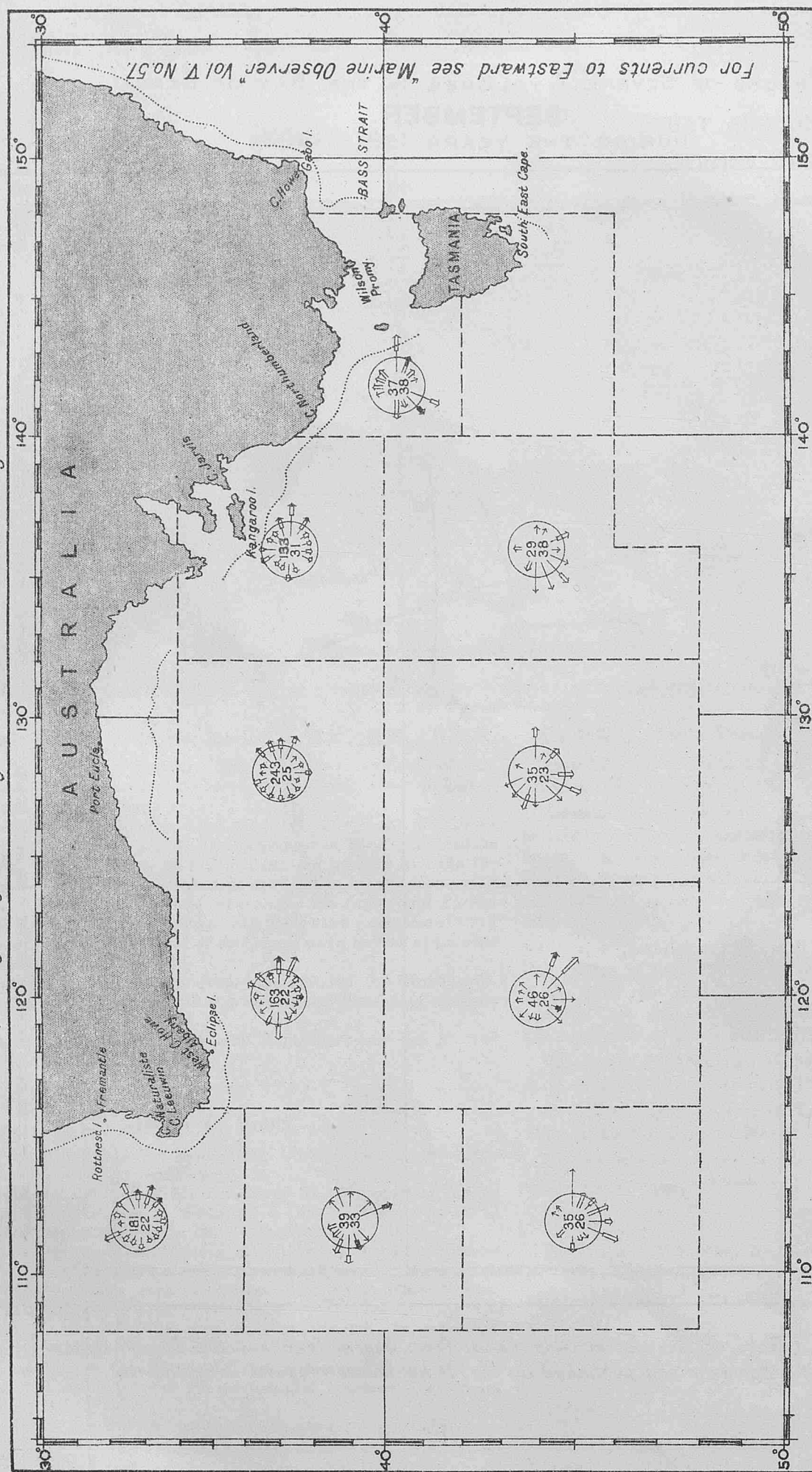
TRACKS OF SEVERE CYCLONES IN THE BAY OF BENGAL  
**SEPTEMBER**  
 DURING THE YEARS 1891-1923.



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

# CURRENTS ON THE TRACKS TO THE SOUTH OF AUSTRALIA, AUGUST, SEPTEMBER AND OCTOBER.

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



## EXPLANATION OF CURRENT ROSES.

The current roses are drawn from observations within the pecked lines. Arrows flow with the current, length represents frequency, thickness strength. 6-12 miles per day 13-24 " " " 25-46 " " " 49-72 " " " 73 " " " and above

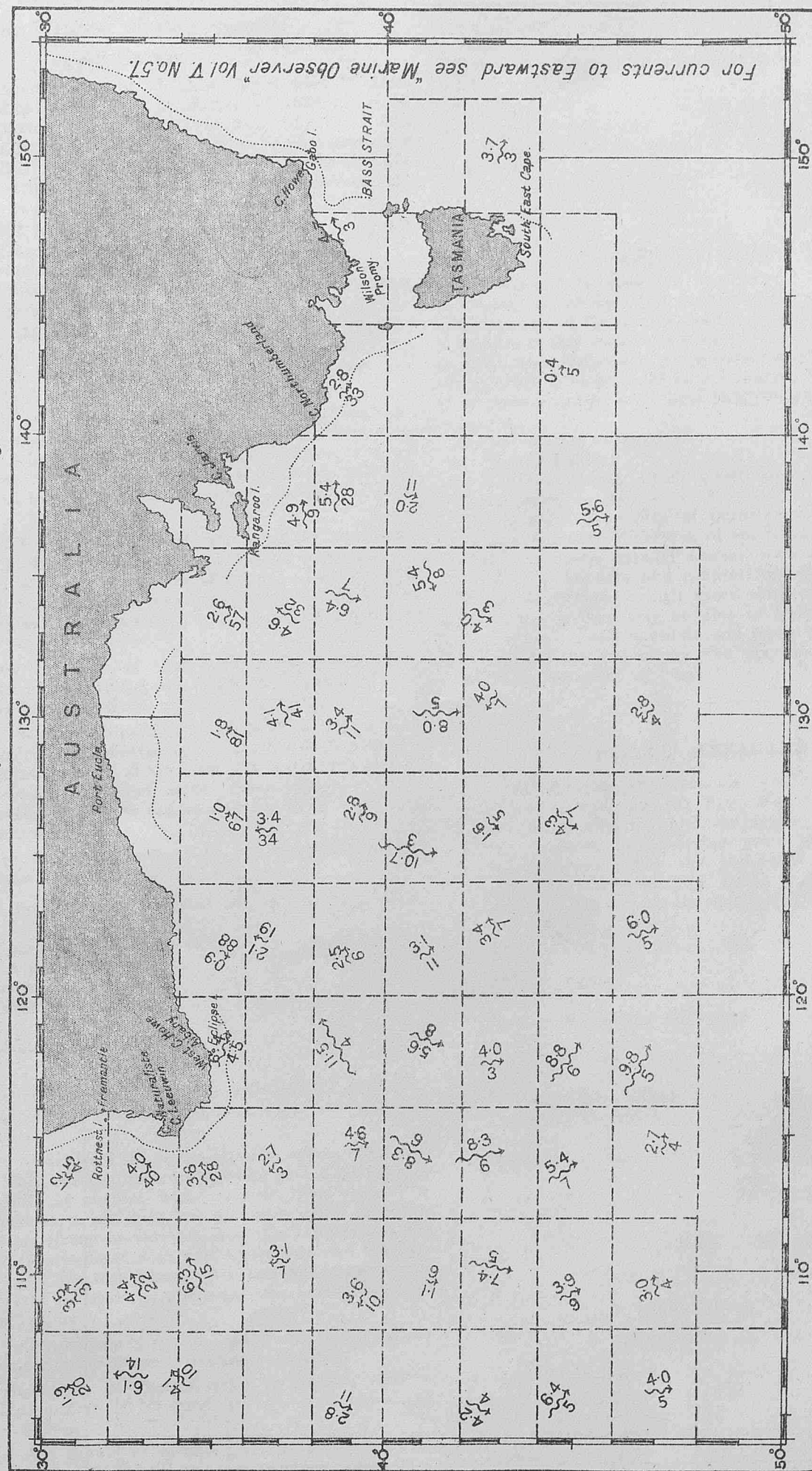
Distance from tail of arrow to circle represents 5%. Scale 10 20 30 40 50% The upper figure in the centre of the rose gives total number of observations, the lower figure the percentage frequency of currents less than 6 miles per day. The roses are drawn so that their centres lie within the areas to which they refer.

MAXIMUM DRIFTS REPORTED.			REPORTED.		
Name of Ship	Date	Middle	Set	Drift	Wind
	Day	Lat. Long.			
Orviset	1	1922 35° 25'S 134° 51'E	E	39	SW
Dorset	10	1924 30° 55'S 140° 41'E	S 75° E	30	SW
Clan Macnaughten	1	1925 38° 30'S 140° 21'E	S 75° E	40	W
Ormonde	1	1926 36° 13'S 123° 22'E	N 76° E	30	W
Georgic	8	1911 34° 02'S 111° 55'E	S 80° E	36	SSW
Ballarat	2	1913 33° 25'S 108° 21'E	S 60° E	39	WNW
Honourata	22	1921 37° 33'S 131° 56'E	S 76° E	30	Var.
Port Nicholson	2	1922 45° 36'S 119° 46'E	S 88° E	32	NW by N
Balnard	5	1927 33° 43'S 105° 16'E	N 82° E	44	S
Clan Macpherson	17	1921 35° 22'S 117° 18'E	E	34	W by N
Wangaratta	17	1923 37° 31'S 133° 54'E	N 13° W	33	SW by W
British Engineer	20	1923 37° 45'S 133° 06'E	N 13° E	31	—
British Engineer	21	1923 36° 32'S 128° 36'E	N 10° E	36	—
Orestes	11	1928 36° 33'S 128° 34'E	N 10° E	33	—



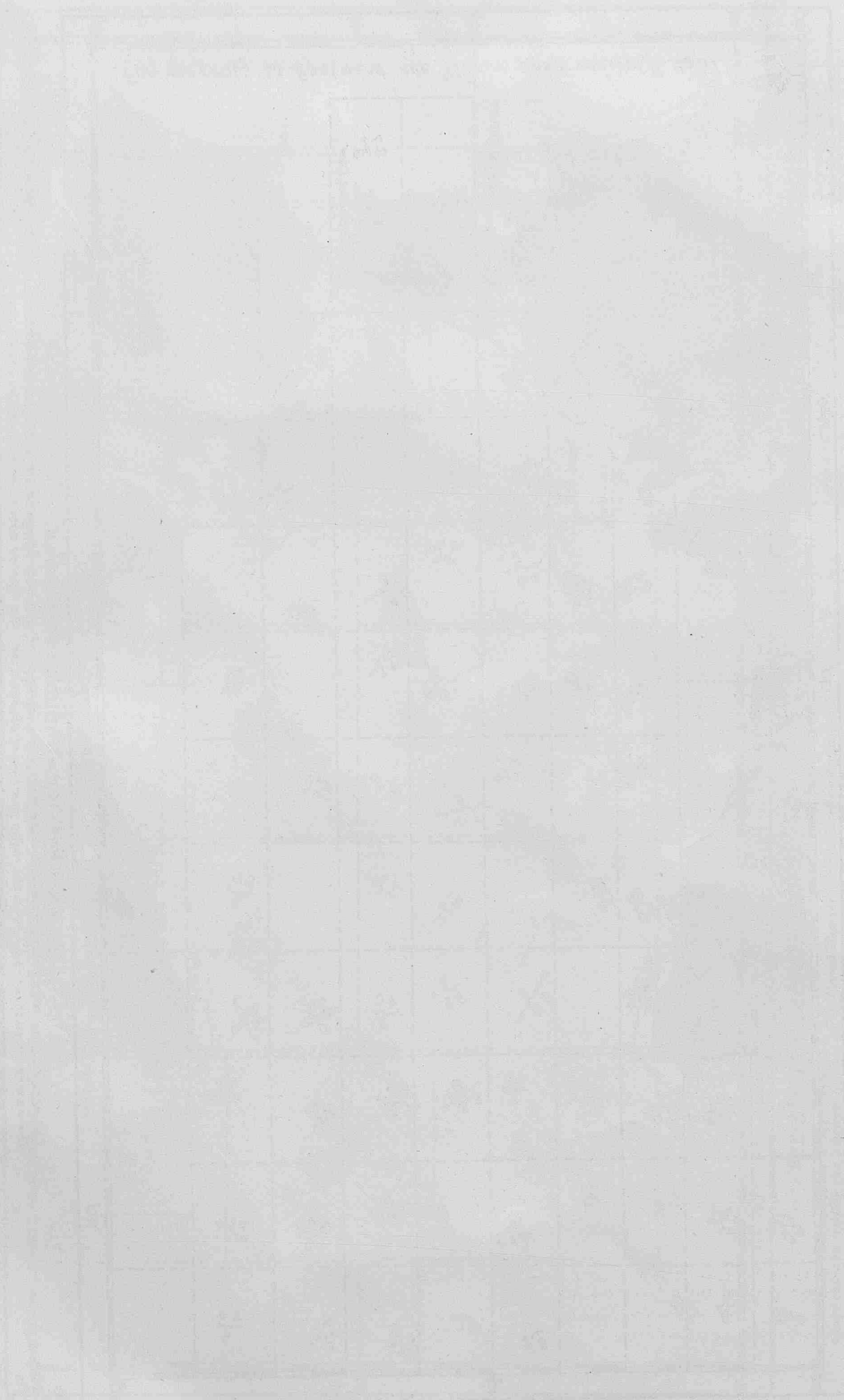
# CURRENTS ON THE TRACKS TO THE SOUTH OF AUSTRALIA, AUGUST, SEPTEMBER AND OCTOBER.

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



## EXPLANATION OF CURRENT ARROWS.

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



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**VERY IMPORTANT.****SELECTED SHIPS.****Routine Wireless Weather Reports.****In All Oceans.**

The attention of the Masters of all ships fitted with Wireless Telegraphy is invited to these reports, particulars of which are given in WIRELESS AND WEATHER AN AID TO NAVIGATION, Chapter I and Appendix I, and guidance for their use is given in the remaining chapters of this book. "Selected Ships" are requested to take the greatest care in drafting these reports, always preserving the sequence of particulars and elements when possible.

The set and drift of current, with positions *from* and *to*, should be included in these reports when this can be found with reliance. The importance of including recent information of ice sighted or received, with its position, cannot be too strongly advocated, particularly on the trade routes of the Southern Ocean.

Any ship at any time observing the formation of a Tropical Revolving Storm should make an urgent report to all ships and the nearest appropriate station in the form suggested in WIRELESS AND WEATHER AN AID TO NAVIGATION.

A Tropical Revolving Storm having been reported, "Selected Ships" should make their routine reports as usual, and where there are not sufficient "Selected Ships" in the vicinity of a Tropical Revolving Storm other ships should assist in carrying out this service, being careful to use the same procedure and not to jamb each other.

The Commanders of "Selected Ships" are asked to have great care taken that the position of the ship given in these reports is the most accurate possible, for not only are they used in conjunction with Meteorological work, but they may give useful information to all ships in the vicinity in hazy weather, particularly if course and speed is indicated.

Remarks upon any use made of these reports for navigational purposes, in addition to meteorology and navigation, particularly if the Direction Finder is used, will be welcomed.

The function of "Selected Ships" in this Voluntary system is to provide and communicate to *all ships* useful Marine Meteorological information for safe navigation, at the same time communicating to Meteorological Centres as required useful information for their purposes, and on each occasion as far as possible doing so by one message and one transmission.

The particulars at the commencement of the standard form of message are those most generally essential, viz. :—

The address: i.e., CQ and specified station call sign when required.

The distinguishing Word: i.e., Weather.

The Latitude and Longitude,

Barometer corrected,

Wind True Direction and Force,

Weather,

G.M. Time of observation.

Date.

The remaining particulars should be given with careful regard to locality and requirements, preserving the sequence but not including unnecessary information.

The change or tendency of the barometer with course and speed is most useful when the ship is actually in or near a depression. The set and drift of current with position *from* and *to* is valuable information to all ships but especially so in localities where currents are strong or variable, and this information has increased value if considered with past experience and the conditions shown by a Weather Chart. Air and sea temperatures are more important in localities where fog may be met than for example in the Tropics.

Swell and its direction may be of special significance in the regions of Tropical Revolving Storms or other intense depressions.

The value of information of Past Weather is greatest after a decided change. Information of Ice derelicts, etc., is so important that this should be obvious.

The name of the ship should be always given at the end of the message as the Master's authority and as a means of identification.

**SEA AND SWELL MEASUREMENTS.**

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

An article will be found in Volume II, No. 19, upon "Sea and Swell" and on pages 43-8, of "The Marine Observer's Handbook" 4th Edition, instructions are given. Form 684 may be obtained from the Agents.

**SPEED OF PORPOISES.**

The Aeronautical Research Committee of the National Physical Laboratory are anxious to have reliable information of the speed of Porpoises and in the case of spurts of speed, the duration of them. A member of this committee suggests that "If the very high speeds at which some fishes and sea mammals—particularly the porpoise—are reported to swim could be substantiated, the information would be of great scientific value both to hydrodynamical and aeronautical engineers."

The information required is:—

Speed of ship.

The time during which a particular porpoise maintained the same speed as ship.

The relative position of porpoise and ship.

The estimated difference of speed between porpoise and ship when on nearly parallel courses, with times.

General remarks and confirmatory evidence.

Marine Observers in high speed ships are asked to enter such observations as they may be able to make, in the Meteorological Log or Form 911 and to obtain and return similar information from Whalers, Sealers and others who may have special opportunities of studying the speed of "fish."

**POSTAL ARRANGEMENTS.**

THE MARINE OBSERVER is published, when circumstances permit, on the first Wednesday of the month previous to that to which the number refers.

If captains of observing ships will forward to the Meteorological Office the particulars required hereunder, endeavour will be made as far as mails permit to post the latest number for use on their homeward passage.

S.S..... Captain.....

Port of Call.....

Date of Homeward Departure.....

Postal Address.....

When this information is not given THE MARINE OBSERVER is addressed to the Commanding Officer, s.s. ...., c/o the owners, and captains are requested to make their own arrangements for forwarding.

**GREAT BRITAIN.****Wireless Telephony (R/T) Issues.****"Weather Shipping" Bulletin.****Temporary Arrangement.**

During the Promenade Concert Season Aug. 10th to Oct. 15th, inclusive, it has been found necessary to change the time of broadcasting the parts of the "Weather Shipping" Bulletin broadcast through Davenport, from 2030 G.M.T. to 2055 G.M.T. Sunday remaining 2000 G.M.T.



# ICE CHART. WESTERN NORTH ATLANTIC.

## LETTERS OF TRANSATLANTIC TRACKS INDICATE.

- (C) From 1st September to 31st January, inclusive.
- (F) From 16th May to Opening of Belle Isle route, and to 30th November when not using the Belle Isle route.
- (E) 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.
- (G) From the opening of the Straits of Belle Isle to 14th November.

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

## IMPORTANT.

### ROUTE NOTICES.

For latest information re Tracks see Copy of letter from Cunard S.S. Co. on this Chart.

## 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.
Sept. 2, 1883	Boue, Olivette ...	35°40'N. 30°00'W.	Lump of ice.
" —, 1895	S.S. Gulf of Taranto	38°35'N. 71°36'W.	2 bergs 30 ft. high, 300-400 ft. long, and much field ice over 2 miles area.
" 19, 1906	S.S. Lord Lansdowne	54°50'N. 22°00'W.	Small berg 20 ft. by 6 ft.
" 10, 1908	S.S. Deutschland ...	45°28'N. 27°18'W.	2 small bergs and 1 large.
" 6, 1920	U.S. Hyd. Bulletin...	47°10'N. 38°34'W.	Berg.
" 2, 1922	S.S. Hallgjerd	50°00'N. 40°05'W.	Berg.
" 15, 1922	S.S. Empress of Britain.	52°52'N. 40°12'W.	Large berg.
" 3, 1923	S.S. Djambi ...	40°10'N. 31°38'W.	Piece of ice, about 30 ft. long 1½ ft. out of water.

Reports of Ice sighted between July 1st and July 31st, 1929, 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 from the Cunard Steamship Co., dated 10th July, 1929:—

### North Atlantic Lane Routes.

"We desire to inform you that the following message has been sent to all Lines party to the above Tracks Agreement:—

"Tracks in view message received from Washington reporting warm water to Tail of Bank and berg latitude 42°05' Longitude 49°33' probably disintegrated revert Track "B" westbound Saturday thirteenth July eastbound twentieth July.

Cunard."



## DERELICTS AND FLOATING WRECKAGE.

## Co-operation of Shipowners, Masters and Mates.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

For sample weather report message see Chapter I. of "Wireless and Weather an Aid to Navigation," page 6, and page 19 of Vol. VI., No. 61.

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

Date.	Position.		Description.
	Latitude.	Longitude.	
<b>NORTH SEA.</b>			
12.7.29	51°12'N.	1°41'E.	Heavy log.
19.7.29	56°58'N.	7°15'E.	Waterlogged boat, 18 ft. long, bottom up.
20.7.29	53°48'N.	4°23'E.	Drifting capsized vessel.
<b>ENGLISH CHANNEL.</b>			
27.7.29	50°20'N.	1°14'W.	Small boat painted red, yellow, white and blue in quadrants.
28.7.29	50°16'N.	3°08'W.	Mast projecting out of water, large red flag, white centre, blue star.
<b>MEDITERRANEAN.</b>			
21.7.29	36°22½'N	22°58½'E.	S.V. <i>Sant' Elena</i> abandoned, floating bow up, dangerous to navigation.
<b>NORTH ATLANTIC.</b>			
1.7.29	40°26'N.	58°55'W.	Gas buoy showing 12 ft. out of water.
1.7.29	41°10'N.	32°57'W.	Dory painted yellow.
3.7.29	41°03'N.	46°20'W.	Part of wooden vessel, almost submerged.
4.7.29	50°06'N.	11°08'W.	Heavy timber, resembling part of landing stage, about 30 ft. long, 4 ft. wide, dangerous to navigation.
5.7.29	40°01'N.	38°04'W.	Tree trunk about 20 ft. long, 2 ft. diameter, covered with marine growth.
7.7.29	40°28'N.	11°47'W.	Wreckage, barnacle covered, projecting 4 ft. above water, dangerous to navigation.
8.7.29	48°50'N.	12°49'W.	Conical buoy adrift, painted red, dangerous to navigation.
8.7.29	27°20'N.	74°26'W.	Pile projecting about 8 ft. out of water, apparently attached to submerged wreckage.
11.7.29	40°18'N.	36°56'W.	Cylindrical tank about 6 ft. long, showing 3 ft. out of water.
11.7.29	40°14'N.	62°30'W.	Spar projecting vertically 6 ft. out of water, apparently attached to submerged wreckage.
14.7.29	40°15'N.	46°03'W.	Buoy marked <i>FID</i> , <i>US Survey</i> , with tripod superstructure, black cage, blue and white flag.
19.7.29	49°53'N.	12°50'W.	Red can buoy.
20.7.29	48°12'N.	6°32'W.	2 large buoys.
20.7.29	48°06'N.	6°34'W.	
22.7.29	48°01'N.	5°36'W.	Red conical buoy marked 3 <i>Egypt</i> .
22.7.29	32°55'N.	46°58'W.	Drifting cylindrical bell buoy, no marks, bell intact.
23.7.29	43°48'N.	9°22'W.	Red cage buoy with spar.
<b>GULF OF MEXICO.</b>			
1.7.29	15°22'N.	81°21'W.	Large red bell buoy.
3.7.29	24°20'N.	82°10'W.	Black cylindrical buoy.
4.7.29	28°31'N.	88°52'W.	Large tree 60 ft. long.
6.7.29	27°59'N.	87°41'W.	Large tree trunk, roots projecting 6 ft. out of water.
9.7.29	22°22'N.	86°37'W.	Two logs about 40 ft. long, 2 ft. diameter.
9.7.29	28°27'N.	88°46'W.	Log about 20 ft. long.
<b>CARIBBEAN SEA.</b>			
4.7.29	11°06'N.	79°09'W.	Large spar about 60 ft. long, attached to wreckage.
<b>NORTH PACIFIC.</b>			
2.7.29	43°10'N.	124°38'W.	Large tree roots projecting out of water.
5.7.29	7°35'N.	82°29'W.	Log about 30 ft. long.
9.7.29	32°34'N.	117°13'W.	Timber 30 ft. long.
11.7.29	41°10'N.	124°21'W.	Number of logs 40 to 60 ft. in length, 2 to 4 ft. diameter.
13.7.29	16°10'N.	99°00'W.	Large raft.

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

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

**LIVERPOOL** ... 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.  
(Telephone No.: Cardiff 6813).

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

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

## Agents (contd.).

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

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

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

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

**SYDNEY**,  
New South Wales. Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R.,  
Deputy Director of Navigation.  
Captain C. LINDBERGH.  
Customs House.  
(Telephone No.: B6421).

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

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



## LIST OF VOLUNTARY OBSERVING SHIPS

i

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

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

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

Only in special cases will individual letters be sent.

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

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

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

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

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

## Explanation of Abbreviations.

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

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

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

No. = No Meteorological Office instrumental equipment on board.

M = Ship's barometer *mercurial*.

A = Ship's barometer *aneroid*.

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

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

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

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

\*\* = Short range transmission and reception.

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

## Selected Ships.

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

Name of Vessel.	Captain.	Observing Officers.	Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 19.7.29.	Date Received.
<i>Abinsi</i> ...	Millson, H. E. ...	S. H. Worsley ...	No. A.	Elder Dempster ...	Form 911 17.4.29 to 6.5.29...	28.5.29
†† <i>Accra</i> ...	Wright, J. B. ...	R. B. Ellis ...	" M.	" " ...	8.5.29 to 11.6.29...	19.6.29
*† <i>Achilles</i> ...	Williams, D. T. ...	A. G. Phillips, N. Anderson, F. W. Hilton.	M.L.	A. Holt " ...	Met. Log. 1.12.28 to 13.4.29	16.5.29
*† <i>Actor</i> ...	Nicholas, P. O. ...	E. Pearce, F. M. Eales, G. Morrice.	"	Harrison ...	" 2.12.28 to 14.6.29	24.6.29
†† <i>Adda</i> , M.V. ...	Toft, J. T. ...	S. A. Boswell ...	No. M.	Elder Dempster ...	Form 911 5.6.29 to 8.7.29 ...	15.7.29
††50 <i>Adriatic</i> ...	Hickson, V. W., R.D., Lt.-Commr. R.N.R.	J. A. Holme, H. R. Wilkinson, D. W. Chamberlain.	W.T.	White Star ...	W.T. Reg. 3.6.29 to 22.6.29... Form 911 2.6.29 to 22.6.29...	26.6.29 26.6.29
<i>Aeneas</i> ...	Wallace, W. K. ...	D. R. Bannerman ...	No. A.	A. Holt ...	31.3.29 to 4.5.29...	10.6.29
<i>Agapenor</i> ...	Christie, W. ...	B. Bell ...	" A.	" ...	7.6.29 to 23.6.29	1.7.29
<i>Aidan</i> ...	Evans, L. ...	N. Caris ...	" A.	Booth ...	2.6.29 to 16.6.29...	24.6.29
<i>Alban</i> ...	Buck, R. H. ...	M. Thomas, W. Brearley ...	" A.	" ...	28.3.29 to 22.5.29	30.5.29
*† <i>Alipore</i> ...	Dawson, E. E. N. ...	" ...	" M.	P. and O. ...	27.3.29 to 30.4.29	27.5.29
<i>Almanzora</i> ...	Clarke, E. C. ...	F. Deveson ...	" A.	R.M.S.P. ...	17.5.29 to 4.7.29	11.7.29
††63 <i>Albertic</i> ...	Summers, F. F., R.D., Commr. R.N.R.	W. F. Dennison, W. Hill, R. H. Shaw.	W.T.	White Star ...	W.T. Reg. 25.5.29 to 16.6.29 24.6.29 to 14.7.29 Form 911 3.3.29 to 24.3.29...	19.6.29 17.7.29 26.3.29
<i>Alondra</i> ...	Scott, L. S. ...	H. Peters ...	No. A.	Yeoward ...	2.6.29 to 22.6.29...	25.6.29
<i>Alynbank</i> ...	Clayton, W. E. ...	R. A. B. Ardley ...	" A.	A. Weir & Co. ...	16.4.29 to 18.5.29	11.6.29
†† <i>Andalucia Star</i> ...	Thomas, R. J. ...	A. G. Sampson ...	" M.	Blue Star ...	3.6.29 to 14.6.29	16.7.29
<i>Anchises</i> ...	Woodgett, R. J. ...	R. Fountain, J. F. Browning	" A.	A. Holt ...	11.3.29 to 30.5.29	31.5.29
†† <i>Andes</i> ...	Matthews, G. P. ...	T. W. Stevens, L. A. Wood, R. N. Mayo.	M.L.	R.M.S.P. Co. ...	Met. Log. 23.2.29 to 4.6.29	13.6.29
<i>Antiochus</i> ...	Jones, E. ...	A. Pope ...	No. A.	A. Holt ...	Form 911 22.4.29 to 1.6.29	3.7.29
*† <i>Aorangi</i> , M.V. ...	Crawford, R. ...	E. V. Bilger, E. M. Anderson, D. Richards.	M.L.	Canadian-Australasian	Met. Log. 6.2.29 to 23.5.29...	25.6.29
††30 <i>Aquitania</i> ...	Diggles, E. G., R.D., Capt. R.N.R.	R. W. Bee, J. Locke, G. Duguid.	W.T.	Cunard ...	W.T. Reg. 9.6.29 to 26.6.29	28.6.29
††62 <i>Arabic</i> ...	Bulman, J. B. ...	W. Hesketh, F. Wills, C. Clark.	"	White Star ...	" 30.6.29 to 13.7.29	15.7.29
*† <i>Arafura</i> ...	Gordon, A. S. ...	F. R. Miller, B. W. Dun, C. Stratford, H. Nuzum.	M.L.	Eastern and Australian	Met. Log. 5.11.28 to 17.4.29	15.6.29
*† <i>Argyllshire</i> ...	Wallace, J. ...	R. W. Cook, C. C. Reeder.	No. M.	Federal ...	Form 911 20.5.29 to 8.6.29...	8.7.29
*† <i>Ariguaní</i> ...	Scudamore, J. H. H., D.S.C., R.D., Commr. R.N.R.	G. McKee, J. W. Dodd, W. Ireland.	M.L.	Elders & Fyffes ...	Met. Log. 15.12.28 to 14.4.29	26.4.29
<i>Ariosto</i> ...	Biggins, R. L. ...	" ...	No. A.	Ellerman Wilson ...	Form 911 17.12.28 to 29.12.28	4.2.29
†† <i>Armada Castle</i> ...	Owen, S. H. ...	" ...	M.L.	Union Castle ...	Met. Log. 12.4.29 to 1.6.29...	5.6.29
*† <i>Arracan</i> ...	Macfarlane, W. M. F.	J. Henderson, J. Morrison, F. Scott.	"	P. Henderson ...	" 18.10.28 to 7.3.29	27.3.29
<i>Arundel</i> ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 5.7.29	5.7.29
<i>Arundel Castle</i> ...	Owen, S. H. ...	P. Clissold ...	No. A.	Union Castle ...	Form 911 8.2.29 to 31.3.29...	4.4.29
*† <i>Astronomer</i> ...	Richards, J. ...	A. Frew, E. B. Stephens, W. B. Littlechild.	M.L.	Harrison ...	Met. Log. 5.9.28 to 31.1.29...	14.2.29
*† <i>Ascanius</i> ...	Wilson, C. A. ...	T. Robb, E. M. Robb, W. H. Elliott.	"	A. Holt ...	" 28.10.28 to 1.3.29	18.3.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 19.7.29	Date Received.
<i>Atrous</i> ...	Wilkinson, T. G. ...	H. Nicholas ...	No. A.	A. Holt ...	Form 911 22.5.29 to 31.5.29 ...	1.7.29
<i>Auditor</i> ...	Owen, W. T. ...	D. O. Percy ...	" M.	Harrison ...	" 9.3.29 to 29.3.29 ...	7.6.29
<i>Australia</i> ...	Scutt, W. ...	" ...	M.L.	British India ...	" ...	"
<i>Autolyceus</i> ...	Dunlop, J. K. ...	" ...	No. A.	A. Holt ...	" 25.10.28 to 11.11.28 ...	28.11.28
<i>Balmoral Castle</i> ...	J. H. Kerbey ...	H. A. Deller ...	" A.	Union Castle ...	" 10.5.29 to 26.5.29 ...	15.7.29
<i>Balranald</i> ...	Townshend, W. P. ...	H. Stinn, G. Owen, F. Ward, L. Bailey.	" M.	P. & O. Branch ...	Met. Log. 13.9.28 to 10.1.29 ...	23.1.29
<i>Baltic</i> ...	Warner, G. E., R.D., Capt., R.N.R.	A. C. T'Anson, J. C. Boyce ...	W.T.	White Star ...	W.T. Reg. 17.6.29 to 6.7.29 ...	10.7.29
<i>Bampton Castle</i> ...	James, J. S. ...	W. A. Cooke ...	No. A.	Union Castle ...	Form 911 16.6.29 to 7.7.29 ...	11.7.29
<i>Banffshire</i> ...	Westropp, T. G. ...	A. McL. Pilcher ...	" M.	Turnbull Martin ...	" 15.3.29 to 9.4.29 ...	17.6.29
<i>Baradine</i> ...	Allin, C. H. C. ...	C. B. Roche, B. W. Pollitt, P. Haworth, L. A. Hill.	M.L.	P. & O. Branch ...	Met. Log. 12.4.29 to 18.7.29 ...	6.6.29
<i>Barpeta</i> ...	Rudge, J. G. ...	N. Apps ...	No. M.	British India ...	Form 911 1.5.29 to 22.5.29 ...	15.6.29
<i>Barrabool</i> ...	Rhodes, H. R. ...	T. G. Davies ...	" M.	P. & O. Branch ...	" 11.1.29 to 28.1.29 ...	5.3.29
<i>Barranca</i> ...	Edwards, A. C. ...	" ...	M.L.	Elders & Fyffes ...	" ...	"
<i>Baychimo</i> ...	Cornwall, S. A. ...	" ...	No. A.	Hudson's Bay Co. ...	" 5.10.28 to 19.11.28 ...	3.12.28
<i>Belgenland</i> ...	Morehouse, W. A. ...	F. Good, C. H. Otterson, F. Clitty.	W.T.	Red Star ...	W.T. Reg. 16.6.29 to 5.7.29 ...	9.7.29
<i>Beliana</i> ...	Rollo, W. ...	G. V. Legassick ...	No. M.	P. & O. Branch ...	Form 911 16.6.29 to 6.7.29 ...	8.7.29
<i>Benalder</i> ...	Fairweather, J. J. ...	D. T. McCullum ...	" M.	Ben Line ...	" 2.3.29 to 12.6.29 ...	19.6.29
<i>Benalla</i> ...	Sheepwash, J. H. ...	D. E. C. Otter ...	" A.	P. & O. Branch ...	" 29.5.29 to 10.6.29 ...	24.6.29
<i>Bendigo</i> ...	Nicholl, R. N. C. ...	G. G. Mason ...	" M.	P. & O. Branch ...	" 13.4.29 to 26.5.29 ...	31.5.29
<i>Benefactor</i> ...	Jones, C. W. ...	S. M. Smith, R. Huntingdon ...	" M.	Harrison ...	" 9.8.28 to 28.9.28 ...	3.10.28
<i>Berengaria</i> ...	Rostron, Sir A. H., K.B.E., R.D., Capt., R.N.R.	S. A. T. Bullock, F. P. Collins, W. C. Robson.	W.T.	Cunard ...	W.T. Reg. 15.4.29 to 13.5.29 ...	23.5.29
<i>Berrima</i> ...	Short, C. E. ...	G. H. Durrant ...	No. M.	P. & O. Branch ...	Form 911 16.6.29 to 2.7.29 ...	4.7.29
<i>Brenda</i> ...	Lamont, A. ...	N. Ross ...	" A.	Scottish Fishery Bnd.	" 25.5.28 to 3.6.28 ...	27.8.28
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	C.C.	Southern Railway ...	Telegraphic Report 11.5.29 ...	3.7.29
<i>British Dominion</i> , M.V.	Taylor, R. J. ...	H. B. Phillips ...	No. M.	British Tankers ...	Form 911 8.6.29 to 4.7.29 ...	11.5.29
<i>British Merchant</i>	Putt, R. O. ...	C. Low ...	" M.	"	" 9.5.29 to 20.6.29 ...	8.7.29
<i>Brugera</i>	Birch, A. ...	"	" A.	Lampart & Holt ...	" 27.11.28 to 24.2.29 ...	4.3.29
<i>Bulysses M.V.</i>	Head, B. P. ...	A. J. Clatworthy ...	" M.	Anglo-Saxon Petroleum Co.	" 7.6.29 to 12.7.29 ...	17.7.29
<i>Buteshire</i> ...	Page, W. J. ...	"	M.L.	Turnbull Martin ...	" ...	"
<i>Calgarie</i> ...	Binks, J. W., R.D., Lt.-Commr., R.N.R.	G. Kavanagh ...	W.T.	White Star ...	W.T. Reg. 5.3.29 to 11.5.29 ...	15.5.29
<i>Cambria</i> ...	Foy, C. A. ...	"	No.	W.I. and Panama Telegraph Co.	Form 911 22.4.29 to 10.5.29 ...	15.5.29
<i>Cambria</i> ...	Copland, C. P. ...	O. W. Ll. Jones ...	C.C.	L.M. & S. Rly ...	Telegraphic Report 6.7.29 ...	6.7.29
<i>Cambridge</i> ...	Williams, R. ...	J. Herbert, D. C. Shedden ...	M.L.	Federal ...	" ...	"
<i>Cameronia</i> ...	Gemmell, W. ...	"	"	Anchor ...	Met. Log. 27.1.29 to 17.6.29 ...	24.6.29
<i>Canito</i> ...	Forrester, W. T., O.B.E.	H. H. Dunning, W. E. Grant, G. M. Roberts.	"	Elders & Fyffes ...	" 11.10.28 to 8.3.29 ...	13.3.29
<i>Canadian Importer</i>	Forson, A. ...	"	No. A.	Canadian Gov. Mercantile Marine.	Form 911 15.5.29 to 13.6.29 ...	15.7.29
<i>Canadian Winner</i>	McConechy, W. G. ...	J. M. Lang ...	" M.	"	" 17.9.28 to 13.10.28 ...	27.11.28
<i>Canonesa</i> ...	Brodie, W. H. ...	T. Wetherall ...	" M.	Furness Houlder ...	" 25.2.29 to 25.3.29 ...	4.4.29
<i>Cape of Good Hope</i>	Jacobson, T. A. ...	W. S. Bartlett ...	" A.	Lyle S.S. Co. ...	" 27.3.29 to 14.6.29 ...	15.7.29
<i>Carmania</i> ...	Brown, F. G., R.D., Capt., R.N.R.	E. R. Taylor, E. Gleave, P. O. Davis.	W.T.	Cunard ...	W.T. Reg. 27.5.29 to 14.6.29 ...	20.6.29
<i>Carnarvon Castle</i> , M.V.	Stanley, W. F., R.D., Commr., R.N.R.	H. L. Shaw, G. D. Pennick, S. S. Smith.	M.L.	Union Castle ...	Met. Log. 24.6.29 to 10.7.29 ...	15.7.29
<i>Caronia</i> ...	Hossack, W. H., R.D., Capt., R.N.R.	T. Parry, E. R. B. Freeman, S. E. Clowser.	W.T.	Cunard ...	W.T. Reg. 19.1.29 to 12.5.29 ...	23.5.29
<i>Casanare</i> ...	Browne, S. ...	"	No. A.	Elders & Fyffes ...	Form 911 10.6.29 to 28.6.29 ...	4.7.29
<i>Cathay</i> ...	Griffin, R. H., O.B.E., R.D., Capt., R.N.R.	R. A. C. Beeching ...	" M.	P. & O ...	W.T. Reg. 9.6.29 to 29.6.29 ...	4.7.29
<i>Cavina</i> ...	Riseley, A. D. ...	R. C. Harradon ...	" A.	Elders & Fyffes ...	" 29.5.29 to 29.6.29 ...	2.7.29
<i>Cedric</i> ...	Kearney, J., Lt.-Commr., R.N.R.	W. Nicoll, N. E. Banks, J. Law.	W.T.	White Star ...	" 6.6.29 to 28.6.29 ...	1.7.29
<i>Centaur</i> ...	Ward Hughes, J. ...	N. L. Thompson, J. Cockburn, B. L. Brind.	M.L.	A. Holt & Co. ...	W.T. Reg. 10.6.29 to 30.6.29 ...	9.7.29
<i>Ceramic</i> ...	Musgrave, T. ...	H. A. R. Daman ...	No. A.	White Star ...	Form 911 9.6.29 to 30.6.29 ...	11.7.29
<i>Changite</i> ...	Gambrill, F. C. ...	T. Tyer, D. Baigent, D. H. O'Hulton.	M.L.	Yull & Co. ...	Met. Log. 16.7.28 to 14.12.28 ...	18.2.29
<i>Changuinola</i> ...	Thorburn, R. A., R.D., Commr., R.N.R.	B. R. Coe ...	No. A.	White Star ...	Form 911 13.4.29 to 20.5.29 ...	22.5.29
<i>Chindwin</i> ...	Paterson, G. ...	"	" A.	Yull & Co. ...	Met. Log. 1.9.28 to 17.1.29 ...	20.3.29
<i>Chiripo</i> ...	Sapsworth, S. A. ...	"	" A.	Elders & Fyffes ...	Form 911 4.5.29 to 4.6.29 ...	7.6.29
<i>City of Baroda</i> ...	McMillan, J. ...	J. E. Jenkins, W. Faichney, F. T. Mallett.	M.L.	Henderson ...	" 16.3.29 to 28.5.29 ...	24.6.29
<i>City of Benares</i> ...	Anderson, W. W. ...	P. C. Wilson ...	No. A.	Elders & Fyffes ...	Met. Log. 20.4.29 to 6.7.29 ...	11.7.29
<i>City of Bombay</i> ...	Brown, O. C. ...	E. H. Roberts ...	" M.	Ellerman ...	" 1.1.29 to 22.4.29 ...	30.4.29
<i>City of Bristol</i> ...	Jenkins, D. ...	K. G. Crockett ...	" M.	"	Form 911 5.11.28 to 16.2.29 ...	13.3.29
<i>City of Canterbury</i> ...	Stanley, A. ...	R. H. Hodgson ...	" A.	"	" 23.5.29 to 19.6.29 ...	17.7.29
<i>City of Carlisle</i> ...	Mordue, J. A. ...	"	" A.	"	" 11.11.28 to 1.12.28 ...	7.1.29
<i>City of Chester</i> ...	Letton, F. W. ...	C. C. Duncan, P. C. Arthur, M. J. Mc Nicol.	M.L.	"	" 9.4.29 to 8.5.29 ...	21.5.29
<i>City of Hong Kong</i>	Walton, H. L., O.B.E., R.D., Commr., R.N.R.	H. Saunders ...	No. A.	"	" 7.6.29 to 14.7.29 ...	16.7.29
<i>City of Khios</i> ...	Reay, A. S. ...	"	" A.	"	Met. Log. 7.10.28 to 13.2.29 ...	25.2.29
<i>City of London</i> ...	Nicoll, L. ...	"	" A.	"	Form 911 1.5.29 to 25.5.29 ...	31.5.29
<i>City of Osaka</i> ...	Smith, W. H. ...	R. E. Thornton ...	" A.	"	" 19.2.29 to 10.3.29 ...	2.4.29
<i>City of Rangoon</i> ...	Jones, P. ...	R. K. Walker ...	" M.	"	" 2.2.29 to 17.4.29 ...	3.5.29
<i>City of Yokohama</i>	Singleton, J. G. ...	E. R. Wildermuth, R. H. Stewart, F. E. Broadbent.	M.L.	"	" 29.3.29 to 10.4.29 ...	1.5.29
<i>Clan Alpine</i> ...	Young, A. H., Commr., R.D., R.N.R.	"	" A.	"	Met. Log. 28.3.28 to 9.7.28 ...	1.8.28
<i>Clan Kenneth</i> ...	Giles, H. J., R.D., Commr., R.N.R.	"	" A.	"	Form 911 16.2.29 to 24.2.29 ...	23.4.29
<i>Clan Lindsay</i> ...	Worthington, J. H. ...	W. A. Nicholas ...	" A.	"	" 7.4.29 to 6.5.29 ...	28.5.29
<i>Clan MacBean</i> ...	Hannay, L. G. ...	J. C. Robertson ...	" A.	"	" 13.5.29 to 6.6.29 ...	1.7.29
<i>Clan Macbeth</i> ...	Laird, C. ...	G. L. Roe ...	" A.	"	" 26.4.29 to 19.5.29 ...	25.6.29
<i>Clan Macgadyen</i> ...	Redford, L. F. ...	T. A. Pearson ...	" A.	"	" 28.4.29 to 26.5.29 ...	17.6.29
<i>Clan Macfarlane</i> ...	Mackinlay, A. ...	F. H. Thornton ...	" A.	"	" 19.3.29 to 9.4.29 ...	30.5.29
<i>Clan Macgillivray</i> ...	Holman, W. G. ...	H. Lockyer ...	" A.	"	" 6.6.29 to 17.6.29 ...	1.7.29
<i>Clan Macindoe</i> ...	Phillips, G. P. ...	E. Crowther ...	" A.	"	" 28.10.28 to 14.12.28 ...	21.1.29
<i>Clan Mackellar</i> ...	"	"	" A.	"	" 31.1.29 to 16.6.29 ...	8.7.29

## LIST OF VOLUNTARY OBSERVING SHIPS

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Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 197.29.	Date Received.
*† <i>Clan Macphee</i> ...	Gourlay, J. B. ...	E. H. Stone, K. C. Simpson, L. R. Legg. ...	M.L.	Clan ...	Met. Log. 11.6.28 to 12.12.28 ...	28.1.29
<i>Clan Macnaughton</i> ...	Clark, J. ...	A. H. Hersee ...	No. A.	" ...	Form 911 2.6.29 to 14.6.29... ..	15.6.29
<i>Clan Macquarrie</i> ...	West, W. F. ...	E. Gregory ...	" A.	" ...	" 14.5.29 to 2.6.29... ..	8.7.29
<i>Clan Macquarrie</i> ...	Higgins, C. J. ...	D. McAllister ...	" A.	" ...	" 22.5.29 to 12.6.29 ...	20.6.29
*† <i>Clan Macwhirter</i> ...	Low, A. ...	F. B. Barker, H. M. Watkins ...	M.L.	" ...	Met. Log. 18.6.28 to 18.1.29 ...	11.2.29
*† <i>Clan Malcolm</i> ...	George, L. S. ...	F. B. Fairweather, H. E. Luxton, J. F. Hubbard. ...	"	" ...	" 18.11.28 to 25.5.29 ...	13.6.29
<i>Clan Morrison</i> ...	Porterfield, W. M. Lt.-Commr., R.N.R. ...	L. C. Cuthbert ...	No. A.	" ...	Form 911 20.5.29 to 15.6.29 ...	8.7.29
<i>Clan Murdoch</i> ...	Calderwood, W. ...	J. B. Davies ...	" A.	" ...	" 28.4.29 to 22.5.29 ...	25.5.29
<i>Clan Ranald</i> ...	Fraser, R. K. ...	K. G. Tucker ...	" A.	" ...	" 11.4.29 to 19.5.29 ...	10.6.29
<i>Clan Ross</i> ...	Neill, G. A. ...	A. G. Beynon ...	" A.	" ...	" 7.5.29 to 2.6.29 ...	25.6.29
<i>Clan Sinclair</i> ...	Baker, E. W. ...	C. W. Daish ...	" A.	" ...	" 25.5.29 to 11.6.29 ...	1.7.29
*† <i>Colonial</i> ...	Worthington, B. ...	A. S. Milne ...	" M.	T. & J. Harrison ...	" 13.4.29 to 23.6.29 ...	29.6.29
*† <i>Comorin</i> ...	Borland, J. McI., C.B., D.S.O., R.D., Capt., R.N.R. ...	E. C. White ...	" M.	P. & O. ...	" 16.4.29 to 30.5.29 ...	15.6.29
*† <i>Corinthic</i> ...	Freeman, C. P. ...	E. M. Burt, M. Bennett, I. A. Macnaughton. ...	M.L.	White Star ...	Met. Log. 8.12.28 to 26.3.29 ...	8.4.29
<i>Cornwall</i> ...	Lamb, C. B. ...	C. R. Brown ...	No. A.	Federal ...	Form 911 10.12.28 to 17.1.29 ...	18.3.29
<i>Crawford Castle</i> ...	Conley, E. A. ...	" ...	" A.	Union Castle ...	" ...	"
*† <i>Culebra</i> ...	Goble, C. J., R.D., Commr., R.N.R. ...	H. D. Cooper, R. N. Fletcher, C. Blake. ...	M.L.	R.M.S.P. Co. ...	Met. Log. 9.4.29 to 8.6.29 ...	26.6.29
*† <i>Cumberland</i> ...	Macmillan, D. ...	P. Shakespear, F. Loughhead, T. Shillito, J. Lennox. ...	"	Federal... ..	" 29.10.28 to 29.3.29 ...	5.4.29
*† <i>Custodian</i> ...	O'Connor, T. ...	" ...	No. M.	Harrison ...	" ...	"
<i>Cyclops</i> ...	Cosker, W. ...	C. B. P. Anderson ...	" A.	A. Holt ...	Form 911 24.4.29 to 14.5.29 ...	15.6.29
*† <i>Daga</i> ...	Wiles, N. ...	I. B. Campbell ...	" M.	P. Henderson... ..	" 4.3.29 to 10.6.29... ..	15.6.29
<i>Dakotian</i> ...	Robb, J. ...	H. Arnold ...	" A.	Leyland ...	" 22.4.29 to 1.5.29 ...	10.6.29
<i>Dardanus</i> ...	Glossop, S. ...	R. W. Ellis ...	" A.	A. Holt ...	" 20.5.29 to 10.7.29 ...	12.7.29
*† <i>Darro</i> ...	Turner, E. H. ...	" ...	" M.	R.M.S.P. Co. ...	" 19.6.29 to 1.7.29... ..	8.7.29
*† <i>Defender</i> ...	Haylett, E. ...	" ...	" M.	T. & J. Harrison ...	" ...	"
<i>Delilian</i> ...	Fulford, S. S., R.D., Commr. R.N.R. ...	" ...	" A.	Leyland ...	" ...	"
*† <i>Delphic</i> ...	Vaughan, P. R. ...	E. B. Clark ...	" M.	White Star ...	" 4.5.29 to 18.6.29... ..	26.6.29
*† <i>Delta</i> ...	Townshend, W. P., R.D., Capt., R.N.R. ...	D. M. Stafford ...	" M.	P. & O. ...	" 24.4.29 to 19.6.29 ...	11.7.29
*† <i>Demerara</i> ...	Willan, F. G. L., R.D., Capt., R.N.R. ...	P. W. Brundell ...	" M.	R.M.S.P. Co. ...	" 15.4.29 to 6.5.29... ..	10.6.29
*† <i>Demosthenes</i> ...	Ogilvy, A. ...	S. A. Ferguson ...	" M.	Aberdeen Common-wealth Booth ...	" 21.4.29 to 9.6.29... ..	12.6.29
<i>Denis</i> ...	Harris, F. C. P. ...	J. H. Stokes ...	" A.	Booth ...	" 15.4.29 to 29.4.29 ...	24.6.29
*† <i>Deseado</i> ...	F. S. Hannam ...	A. Barff ...	" M.	R.M.S.P. Co. ...	" 16.3.29 to 10.5.29 ...	14.5.29
*† <i>Desna</i> ...	Green, J. ...	L. T. Peterson ...	" M.	" ...	" 3.9.28 to 24.10.28 ...	12.11.28
<i>Deucalion</i> ...	Melling, C. F. ...	R. F. Dryden ...	" A.	A. Holt ...	" 29.4.29 to 15.5.29 ...	25.6.29
*† <i>Devon</i> ...	Kinnell, G. ...	S. C. Bradley ...	" M.	Federal ...	" 19.4.29 to 14.7.29 ...	17.7.29
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	" C.C.	Southern Railway ...	Telegraphic Report 18.7.29 ...	18.7.29
<i>Dimboola</i> ...	Dawson, J. ...	S. J. Griffith ...	No. A.	Melbourne S.S. Co. ...	Form 911 12.4.29 to 5.6.29... ..	15.7.29
*† <i>Discovery</i> , Auxy. Barque. ...	King Davis, J. ...	W. R. Colbeck ...	M.L.	Douglas Mawson Expedition. ...	" ...	"
*† <i>Domala</i> , M.V. ...	Kitson, A. G. ...	H. Robertson ...	No. M.	British India ...	" 26.2.29 to 11.5.29 ...	17.6.29
*† <i>Dominia</i> , C.S. ...	Campos, V., O.B.E., Lt.-Commr., R.N.R. ...	S. A. Garnham, A. S. Muir, L. J. Hegarty, W. F. Anderson. ...	M.L.	Telegraph Construc-tion & Maintenance. ...	Met. Log. 8.8.28 to 5.12.28... ..	27.12.28
<i>Dominic</i> ...	Saxton, C. ...	G. H. Clark ...	No. A.	Booth ...	Form 911 6.1.29 to 4.4.29 ..	10.4.29
*† <i>EdDoric</i> ...	Hulme, R. ...	F. E. Patchett, J. Farrell, S. A. Jones. ...	W.T.	White Star ...	" 1.6.29 to 24.6.29... ..	26.6.29
<i>Dorington Court</i> ...	Clarke, E. J. ...	P. Jones ...	No. A.	Haldin & Co. ...	Form 911 7.1.29 to 14.2.29... ..	16.3.29
<i>Dromore Castle</i> ...	MacMahon, J., R.D., Commr., R.N.R. ...	J. A. Sowden ...	" A.	Union Castle ...	" 15.4.29 to 9.5.29... ..	5.6.29
*† <i>Dryden</i> ...	Major, T. W. ...	" ...	" M.	Lampart & Holt ...	" 21.10.28 to 14.1.29 ...	7.2.29
*† <i>Duchess of Atholl</i> ...	Griffiths, E. ...	" ...	" M.	Canadian Pacific ...	" 22.6.29 to 9.7.29... ..	11.7.29
*† <i>Duchess of York</i> ...	Stuart, R.N., V.C., D.S.O., Commr. R.N.R. ...	A. Monsey ...	" M.	" ...	" 16.6.29 to 3.7.29... ..	8.7.29
<i>Dunaff Head</i> ...	Butt, H. L., R.D., Lt.-Commr., R.N.R. ...	D. Martin ...	" A.	Ulster S.S. Co. ...	" 22.1.29 to 6.2.29 ...	18.2.29
<i>Dunluce Castle</i> ...	Jackson, C. R. ...	H. Colwill ...	" A.	Union Castle ...	" 11.4.29 to 2.5.29... ..	7.5.29
<i>Dunrobin</i> ...	Ramsay, J. D. ...	W. Martin ...	" A.	Glen & Co. ...	" 28.5.29 to 15.6.29 ...	3.7.29
*† <i>Duquesa</i> ...	Barker, A. W. ...	" ...	" M.	Furness Withy ...	" 22.4.29 to 28.6.29 ...	3.7.29
*† <i>Durenda</i> , M.V. ...	Beeching, P. H. ...	J. E. Miles ...	" M.	British India ...	" 6.3.29 to 24.3.29... ..	19.4.29
<i>Edinburgh Castle</i> ...	Gardner, G. F., O.B.E., Lt.-Commr., R.N.R. ...	C. P. Goode ...	" A.	Union Castle ...	" 28.3.29 to 19.5.29 ...	25.5.29
<i>Egori</i> ...	Sola, P., D.S.O. ...	J. T. Townson ...	" A.	Elder Dempster ...	" 2.5.29 to 16.7.29... ..	17.7.29
*† <i>El Argentino</i> ...	Ellis, F. ...	D. Rankine ...	" M.	Houlder ...	" 5.3.29 to 10.5.29 ...	1.6.29
*† <i>Eldon Park</i> ...	Burns, R. ...	E. Roberts, A. Pearson, J. E. Iliff. ...	M.L.	Denholm S.S. Co. ...	Met. Log. 9.12.28 to 13.4.29 ...	22.4.29
*† <i>Elpenor</i> ...	Gordon, A. L. ...	" ...	"	A. Holt ...	" ...	"
*† <i>Elstree Grange</i> ...	St. Pierre, P. ...	" ...	No. M.	Houlder ...	Form 911 10.2.29 to 16.5.29 ...	30.5.29
*† <i>El Uruguayo</i> ...	McNamara, T. ...	F. E. Hailstone ...	" M.	" ...	" ...	"
*† <i>Elysia</i> ...	Duncan, A. R. ...	D. Blair, G. S. Sinclair, W. Beveridge. ...	M.L.	Anchor ...	Met. Log. 30.1.29 to 1.4.29... ..	16.4.29
*† <i>Empress of Asia</i> ...	Hailey, A. J., Lt.-Commr., R.N.R. ...	L. M. Goddard, J. F. Patrick, R. J. Hickey, E. Newell, A. G. Simmons ...	"	Canadian Pacific ...	" 17.2.29 to 31.5.29 ...	19.7.29
*† <i>Empress of France</i> ...	Robinson, S., C.B.E., R.D., Commr. R.N.R. ...	" ...	"	" ...	" 9.3.29 to 21.6.29 ...	19.7.29
*† <i>Empress of Russia</i> ...	Hosken, A. J. ...	R. A. Leicester, J. B. Smith, H. B. Metcalf, A. C. Jones. ...	"	" ...	" 17.11.28 to 22.3.29 ...	20.4.29
<i>Endeavour</i> ...	La w, E. F. B., Commr., R.N. ...	M. B. Thomas ...	"	His Majesty's Ship ...	" 15.3.29 to 8.7.29 ...	18.7.29
<i>Enterprise</i> ..	Pridham-Wippell, H.D., Capt., R.N. ...	" ...	"	" ...	" ...	"
*† <i>Essequibo</i> ...	Roberts, E. ...	L. Marsland ...	No. M.	R.M.S.P. Co. ...	Form 911 22.5.29 to 3.6.29... ..	15.6.29
<i>Eumaeus</i> ...	Read, J. W. ...	D. W. Stroud ...	" A.	A. Holt ...	" 30.4.29 to 13.5.29 ...	15.6.29
<i>Euryades</i> ...	Findlay, J. ...	W. K. Hole ...	" A.	A. Holt ...	" 20.3.29 to 7.6.29... ..	13.6.29
*† <i>Explorer</i> ...	Ling, J. T. ...	A. E. Rogers ...	" M.	Harrison ...	" 9.2.29 to 22.5.29... ..	13.6.29
<i>Explorer</i> ...	Allan, J. ...	A. Stout, F. O. Sheehy ...	" A.	Scottish Fishery Board. ...	" 2.6.29 to 30.6.29... ..	3.7.29
*† <i>Ferndale</i> ...	Thompson, W. ...	R. S. Hartrick ...	" M.	Aberdeen Common-wealth. ...	" 7.7.28 to 5.8.28 ...	23.8.28



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 19.7.29.	Date Received.
*† <i>Fordsdale</i> ...	Richardson, A. V. ...	F. Vaughan ...	No. M.	Aberdeen Common-wealth.	Form 911 22.2.29 to 18.3.29 ...	4.4.29
<i>Francisco</i> ...	Scales, H. ...	W. F. Hewetson ...	" A.	Ellerman Wilson ...	" 11.4.29 to 22.5.29 ...	27.5.29
<i>Freya</i> ...	Angus, W. ...	W. Pirrie ...	" A.	Scottish Fishery Board.	" 1.5.29 to 31.5.29 ...	5.6.29
<i>Garth Castle</i> ...	Linklater, H. ...	T. H. Whatley ...	" A.	Union Castle ...	" 1.11.28 to 29.12.28 ...	3.1.29
<i>Gascoyne</i> ...	Johnson, L. ...	W. J. Macphedran, C. Melson, J. S. Macbride.	M.L.	A. Holt & Co. ...	Met. Log. 11.9.28 to 15.2.29 ...	24.4.29
*† <i>Glamorganshire</i> ...	Womersley, H. ...	R. E. E. Hadlow ...	No. M.	R.M.S.P. Co. ...	Form 911 17.4.29 to 29.5.29 ...	15.6.29
*† <i>Glenamoy, M.V.</i> ...	Homan, C. E. ...	R. K. Bishop, F. B. C. Wetherley.	M.L.	Glen Line ...	Met. Log. 24.12.28 to 5.5.29 ...	12.6.29
<i>Glenapp</i> ...	Ingram, T. F. ...	" ...	No. A.	" ...	Form 911 19.1.29 to 27.2.29 ...	2.4.29
<i>Glenbeg</i> ...	Newing, L. ...	F. B. Angier ...	" A.	" ...	" 5.3.29 to 9.7.29 ...	11.7.29
*† <i>Glenegarray</i> ...	Angier, J. ...	J. Tyler ...	" M.	" ...	" 24.6.29 to 2.7.29 ...	11.7.29
<i>Glenluc</i> ...	Kennett, W. H. ...	H. B. Porter ...	" A.	" ...	" 25.4.29 to 10.5.29 ...	21.5.29
<i>Glenishane</i> ...	Suter, S. C. ...	" ...	" A.	" ...	" 10.11.28 to 1.4.29 ...	6.4.29
<i>Glenworth</i> ...	Kilgour, H. A. ...	W. C. Wright ...	" A.	R. S. Dalgleish ...	" 24.4.29 to 13.6.29 ...	2.7.29
<i>Gloucestershire</i> ...	Robin, E. ...	W. Moore ...	" A.	Bibby ...	" 1.12.28 to 8.2.29 ...	12.2.29
<i>Gloxinta</i> ...	Pool, F. G. ...	D. Coughlan ...	" A.	Stag Line ...	" 5.4.29 to 14.5.29 ...	5.6.29
<i>Guildford Castle</i> ...	Morgan, A. O., R.D., Commr. R.N.R.	" ...	" A.	Union Castle ...	" ...	"
<i>Halestus</i> ...	Samuels, C. ...	N. MacLeod ...	" A.	R. P. Houston ...	" 5.5.29 to 23.5.29 ...	16.7.29
<i>Haliartus</i> ...	Felton, W. J. ...	F. D. Bonney ...	" A.	" ...	" 13.11.28 to 8.2.29 ...	28.2.29
*† <i>Hardwicke Grange</i> ...	Fowler, W. H. ...	" ...	" M.	Houlder ...	" 13.4.29 to 3.6.29 ...	19.6.29
<i>Harmonides</i> ...	Elwell, F. R. ...	R. H. Pape ...	" A.	R. P. Houston ...	" 4.5.29 to 1.6.29 ...	5.6.29
*† <i>Hatimura</i> ...	Hemmings, W. H. ...	L. E. Heath ...	" M.	British India ...	" 1.5.29 to 29.6.29 ...	15.7.29
*† <i>Hawaki, M.V.</i> ...	Norton, A. T. ...	D. M. McLeish, C. H. George, F. C. Cochran.	M.L.	Union S.S. Co., N.Z. ...	Met. Log. 17.4.28 to 25.10.28 ...	4.1.29
<i>Herald</i> ...	Turner, H. E., Lieut-Commr.	W. H. Martin ...	M.L.	His Majesty's Ship ...	Met. Log. 31.10.28 to 28.11.28 ...	9.1.29
<i>Hermindus</i> ...	Roberts, T. V. ...	D. W. MacGregor ...	No. A.	Aberdeen Common-wealth.	Form 911 9.4.29 to 18.5.29 ...	25.5.29
<i>Herschel</i> ...	Watson, W. W. ...	" ...	" A.	Lampport & Holt ...	" 13.1.29 to 18.4.29 ...	20.4.29
*† <i>Hertford</i> ...	Burton Davies, J. ...	" ...	M.L.	Federal ...	" ...	"
<i>Hestione</i> ...	McComish, A. B. ...	" ...	No.	R. P. Houston ...	" ...	"
<i>Hiberna</i> ...	Dudgeon, L. T. ...	A. Marsh ...	E.C.	L.M. & S. Railway ...	Telegraphic Report 19.7.29 ...	19.7.29
*† <i>Highland Chieftain, M.V.</i> ...	Robinson, R. H. ...	" ...	No. M.	Nelson ...	Form 911 20.5.29 to 8.7.29 ...	16.7.29
<i>Highland Pride</i> ...	Robinson, R. H. ...	F. Quelch ...	No. A.	" ...	" 8.9.28 to 3.11.28 ...	7.11.28
<i>Prince</i> ...	Taylor, F. ...	W. A. Hall ...	" A.	" ...	" 30.3.29 to 11.4.29 ...	25.4.29
<i>Rover</i> ...	McKinnon, H. ...	E. Smart ...	" A.	Nelson ...	" 1.1.29 to 18.2.29 ...	11.3.29
<i>Hildebrand</i> ...	Peregrine, D. ...	" ...	" A.	Booth ...	" 14.5.29 to 27.6.29 ...	2.7.29
*† <i>Hobson's Bay</i> ...	Kydd, O. J. ...	J. Worrall, D. Horn, G. Cook	M.L.	Aberdeen Common-wealth.	Met. Log. 6.3.29 to 14.6.29 ...	3.7.29
<i>Holbein</i> ...	Gough, W. A. ...	F. Delaney ...	No. A.	Lampport & Holt ...	Form 911 6.1.29 to 17.3.29 ...	2.4.29
*† <i>Homer</i> ...	White, E. R., R.D., Commr. R.N.R.	H. G. Morgan, W. T. Poustie, A. E. Dyer, S. B. Morfee.	W.T.	White Star ...	W.T. Reg. 6.6.29 to 21.6.29 ...	25.6.29
<i>Hororata</i> ...	Barnett, H. ...	E. A. Quick ...	No. A.	New Zealand S.S. Co. ...	Form 911 26.6.29 to 10.7.29 ...	13.7.29
<i>Hubert</i> ...	Briscoe, W. ...	G. G. Westhorp ...	" A.	Booth ...	" 17.1.29 to 8.2.29 ...	18.3.29
<i>Huntingdon</i> ...	Field, H. G. B. ...	H. G. Letts ...	" A.	Federal ...	" 2.1.29 to 1.3.29 ...	22.3.29
*† <i>Huntsman</i> ...	Russell, H. ...	J. Richardson ...	" M.	" ...	" 16.2.29 to 5.3.29 ...	25.3.29
*† <i>Hydaspes</i> ...	Williams, P. E. ...	P. McMillan ...	" M.	Harrison ...	" 13.4.28 to 15.8.28 ...	3.9.28
				R. P. Houston ...	" 27.3.29 to 24.4.29 ...	2.5.29
*† <i>Ingoma</i> ...	Gibbings, W. ...	W. E. Williams, W. J. Greenhalgh.	" M.	Harrison ...	Form 911 25.5.29 to 5.7.29 ...	12.7.29
<i>Inkum</i> ...	Meethan, J. T. ...	" ...	" A.	J. H. Welsford ...	" 2.5.29 to 21.6.29 ...	5.7.29
<i>Irania, M.V.</i> ...	Adams, P. A. ...	E. Allen ...	" A.	Iranian Tanker Co. ...	" ...	"
*† <i>Iris, C.S.</i> ...	Hughes, H. P. ...	" ...	M.L.	Pacific Cable Board ...	Met. Log. 23.2.29 to 19.3.29 ...	18.7.29
<i>Iroquois</i> ...	Nares, J. D., D.S.O., Capt. R.N.	A. B. Foulestone ...	"	His Majesty's Ship ...	" 1.9.28 to 30.11.28 ...	8.1.29
*† <i>Ixion</i> ...	Collins, H. M. ...	D. Law ...	"	A. Holt ...	" 28.11.28 to 18.4.29 ...	28.6.29
<i>Javanese Prince, M.V.</i> ...	Smith, J. ...	J. B. Morrison ...	No. A.	Prince ...	Form 911 21.5.29 to 6.6.29 ...	25.6.29
*† <i>Jeypore</i> ...	Cooper, C. P., O.B.E., R.D. Capt. R.N.R.	" ...	" M.	P. & O. ...	" 7.3.29 to 3.4.29 ...	6.5.29
<i>Justin</i> ...	Bush, H. ...	J. Stretch ...	" A.	Booth ...	" 15.2.29 to 9.4.29 ...	22.4.29
*† <i>Kaisar-i-Hind</i> ...	Headlam, P. C., R.D., Commr. R.N.R.	R. H. Hand ...	" M.	P. & O. ...	" 13.4.29 to 5.6.29 ...	10.6.29
*† <i>Kalyan</i> ...	Cornwall Jones, B. ...	W. R. B. Noal ...	" M.	P. & O. ...	" 4.5.29 to 14.6.29 ...	24.6.29
*† <i>Kangaroo</i> ...	Norris, H. C. ...	J. Sinclair, J. S. Airey, E. Hutchinson, J. Edward, H. Reynolds, V. L. Gilbert.	M.L.	State Service Australia.	Met. Log. 3.9.28 to 24.2.29 ...	27.5.29
*† <i>Karamca</i> ...	McIntosh, A. ...	K. D. Fisher, A. C. Jones, J. W. Thompson, H. M. Clark.	"	Shaw, Savill & Albion	" 10.3.29 to 1.7.29 ...	10.7.29
*† <i>Karapara</i> ...	Miller, A. C. ...	J. Small ...	No. M.	British India ...	Form 911 6.5.29 to 24.5.29 ...	24.6.29
*† <i>Kashgar</i> ...	Northcote, H. B., R.D., Commr. R.N.R.	R. P. Eddy ...	" M.	P. & O. ...	" 12.2.29 to 22.3.29 ...	26.3.29
*† <i>Kashmir</i> ...	Bent, E. ...	" ...	" M.	P. & O. ...	Form 911 19.10.28 to 4.1.29 ...	17.1.29
*† <i>Khandalla</i> ...	Baird, S.K. ...	" ...	" M.	British India ...	" 27.3.29 to 10.5.29 ...	10.6.29
*† <i>Khiva</i> ...	Britten, P. O. ...	C. E. Arundel, J. A. Ridley, H. V. Williamson.	M.L.	P. & O. ...	Met. Log. 10.1.29 to 20.4.29 ...	26.4.29
*† <i>Knight Companion</i> ...	Davis, A. L. ...	J. H. Isherwood ...	No. M.	A. Holt ...	Form 911 18.3.29 to 6.4.29 ...	3.6.29
*† <i>Koolinda, M.V.</i> ...	Buckeridge, J. Kavanagh, J.	" ...	" M.	State Service, Australia.	" 24.7.28 to 6.9.28 ...	15.10.28
*† <i>Laeonia</i> ...	Doyle, M. ...	E. W. Connell, A. B. Fasting, F. G. Russell ...	W.T.	Cunard ...	W.T. Reg. 27.5.29 to 15.6.29 ...	19.6.29
					" 24.6.29 to 10.7.29 ...	16.7.29
<i>Laguna</i> ...	Dunn, R. E., O.B.E. ...	R. W. Hanson ...	No. A.	Pacific S.N. Co. ...	Form 911 27.5.29 to 10.7.29 ...	15.7.29
*† <i>Lahore</i> ...	Charters, W. ...	N. Bell ...	" M.	P. & O. ...	" 9.4.29 to 28.4.29 ...	1.5.29
<i>Lalande</i> ...	Hamill, H. ...	" ...	" A.	Lampport & Holt ...	" ...	"
<i>Lancashire</i> ...	de Legh, P. ...	W. H. Campe ...	" A.	Bibby ...	Form 911 30.10.28 to 27.1.29 ...	7.2.29
*† <i>Lancastria</i> ...	Townley, J. C. R.D., Commr. R.N.R.	G. Overton, P. L. Williams, J. W. Caunce.	W.T.	Cunard ...	W.T. Reg. 16.5.29 to 13.6.29 ...	15.6.29
					Form 911 20.5.29 to 5.6.29 ...	11.6.29
<i>Laomedon</i> ...	Hatfield, F. ...	O. P. H. Wynne ...	No. A.	A. Holt ...	" 19.5.29 to 6.6.29 ...	10.6.29
					" 28.3.29 to 31.5.29 ...	13.6.29

## LIST OF VOLUNTARY OBSERVING SHIPS

v

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Report Contributed. Received up to 19.7.29.	Date Received.
*† La Paz, M.V. ...	Benson, C. W. ...	E. Hicks ...	No. M.	Pacific S.N. Co. ...	Form 911 45.29 to 12.7.29...	15.7.29
††55 Lapland ...	Harvey, H. ...	J. C. Flett, J. Gladstone ...	W.T.	Red Star ...	W.T. Reg. 2.6.29 to 22.6.29 ...	25.6.29
*† Largs Bay ...	Jenkyn, W. M. ...	... ..	No. M.	Aberdeen Common-wealth.	Form 911 2.6.29 to 22.6.29 ...	26.6.29
††64 Laurentic ...	Trant, E. L., R.D., Commr., R.N.R.	J. W. Peters, R. Hawkyns ...	W.T.	White Star ...	25.1.29 to 4.5.29 ...	7.5.29
*† Lautaro, M.V. ...	Leyne, R. W. ...	J. T. Denley ...	No. M.	Pacific S.N. Co. ...	W.T. Reg. 26.5.29 to 14.6.29 ...	19.6.29
*† Leicestershire ...	English, G. L. ...	R. S. Evans, H. G. Walton, E. D. Brand, A. Thomson.	M.L.	Bibby ...	23.6.29 to 11.7.29 ...	16.7.29
*† Limerick ...	Molyneux, P. L. ...	G. Chaplin ...	No. M.	Federal... ..	Form 911 26.5.29 to 12.7.29 ...	15.7.29
*† Llandaf Castle ...	Gilbert, E. F. ...	W. A. Cooke ...	M.L.	Union Castle ...	25.2.29 to 14.6.29 ...	19.6.29
*† Llandovery Castle	Stuart, C. E., Capt. R.N.R.	C. H. Williams, G. Moon, P. Clissold.	"	" ...	Met. Log. 2.2.29 to 10.4.29 ...	17.4.29
Llanstephan Castle	Whitfield, G. J. ...	... ..	No. A.	" ...	Form 911 18.1.29 to 24.2.29 ...	18.3.29
*† Lobos, M.V. ...	Pape, E. R. ...	S. E. Ayland ...	" M.	Pacific S.N. Co. ...	29.12.28 to 16.1.29 ...	12.2.29
*† Loch Katrine ...	Schlanbusch, O. V. ...	D. A. Mallinson ...	" A.	R.M.S.P. Co. ...	Met. Log. 15.11.28 to 21.1.29 ...	1.2.29
*† Logician ...	Herschel, R. F. ...	A. G. S. Madrell ...	" M.	Harrison ...	Form 911 15.6.29 to 2.7.29 ...	6.7.29
*† London Importer ...	Nuttall, E. L. ...	F. F. Feint, J. H. Metcalfe, J. G. Freeman.	" M.	Furness Withy ...	" 22.5.29 to 9.6.29 ...	3.6.29
Lord Antrim ...	Jarvis, F. E. ...	... ..	" A.	Ulster S.S. Co. ...	" 3.2.29 to 5.5.29 ...	10.5.29
*† Loriga, M.V. ...	Clapham, E. C. ...	D. P. Morgan ...	" A.	Pacific S.N. Co. ...	" 23.2.29 to 18.4.29 ...	30.4.29
*† Losada, M.V. ...	Ross, J. ...	D. Beamer ...	" M.	" ...	Form 911 4.1.29 to 19.1.29 ...	23.1.29
*† Macedonia ...	Morton, A. J. ...	C. J. L. Hayward ...	" M.	P. & O. ...	" 8.2.29 to 27.2.29 ...	3.6.29
*† Macchardu ...	Hanna, R. G. ...	A. C. Hocking ...	" M.	Brooklebank ...	" 5.6.29 to 22.6.29 ...	17.6.29
*† Macquarie ...	Heyen, G. H. ...	... ..	No. M.	On Chang & Co. ...	" 9.5.29 to 20.6.29 ...	26.6.29
*† Maharaja ...	Elliot, G. F. ...	... ..	" M.	Brooklebank ...	" 19.6.29 to 28.6.29 ...	8.7.29
*† Mahronda ...	Sharpe, G. ...	L. Lee ...	" M.	Asiatic S.N. Co. ...	" ... ..	10.6.29
*† Mahsud ...	Kershaw, R. W. ...	J. D. Paisley ...	" M.	Brooklebank... ..	" 6.3.29 to 24.4.29 ...	16.6.29
*† Maidan ...	Robertson ...	... ..	" M.	" ...	" 20.5.29 to 29.5.29 ...	6.6.29
*† Maihar ...	Charlton, W. L. ...	J. W. B. Robertson, C. Cadwallader, A. D. Spring, R. Belford.	M.L.	" ...	" 15.4.29 to 24.4.29 ...	22.5.29
*† Maimoa ...	Johnson, J. W. ...	D. Aitchison, A. D. Masters, R. Belford.	"	Shaw, Savill & Albion	" 1.5.29 to 3.6.29 ...	11.6.29
Maimyo ...	Smith, G. C. ...	H. M. Drummond ...	No. A.	Brooklebank ...	Met. Log. 2.11.28 to 10.3.29 ...	8.4.29
††58 Majestic ...	Marshall, W. C.B., D. S. O., R.D., Commr. R.N.R.	W. W. Pearson, A. Fisher, W. T. Fitz Gerald, A. H. Young.	W.T.	White Star ...	Form 911 11.11.28 to 15.3.29 ...	19.3.29
*† Makalla ...	Maugham, J. W. ...	A. L. Harrop ...	No. M.	Brooklebank ...	Form 911 18.8.28 to 14.11.28 ...	29.11.28
*† Makambo ...	Williams, D. J. ...	R. Perry, R. A. Williams S. Sandison.	M.L.	Burns Philp ...	W.T. Reg. 13.6.29 to 26.6.29 ...	2.7.29
*† Makura ...	{ Martin, W. ...	W. A. Todd, J. Billingham, G. Edwards.	"	Canadian-Australasian	Form 911 25.3.29 to 2.5.29 ...	10.5.29
*† Malabar, M.V. ...	Donaldson, A. ...	... ..	No. M.	Burns, Philp & Co. ...	Met. Log. 24.11.28 to 9.4.29 ...	26.6.29
*† Malakuta ...	Adamson, F. L. ...	A. Horspool ...	" M.	Brooklebank ...	" 3.10.28 to 16.2.29 ...	16.4.29
*† Malancha ...	Whitham, F. ...	... ..	" M.	" ...	Form 911 10.11.28 to 21.4.29 ...	28.6.29
*† Malda ...	Wright, J. ...	E. H. Lidstone ...	" M.	British India ...	" 12.5.29 to 8.6.29 ...	15.7.29
†† Maloja ...	Browning, J. B., R.D., Commr. R.N.R.	A. D. Dennis ...	" M.	P. & O. ...	" 1.12.28 to 21.2.29 ...	26.3.29
†† Malwa ...	Stringer, R. H., O.B.E., R.D., Commr. R.N.R.	G. C. Case, F. D. Shaw ...	" M.	" ...	" 21.4.29 to 9.7.29 ...	15.7.29
*† Manchester Brigade	Stott, C. H. ...	J. H. Round, H. Boyce, E. E. Bonnaud.	M.L.	Manchester Liners ...	" 3.5.29 to 8.6.29 ...	15.7.29
Manchester Corporation.	Makin, T. ...	J. F. Whitly ...	No. A.	" ...	Form 911 19.4.29 to 2.5.29 ...	23.5.29
*† Manchester Hero	Riley, J. E. ...	H. Anderton, J. H. Emmett, H. Dobson, A. Ricketts, A. Grant.	M.L.	" ...	Met. Log. 25.8.28 to 4.2.29 ...	15.2.29
Manchester Producer	Struss, F. D. ...	T. J. Boyd ...	No. A.	" ...	Form 911 3.5.29 to 13.6.29 ...	20.6.29
*† Manela ...	Maples, S. H. ...	... ..	" M.	British India... ..	Form 911 24.3.28 to 12.10.28 ...	19.10.28
*† Mangalore ...	Mulchay, G. ...	J. A. Leitch ...	" M.	Brooklebank ...	Form 911 1.6.29 to 29.6.29 ...	3.7.29
*† Manipur ...	Cochran, G. N. ...	R. Penston, G. B. Falconer ...	" M.	Brooklebank ...	" 28.5.29 to 4.6.29 ...	24.6.29
*† Manistee ...	Pengelly, J. ...	... ..	" M.	Brooklebank ...	" 12.4.29 to 9.6.29 ...	15.6.29
*† Manora ...	Hudson, H. T., R.D., Commr., R.N.R.	... ..	" M.	Elders & Fyfes	" 27.4.29 to 23.5.29 ...	19.6.29
†† Mantua ...	Davis, H. C., D.S.C., Commr., R.N.R.	... ..	" M.	British India... ..	Form 911 30.12.28 to 28.3.29 ...	2.4.29
*† Marella ...	Mortimer, S. ...	A. G. Hill, F. Vogelmann, B. Helen.	M.L.	Burns Philp ...	" 25.2.29 to 9.6.29 ...	27.6.29
*† Marengo ...	Curle, J. ...	H. Bryan, G. W. Revell, F. Foyal, S. Butcher.	"	Ellerman Wilson ...	Met. Log. 19.11.28 to 28.3.29 ...	22.6.29
†† Margha ...	Hughes, C. G. ...	P. Wright, H. Watkins ...	No. M.	British India... ..	" 18.7.28 to 6.1.29 ...	22.1.29
*† Marquesa ...	Smiles, R. S. ...	L. Owen... ..	" A.	Furness Houlder ...	" 7.4.29 to 2.7.29 ...	8.7.29
*† Matakana ...	Mitchie, W. ...	... ..	M.L.	Burns, Philp & Co. ...	Form 911 28.4.29 to 4.7.29 ...	11.7.29
Mataram ...	Williams, P. E. ...	E. Davies, B. Forbes-Moffatt, J. Dickson.	No. A.	Shaw, Savill & Albion	Met. Log. 2.5.29 to 2.6.29 ...	15.7.29
†† Mataroa ...	Kershaw, W. A. R. ...	... ..	M.L.	Burns, Philp & Co. ...	Met. Log. 29.9.28 to 11.2.29 ...	13.2.29
*† Matheran ...	Ison, W. A. ...	J. Richardson ...	No. M.	Brooklebank ...	Form 911 6.3.29 to 18.5.29 ...	24.6.29
*† Matiana ...	Green, F. V. ...	W. Mortimer ...	" M.	British India... ..	Met. Log. Shaw, Savill, & Albion	21.5.29
*† Matra ...	Cornish, N. P. ...	W. Gibson, R. V. Andrew ...	" M.	Brooklebank ...	Form 911 6.11.28 to 18.11.28 ...	23.11.28
*† Maunganui... ..	Martin, W. ...	A. J. Herbert ...	" M.	Union S.S. Co. of N.Z.	" 10.3.29 to 4.6.29 ...	10.6.29
*†32 Mauretania	Prothero, W. ...	R. H. C. Crawford, L. Sharpe, C. B. Osborne, B. J. P. Tuck, R. M. Shore, R. W. Rankin, S. C. Belcher.	W.T.	Cunard ...	" 21.4.29 to 13.7.29 ...	17.7.29
††66 Megantic ...	Frank, F. A., D.S.O., R.D., Commr., R.N.R.	A. E. Dyer, J. F. Waltire, A. H. H. Griffiths.	W.T.	White Star ...	Form 911 19.4.29 to 13.5.29 ...	15.6.29
††22 Melita ...	Stewart, A. ...	J. Shearer ...	W.T.	Canadian Pacific	W.T. Reg. 2.6.29 to 4.7.29 ...	9.7.29
†† Memnon ...	Watson, C. J. ...	J. A. C. McGregor ...	No. A.	A. Holt... ..	Form 911 5.5.29 to 24.5.29 ...	28.5.29
††21 Metagama ...	Murray, M. F., R.D., Commr., R.N.R.	J. Hewson, J. H. Tudor, A. Newsome.	W.T.	Canadian Pacific	Form 911 12.1.29 to 23.1.29 ...	28.1.29
*† Middlesex ...	Wilde, H. ...	D. J. Murray, ...	No. M.	Federal... ..	W.T. Reg. 9.6.29 to 30.6.29 ...	10.7.29
*† Minna ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A.	Scottish Fishery Brd.	Form 911 8.2.29 to 16.5.29 ...	25.5.29
††23 Minnedosa ...	McQueen, D. S. ...	C. D. Watt, W. J. P. Roberts, H. M. Sanders.	W.T.	Canadian Pacific	W. T. Reg. 15.5.29 to 4.7.29 ...	11.7.29
†† Minnesota ...	Finch, E., R. D., Commr. R.N.R.	L. C. Hill... ..	No. M.	Atlantic Transport... ..	Form 911 27.5.29 to 15.6.29 ...	25.6.29
†† Minnetonka ...	Gates, T. F., C.B.E. ...	D. K. Cracknell ...	" M.	" ...	" 22.6.29 to 10.7.29 ...	13.7.29
					Form 911 26.5.29 to 10.7.29 ...	17.7.29
					" 2.6.29 to 22.6.29 ...	3.7.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 19.7.29.	Date Received.
†† <i>Minnewaska</i> ...	Claret, F. H., C.B.E., Commr., R.N.R.	... ..	No. M.	Atlantic Transport ...	Form 911 27.5.29 to 12.7.29 ...	17.7.29
†† <i>Mississippi</i> ...	Pearce, H. ...	W. M. Shoesmith ...	" A.	"	" 13.5.29 to 26.5.29 ...	7.6.29
†† <i>Modasa</i> ...	Gilchrist, J. W. ...	A. E. Baker, E. Crozier ...	" M.	British India ...	" 10.6.28 to 28.8.28 ...	18.9.28
†† <i>Moeraki</i> ...	Loriard, C. ...	D. J. Strath, F. G. Harvey ...	" A.	Union S.S. Co. of N.Z.	" 26.4.29 to 2.6.29 ...	8.7.29
†† <i>Moldavia</i> ...	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	C. B. Holmes ...	" M.	P. & O. ...	" 12.4.29 to 15.5.29 ...	31.5.29
†† <i>Mongolia</i> ...	Furlong, G. H. S., R.D., Capt., R.N.R.	A. H. Cole ...	" M.	"	" 17.2.29 to 1.5.29 ...	6.5.29
††24 <i>Montcalm</i> ...	Rothwell, A. ...	F. H. Steel ...	W.T.	Canadian Pacific ...	W.T. Reg. 17.6.29 to 3.7.29 ...	9.7.29
††25 <i>Montclare</i> ...	Griffiths, J. N. ...	E. A. Shergold, T. L. Gillette, T. Sargent.	"	"	" 25.5.29 to 12.6.29 ...	21.6.29
†† <i>Montoro</i> ...	Hillman, E. J. ...	J. Middleton, J. Young, J. Campbell.	M.L.	Burns, Philp & Co. ...	Met. Log. 18.7.28 to 3.2.29 ...	22.6.29
†† <i>Montrose</i> ...	Dott, J. F. ...	J. Soame, J. M. Roche ...	No. M.	Canadian Pacific ...	W.T. Reg. 8.4.29 to 26.4.29 ...	30.4.29
††20 <i>Montroyal</i> ...	Freer, A., R.D., Capt., R.N.R.	L. Outram, D. Ewing ...	W.T.	"	" 9.6.29 to 25.6.29 ...	28.6.29
†† <i>Moresby</i> ...	Henderson, D. A., Commr., R.N.	G. A. Gould ...	M.L.	His Majesty's Australian Ship.	Form 911 8.12.28 to 27.12.28 ...	3.1.29
†† <i>Morvada</i> ...	Mills, T. L., O.B.E., R.D., Commr., R.N.R.	A. J. Norris, H. Maguire ...	No. M.	British India ...	Met. Log. 7.8.28 to 13.12.28 ...	13.3.29
†† <i>Mulbera</i> ...	Caffyn, F. ...	F. C. E. Diamond ...	" M.	"	Form 911 29.7.28 to 29.10.28 ...	31.10.28
†† <i>Nagara</i> ...	Miles, F. R., R.D., Capt., R.N.R.	A. H. Frogbrook ...	" M.	R.M.S.P. Co. ...	" 3.3.29 to 5.4.29 ...	6.6.29
†† <i>Nagoya</i> ...	Cochrane, C. H. ...	S. Spring ...	" M.	P. & O. ...	" 27.4.29 to 23.6.29 ...	26.6.29
†† <i>Naldera</i> ...	Randell, G. G. ...	C. H. Hand, M. F. Shute, J. C. Davies.	M.L.	"	" 23.12.28 to 15.3.29 ...	2.5.29
†† <i>Nardana</i> ...	Moth, F. L. ...	F. G. Sharps ...	No. M.	British India ...	Met. Log. 20.10.28 to 23.1.29 ...	8.2.29
†† <i>Narkunda</i> ...	Parker, J. J. W., R.D., Commr., R.N.R.	M. Boyd ...	" M.	P. & O. ...	Form 911 8.10.28 to 13.11.28 ...	3.12.28
†† <i>Nellore</i> ...	Hignett, A. H., R.D., Lt.-Commr., R.N.R.	T. A. Sergeant ...	" M.	"	" 27.5.29 to 12.6.29 ...	15.6.29
†† <i>Nerbudda</i> ...	Williams, B. N. ...	G. A. Farley, S. Henderson ...	" M.	P. & O. ...	" 8.4.29 to 7.6.29 ...	12.6.29
†† <i>Nestor</i> ...	Houghton, G. K. ...	C. Mackinnon ...	" M.	British India ...	" 16.12.28 to 8.2.29 ...	11.2.29
†† <i>Newby Hall</i> ...	Gorst, W. ...	W. E. Owen ...	No. M.	A. Holt ...	" 23.7.28 to 17.2.29 ...	21.5.29
†† <i>Newfoundland</i> ...	Foxworthy, A. W. ...	R. F. Handley, E. Sainty, D. Hetherington.	M.L.	Ellerman ...	Met. Log. 17.2.29 to 1.4.29 ...	23.5.29
†† <i>Niagara</i> ...	Hill, T. V. ...	V. Knight, R. N. Turner, J. Webb.	"	Furness Withy ...	" 4.1.29 to 7.5.29 ...	14.5.29
†† <i>Ningchow</i> ...	Beale, H. E. ...	H. Morley ...	No. A.	Canadian-Australasian	" 6.3.29 to 20.6.29 ...	19.7.29
†† <i>Nirvana</i> ...	Ayres, R. M. ...	J. K. Ridger ...	" M.	A. Holt ...	Form 911 27.5.29 to 5.6.29 ...	27.6.29
†† <i>Norfolk</i> ...	Mead, G. F. ...	C. R. Wavish, T. M. Devitt, L. W. Fulcher.	M.L.	British India ...	" 24.4.29 to 5.6.29 ...	11.6.29
†† <i>Norna</i> ...	Wright, J. W. ...	T. R. Ness ...	No. A.	Federal ...	" 16.3.29 to 14.7.29 ...	19.7.29
†† <i>Norseman, C.S.</i> ...	Davis, E. R. ...	R. W. Greenfield ...	" M.	Scottish Fishery Brd	" 4.6.29 to 4.7.29 ...	8.7.29
†† <i>Northumberland</i> ...	Upton, H. L., D.S.O., R.D., Lt.-Commr., R.N.R.	W. J. Glassborow, H. R. M. Smith, R. S. Miller.	M.L.	Western Tel. Co. ...	" 7.5.29 to 14.5.29 ...	6.6.29
†† <i>Nova Scotia</i> ...	Furieux, S. ...	... ..	No. A.	Federal ...	Met. Log. 26.11.28 to 15.4.29 ...	26.4.29
†† <i>Noushera</i> ...	Parker, A. A. ...	A. Baillie ...	" M.	Furness Withy ...	Form 911 12.6.29 to 8.7.29 ...	11.7.29
†† <i>Nudea</i> ...	Morrison, W. C. ...	... ..	" M.	British India ...	" 1.5.29 to 22.6.29 ...	17.7.29
†† <i>Oaklands Grange</i> ...	Davis, Q. C. ...	J. C. Thomas ...	" A.	British India ...	" 11.5.29 to 31.5.29 ...	15.7.29
††57 <i>Olympic</i> ...	Parker, W. H., C.B.E., R.D., Capt., R.N.R.	A. E. Harvey, J. Day, W. Paine.	W.T.	British India ...	" 12.3.29 to 2.7.29 ...	5.7.29
†† <i>Orama</i> ...	Matheson, C. G., D.S.O., R.D., Capt., R.N.R.	J. M. M. Swanson, C. K. Blake, F. Gray.	M.L.	White Star ...	Form 911 12.3.29 to 2.7.29 ...	5.7.29
†† <i>Orantian</i> ...	Arkle, J. ...	J. R. Bubb ...	No. A.	Orient ...	W.T. Reg. 30.5.29 to 13.6.29 ...	19.6.29
†† <i>Orbita</i> ...	Dominy, R. H., C.B.E., Commr., R.N.R.	... ..	" M.	"	" 20.6.29 to 3.7.29 ...	6.7.29
†† <i>Oreoma</i> ...	Harvey, J. G. ...	E. B. Sandon ...	" M.	Leyland ...	Met. Log. 3.3.29 to 4.6.29 ...	28.6.29
†† <i>Orduna</i> ...	Daniel, T. ...	R. D. Eckford, W. Pearce ...	" M.	Pacific S.N. Co. ...	Form 911 13.6.29 to 1.7.29 ...	11.7.29
†† <i>Orestes</i> ...	Flynn, G. A. ...	R. Martin ...	" A.	"	" 31.1.29 to 18.4.29 ...	23.4.29
†† <i>Orford</i> ...	Owens, A. L., Commr., R.D., R.N.R.	O. C. Davies ...	" M.	"	" 30.5.29 to 19.6.29 ...	8.7.29
†† <i>Orlita</i> ...	Barkley, E. ...	D. W. Hutchinson, G. W. Irvine, L. L. Hunter.	M.L.	A. Holt ...	" 14.4.29 to 17.6.29 ...	24.6.29
†† <i>Ormonde</i> ...	Rice, W. V., D.S.O., D.S.C., Commr., R.N.	H. P. Price ...	"	Orient ...	" 28.7.28 to 8.9.28 ...	26.11.28
†† <i>Oronsay</i> ...	Cameron, E. P., Commr., R.D.	T. Fox Russell, R. S. Hawker, K. M. Morrison.	"	"	" 14.2.29 to 26.4.29 ...	11.5.29
†† <i>Oroya</i> ...	Ridyard, A. ...	P. H. Ray ...	No. M.	Pacific S.N. Co. ...	Met. Log. 18.12.28 to 22.5.29 ...	1.6.29
†† <i>Orsova</i> ...	Thorne, G. G., R.D., Commr., R.N.R.	L. J. Vesty, N. W. Smith, J. D. Birch, R. B. Stannard.	M.L.	His Majesty's Ship ...	" 11.1.29 to 30.5.29 ...	13.6.29
†† <i>Orvieto</i> ...	O'Sullivan, F. R. ...	G. L. Carter, H. A. Whittle, C. D. Lane.	"	Orient ...	" 7.2.29 to 21.5.29 ...	27.5.29
†† <i>Osterley</i> ...	Sarson, M. J. ...	... ..	No. M.	"	" 19.2.29 to 29.4.29 ...	11.5.29
†† <i>Otake</i> ...	Clarke, C. ...	G. Dibley ...	M.L.	Pacific S.N. Co. ...	Met. Log. 31.3.29 to 2.7.29 ...	11.7.29
†† <i>Oxfordshire</i> ...	Poster, W. L. ...	E. A. Insley ...	No. A.	Orient ...	" 23.12.28 to 27.3.29 ...	4.4.29
†† <i>Pacific Shipper, M.V.</i> ...	Goodwin, J. ...	... ..	" A.	"	Form 911 16.5.29 to 20.6.29 ...	24.6.29
†† <i>Pancras</i> ...	Reynolds, H. B. W. ...	C. C. Beal, E. Owen, R. Parry.	M.L.	New Zealand S.S. Co.	" 3.1.29 to 1.3.29 ...	8.3.29
†† <i>Parana</i> ...	Jones, W. C. H. ...	C. J. Murray ...	"	Bibby Bros. ...	" 24.1.29 to 21.2.29 ...	4.3.29
†† <i>Paraora</i> ...	Rathkins, C. E., R.D., Commr., R.N.R.	... ..	"	"	" 23.12.28 to 27.3.29 ...	4.4.29
†† <i>Paris</i> ...	Evans, J. O. ...	J. Greenaway ...	No. A.	"	Form 911 19.2.29 to 29.4.29 ...	11.5.29
†† <i>Patia</i> ...	Cook, C. L. ...	Mr. Biles ...	C.C.	"	Met. Log. 31.7.28 to 5.2.29 ...	1.3.29
†† <i>Pesander</i> ...	Bower, H. C. ...	F. L. Brealey ...	No. A.	Hain S.S. Co. ...	Form 911 7.8.28 to 7.9.28 ...	19.11.28
†† <i>Pennland</i> ...	Slater, H. N. ...	H. E. Readshaw ...	" A.	Southern Ry. ...	Telegraphic Report. 2.4.29 ...	2.4.29
†† <i>Peshawar</i> ...	Making, V. L. ...	... ..	" A.	Elders & Fyffes ...	Form 911 14.5.29 to 15.6.29 ...	19.6.29
†† <i>Polycarp</i> ...	McBryde, A. M. ...	K. A. H. Cummins, S. H. Baldwin, A. M. Toltree.	M.L.	A. Holt ...	" 4.4.29 to 4.6.29 ...	11.6.29
†† <i>Port Adelaide</i> ...	Reynolds, W. H. B. ...	H. W. Taggart ...	No. A.	Red Star ...	" 22.5.29 to 29.6.29 ...	1.7.29
†† <i>Port Adelaide</i> ...	Swan, L. H. ...	R. B. Linklater, C. J. Gorley, F. J. Lavers.	M.L.	P. & O. ...	Met. Log. 10.12.28 to 1.5.29 ...	13.5.29
†† <i>Port Adelaide</i> ...	... ..	... ..	"	Commonwealth Dominion.	Form 911 23.4.29 to 8.5.29 ...	27.5.29
†† <i>Port Adelaide</i> ...	... ..	... ..	"	... ..	Met. Log. 6.1.29 to 19.6.29 ...	15.7.29

## LIST OF VOLUNTARY OBSERVING SHIPS

vii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 19.7.29.	Date Received.
*† Port Auckland ...	Durham, R. S., D.S.C	C. F. Post, E. R. Rowlands, W. Roberts, E. W. Dingle, S. Ray ...	M.L.	Commonwealth & Dominion.	Met. Log. 28.8.28 to 24.1.29 ...	21.2.29
*† " Bowen ...	Hearn, G. W. ...	J. G. Thom, J. C. Goddard, H. B. Walker.	No. A.	" " "	Form 911 9.9.28 to 17.9.28...	26.10.28
*† " Campbell ...	Enright, W. J. ...	J. B. Bradley, G. Langford, J. Stannard, L. J. Brice ...	M.L.	" " "	Met. Log. 26.2.29 to 5.7.29...	11.7.29
*† " Caroline ...	Brown, A. H. ...	H. Pinkney, E. M. Fenton, S. Moate.	"	" " "	" 26.10.28 to 3.4.29 ...	8.4.29
*† " Darwin ...	Sawbridge, I. R. ...	L. W. Cady, A. A. Cooper, E. Beard, J. Rowland-Hill.	"	" " "	" 2.9.28 to 3.1.29 ...	7.1.29
*† " Denison ...	Ferris, J. ...	H. M. Post, V. G. Battle, W. Hopkins.	"	" " "	" 10.10.28 to 14.3.29 ...	1.4.29
" Dunedin, M.V.	Farmar, F. ...	H. Boys-Smith ...	"	" " "	" 19.12.28 to 15.4.29 ...	23.4.29
" Fremantle, M.V.	Gilling, W. ...	L. Copeland, C. L. Webb.	No. A.	" " "	Form 911 29.3.29 to 16.4.29 ...	21.5.29
" Gisborne, M.V.	Hayter, S. W. ...	G. J. O. Jinman, W. B. Craig	A.	" " "	2.1.29 to 1.5.29 ...	11.5.29
*† " Hobart, M. V.	Cottell, S. C. ...	R. B. Stannard, A. McClounan, J. T. Weldin.	M.L.	" " "	Met. Log. 21.11.28 to 23.3.29 ...	3.4.29
*† " Hunter ...	Robinson, C. A. ...	W. G. Jones, F. W. Elgar, W. E. Simpson.	"	" " "	" 1.8.28 to 23.12.28 ...	31.12.28
" Huon ...	Compton, J. E. ...	J. H. Sloan, T. L. Kidwell, J. A. D. Fisher.	No. A.	" " "	Form 911 6.3.29 to 3.4.29 ...	10.4.29
*† " Melbourne ...	Kippins, T. ...	E. H. Rogers, A. Cooper, A. Brown.	M.L.	" " "	Met. Log. 23.11.28 to 21.4.29 ...	25.4.29
*† " Nicholson ...	Jack, J. ...	E. E. Roswell, F. R. Gorman, R. D. Chamberlain.	"	" " "	" 12.9.28 to 30.1.29 ...	27.2.29
*† " Pirie ...	Hudson, J. J. ...	W. Pickup, C. Hodson, C. E. Midwinter.	"	" " "	" 26.11.28 to 22.4.29 ...	3.5.29
*† " Sydney ...	Higgs, W. G. ...	L. J. Skails ...	"	" " "	" 25.9.28 to 29.1.29 ...	8.2.29
*† " Victor ...	Williams, R. ...	F. J. Dean ...	"	" " "	" 14.7.28 to 1.1.29... ..	23.1.29
" Wellington ...	Jones, C. N. ...	J. Milhench, A. E. Martin, E. A. H. Gepp.	No. A.	" " "	Form 911 13.3.29 to 17.4.29 ...	21.5.29
" Protea, H.M.S.A.S.	Dalglish, J., Lt.-Commr., S.A.N.S.	C. W. Copelin ...	M.L.	South African Naval Service.	Met. Log. 3.3.29 to 16.5.29 ...	3.7.29
*† Protesilaus ...	Quirk, T. W. ...	W. Welch ...	"	A. Holt ...	" 20.11.28 to 24.4.29 ...	14.5.29
" Pyrrhus ...	Elford, W. J. ...	R. E. Tucker ...	No. A.	" ...	Form 911 4.6.29 to 12.6.29...	15.6.29
*† Quiloo ...	Cave, S. G. ...	B. P. Skinner ...	" M.	British India...	" 17.3.29 to 14.4.29 ...	9.7.29
†† Rajputana ...	Cadiz, F. G., D.S.O.	R. S. Walker, E. A. A. Crowley, C. W. R. Campbell	" M.	P. & O. ...	" 16.2.29 to 11.4.29 ...	17.4.29
†† Ranchi ...	Brooks, C., D.S.O., R.D., Commr., R.N.R.	H. Harwood, C. R. Pilcher, T. S. Marchington, R. C. Aldridge.	" M.	P. & O. ...	" 3.5.29 to 22.5.29...	28.5.29
†† Ranpura ...	King, A. M., D.S.C.	E. J. Spurling ...	" M.	P. & O. ...	" 13.4.29 to 1.5.29...	3.5.29
†† Razmak ...	Harrison, R., D.S.O., R.D., Capt. R.N.R.	G. R. Thomas ...	" M.	P. & O. ...	" 15.5.29 to 3.7.29 ...	6.7.29
††60 Regina ...	Davies, E. ...	H. N. Lawson, E. H. Hopkins, L. F. Malcouronne.	W.T.	White Star - Dominion	" 16.6.29 to 5.7.29...	8.7.29
*† Remuera ...	Cameron, J. J. ...	R. L. Harry, J. D. Kavanagh, F. O. Colvin.	M.L.	New Zealand S.S. Co.	W.T. Reg. 16.6.29 to 6.7.29...	9.7.29
" Rhexenor ...	Stout, G. L. ...	G. A. Davies ...	No. A.	A. Holt...	Met. Log. 24.11.28 to 15.3.29	17.4.29
" Rhodesian Trans- port.	Bullock, F. W. H. ...	C. H. Williams ...	A.	Houlder Bros. ...	Form 911 4.5.29 to 26.6.29 ...	6.7.29
*† Rimutaka ...	Holland, E. A. ...	G. Baker ...	M.L.	New Zealand S.S. Co.	" 2.2.29 to 6.6.29 ...	24.6.29
Ripley Castle ...	Aylen, C. E. H. ...	W. H. Hughes ...	No. A.	Union Castle ...	Met. Log. 24.1.29 to 9.6.29...	21.6.29
Rother ...	Woodhead, T. H. ...	R. Sell, G. H. Morris, J. G. Bradley.	A.	Goole Steam Shipping	Form 911 8.1.29 to 9.4.29 ...	15.4.29
*† Rotorua ...	Hunter, J. L. B. ...	A. Macarthur ...	M.L.	New Zealand S.S. Co.	Met. Log. 15.3.29 to 3.6.29...	13.6.29
" Royal Transport ...	Robinson, F. W. ...	W. L. Whiteside, R. Cuming, W. H. Brittain.	"	"	Met. Log. 16.3.29 to 4.7.29...	11.7.29
*† Ruapehu ...	Bowen, A. C. ...	A. G. Parker ...	No. A.	Houlder Bros. ...	Form 911 7.2.29 to 12.5.29...	17.6.29
*† St. Albans ...	McKellar, A. W., R.D., Capt., R.N.R.	W. H. Whiteside, R. Cuming, W. H. Brittain.	M.L.	New Zealand S.S. Co.	Met. Log. 2.11.28 to 11.3.29 ...	15.3.29
" St. Helier ...	Diamond, S. L. ...	G. C. Parry ...	"	Eastern and Aus- tralian.	" 4.12.28 to 27.3.29 ...	9.5.29
" St. Julien ...	Richardson, L. ...	A. A. Tully ...	C.C.	G.W. Railway ...	Telegraphic Report 17.7.29 ...	17.7.29
" St. Andrew ...	Pitman, R. ...	A. R. Andrew... ..	No. A.	Rankin Gilmour ...	" 18.7.29 ...	18.7.29
††38 Samaria ...	Bearpark, E. W. ...	"	W.T.	Cunard ...	Form 911 6.4.29 to 24.5.29...	12.6.29
" Sardinian Prince ...	Malin, R. G., Lieut.-Commr., R.N.R.	"	No. A.	Prince ...	W.T. Reg. 10.6.29 to 29.6.29 ...	5.7.29
" Saxon ...	Pearson, F. T. ...	"	A.	Union Castle ...	Form 911 16.4.29 to 20.5.29 ...	29.5.29
*† Scholar ...	Shilston, P. G., R.D., Capt. R.N.R.	"	"	"	" 5.4.29 to 26.5.29...	28.5.29
" Scotia ...	Peterkin, A. G. ...	"	M.	Harrison ...	" 20.1.29 to 16.4.29 ...	24.4.29
††33 Seythia ...	Prichard, S. D., M.B.E.	"	C.C.	L.M. & S. Railway ...	Telegraphic Report 12.7.29 ...	12.7.29
" Sheaf Mount ...	Irving, R. B., O.B.E., R.D., Capt. R.N.R.	"	W.T.	Cunard ...	W.T. Reg. 3.6.29 to 23.6.29 ...	4.7.29
*† Shropshire, M.V. ...	Groves, C. V. ...	"	No. A.	W. A. Souter ...	Form 911 4.5.29 to 27.5.29...	31.5.29
" Silksworth ...	Adamson, B. W. ...	"	M.L.	Bibby ...	Met. Log. 25.4.29 to 14.5.29 ...	21.5.29
*† Sinkiang ...	Blacklock, G. ...	"	No. A.	"	Met. Log. 8.2.29 to 19.4.29...	22.4.29
" Somerset ...	Stringer, C. B. L. ...	"	M.L.	R. S. Dalglish ...	" 3.1.29 to 16.4.29 ...	15.6.29
*† Spero ...	Howell Price, J. ...	"	"	China Navigation Co.	Form 911 26.1.29 to 12.3.29 ...	18.3.29
*† Statesman ...	Montgomery, H. ...	"	"	Federal... ..	Met. Log. 19.1.29 to 29.6.29 ...	9.7.29
" Stephen ...	Mowat, J. ...	"	No. M.	Ellerman Wilson ...	Form 911 31.1.29 to 12.4.29 ...	10.5.29
" Stockwell ...	Evans, L. G. ...	"	A.	Booth ...	" 11.5.29 to 26.5.29 ...	1.7.29
" Surrey ...	Smith, W. ...	"	A.	Brocklebank ...	" 26.10.28 to 22.11.28 ...	28.12.28
" Sutton Hall ...	Mac Rae, A. B. ...	"	M.L.	Federal... ..	" 14.5.29 to 5.6.29 ...	16.7.29
" Sylvafield, M.V. ...	Commr., R.N.R.	"	No. A.	Ellerman ...	" 19.5.29 to 23.6.29 ...	11.7.29
" Tainui ...	Walmsley, R. J. ...	"	A.	Hunting & Son ...	" 26.5.29 to 29.6.29 ...	3.7.29
" Tahiti ...	Xing, J. E. ...	"	M.L.	Shaw, Savill & Albion	" 9.5.29 to 12.6.29...	20.6.29
*† Taiping ...	Clifton Mogg, W. P., Lieut. Commr., R.N.R.	"	No. A.	Union S.S. Co. of N.Z.	" 20.2.29 to 6.6.29 ...	16.7.29
*† Takada ...	Aldwell, B. M. ...	"	M.L.	Yuill & Co. ...	Met. Log. 14.9.28 to 5.1.29 ...	13.2.29
*† Talma ...	Frame, A. M. ...	"	No. M.	British India ...	"	"
" Talthybius ...	Lindon, J. ...	"	M.	"	Form 911 24.2.29 to 6.4.29...	6.5.29
" "	Hocking, R. W., R.D., Lieut.-Commr., R.N.R.	"	M.L.	A. Holt ...	Met. Log. 24.1.29 to 8.4.29 ...	18.6.29



Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed, Received up to 19.7.29.	Date Received.
†† <i>Tamaroa</i> ... ..	Hartman, W. H. ...	A. J. Galvin ... ..	No. M.	Shaw, Savill & Albion	Form 911 28.3.29 to 10.7.29 ...	15.7.29
†† <i>Tanda</i> ... ..	Pilcher, E. T., Lieut.-Commr., R.N.R.	H. Murday, J. F. Heddlie, R. S. Millington.	M.L.	E. & A. S.S. Co. ...	Met. Log 26.2.29 to 29.5.29 ...	25.6.29
†† <i>Taranaki, M.V.</i> ...	Wood, C. ... ..	A. Chrystal, G. Campbell, P. Savill.	"	Shaw, Savill & Albion	" 17.10.28 to 12.2.29 ...	27.2.29
<i>Tarantula</i> ... ..	Henderson, F. M. ...	N. H. King ... ..	No. A.	Anchor ... ..	Form 911 29.12.28 to 5.2.29 ...	1.3.29
<i>Tetresias</i> ... ..	Wilkinson, W. H. ...	R. Blakey ... ..	" A.	A. Holt & Co. ... ..	" 2.12.28 to 23.3.29 ...	8.4.29
†† <i>Tekoa</i> ... ..	Robinson, F. W. ...	T. K. MacDonald ... ..	" M.	New Zealand S.S. Co.	" 4.1.29 to 13.3.29... ..	16.3.29
<i>Telamon</i> ... ..	Willcox, J. H. ... ..	F. A. Brown ... ..	" A.	A. Holt ... ..	" 4.5.29 to 6.6.29 ... ..	15.6.29
<i>Tetela</i> ... ..	Brice, E. H. ... ..	H. Holmes ... ..	" A.	Elders & Fyffes ...	" 9.6.29 to 12.7.29... ..	15.7.29
<i>Teucer</i> ... ..	Beswick, W., D.S.C., Lt.-Commr., R.N.R.	W. F. Cook, H. Rudd ...	" A.	A. Holt ... ..	" 31.1.29 to 30.3.29 ...	4.4.29
†† <i>Themistocles</i> ...	Young, A. D. ... ..	" ... ..	" M.	Aberdeen Common-wealth	" 12.12.28 to 20.1.29 ...	28.1.29
<i>Theseus</i> ... ..	Carnon, C. G. ... ..	H. C. Large ... ..	" A.	A. Holt ... ..	" 11.5.29 to 19.6.29 ...	11.7.29
†† <i>Thistleglen</i> ... ..	Whitfield, G. A., O.B.E.	" ... ..	M.L.	Allan Black & Co. ...	" ... ..	"
†† <i>Tilava</i> ... ..	Rowe, P. W. ... ..	E. A. Rabey ... ..	No. M.	British India... ..	Form 911 31.3.29 to 11.5.29 ...	3.6.29
†† <i>Tinhov</i> ... ..	Newton ... ..	J. S. King... ..	" M.	A. Weir & Co. ... ..	" 21.4.29 to 19.5.29 ...	17.7.29
†† <i>Titan</i> ... ..	Power, J. J. ... ..	P. Cross, R. A. Shennan, E. Saville.	M.L.	A. Holt ... ..	Met. Log. 3.2.29 to 18.6.29... ..	28.6.29
†† <i>Tongarivo</i> ... ..	Burton Davies, J. ...	E. A. Burton, A. E. Williams, H. Wilkinson, D. Baldwin.	"	New Zealand S.S. Co.	Met. Log. 12.8.28 to 7.1.29... ..	18.1.29
<i>Transylvania</i> ...	Smart, R. W. ... ..	P. Middleton ... ..	No. A	Anchor ... ..	Form 911 7.6.29 to 30.6.29... ..	4.7.29
<i>Trefusis</i> ... ..	Hunt, D. ... ..	R. H. Silley ... ..	" A.	Hain S.S. Co. ... ..	" 3.6.29 to 3.7.29 ... ..	5.7.29
†† <i>Trematon</i> ... ..	Evans, B. ... ..	J. Jenkyn, C. M. Quick, R. Stitson.	M.L.	Hain S.S. Co. ... ..	Met. Log. 18.5.28 to 24.12.28 ...	7.1.29
†† <i>Turakina</i> ... ..	Field, H. G. B. ... ..	J. D. B. Fisher ... ..	No. M.	New Zealand S.S. Co.	Form 911 1.12.28 to 28.12.28 ...	14.1.29
†† <i>Tuscania</i> ... ..	Rome, W. B. ... ..	J. Noble... ..	W.T.	Anchor ... ..	W.T. Reg. 3.6.29 to 22.6.29... ..	27.6.29
†† <i>Tyndareus</i> ... ..	Hughes, R. T. ... ..	A. F. Barclay, F. V. Smith, D. S. Bruce.	M.L.	A. Holt ... ..	Form 911 2.6.29 to 22.6.29... ..	26.6.29
†† <i>Ulimaroa</i> ... ..	Wylie, W. J. ... ..	S. B. Komall ... ..	No. M.	Huddart Parker, Ltd.	Met. Log. 30.10.28 to 31.3.29 ...	14.5.29
<i>Ulysses</i> ... ..	Owen, R. D., O.B.E.	A. McDonald ... ..	" A.	A. Holt ... ..	Form 911 12.4.29 to 3.6.29... ..	15.7.29
<i>Umvulosi</i> ... ..	Barnes, E. W. ... ..	" ... ..	" A.	Bullard King ... ..	" 24.3.29 to 7.7.29... ..	16.7.29
†† <i>Upwey Grange</i> ...	Goodrick, H. P. ... ..	G. T. Hurst ... ..	" M.	Houlder ... ..	" 15.5.29 to 15.6.29 ... ..	8.7.29
<i>Vardulia</i> ... ..	Fear, E. T. C. ... ..	W. H. Barker ... ..	" A.	Anchor Donaldson ...	" 18.5.29 to 4.6.29... ..	12.6.29
†† <i>Viceroy of India</i> ...	Ohlson, B. J., D.S.O., R.D., Commr. R.N.R.	A. G. Stansfield... ..	" M.	P. & O. ... ..	Form 911 1.12.28 to 11.1.29 ...	15.1.29
<i>Vigilant</i> ... ..	Simpson, E. S. S. ...	J. H. Hennessey ... ..	" A.	Scottish Fishery Board.	" ... ..	"
†† <i>Waiotapu</i> ... ..	Todd, D. ... ..	L. Leeder ... ..	" M.	Canadian - Australasian.	Form 911 7.6.29 to 30.6.29... ..	4.7.29
†† <i>Wairuna</i> ... ..	Ryan, J. ... ..	H. W. Jones, J. Ritchie, E. R. Pate.	M.L.	Union S.S. Co. of N.Z.	" 4.4.29 to 28.4.29... ..	7.6.29
†† <i>Walmer Castle</i> ...	Morton Betts, W. ...	G. H. Pickering... ..	"	Union Castle ... ..	Met. Log. 2.2.29 to 7.5.29 ... ..	10.7.29
<i>Warfield</i> ... ..	Steel, R. ... ..	" ... ..	No. A.	Federal... ..	Form 911 20.5.29 to 9.6.29... ..	13.6.29
†† <i>Westmoreland</i> ...	Hamilton, F. S. ... ..	A. W. Marshall, W. Timberlake, K. S. Phillips.	M.L.	" ... ..	Form 911 2.2.29 to 21.3.29... ..	2.4.29
†† <i>William Scoresby</i> , R.S.S.	Shannon, R. L. V., Lieut.-Commr. R.N.	M. C. Lester ... ..	"	Falkland Islands Government.	Met. Log. 11.1.29 to 28.5.29 ...	1.6.29
†† <i>Windsor Castle</i> ...	Chave, Sir B., K.B.E.	A. J. Tweddell, C. Gorringer, R. Tyser.	"	Union Castle ... ..	" 22.9.28 to 19.1.29 ... ..	11.5.29
†† <i>Wonganelia</i> ... ..	Suffern, H. ... ..	G. F. Phillips ... ..	No. M.	W. Crossby & Sons ...	" 25.8.28 to 17.2.29 ... ..	21.2.29
†† <i>Woodarra</i> ... ..	Reilly, J. V. ... ..	H. Goater, L. J. C. Simpson, G. F. Alexander J. McPhail.	M.L.	British India... ..	Form 911 14.3.29 to 15.4.29 ...	27.5.29
<i>Zent</i> ... ..	Roberts, H. ... ..	" ... ..	No. A.	Elders & Fyffes ... ..	Met. Log. 15.7.28 to 31.12.28 ...	4.1.29
<i>Conway, H.M.S.</i> ...	Richardson, F. A., D.S.C., Commr. R.N.	The Senior Cadets ... ..	Cadets' M.L.	" ... ..	Form 911 30.4.29 to 2.6.29... ..	5.6.29
<i>Pangbourne Nautical College</i>	Tracy, A. F. G., Commr. R.N.	" ... ..	"	" ... ..	Cadets' Met. Log. 23.9.28 to 15.12.28	19.12.28
<i>Worcester, H.M.S.</i>	" ... ..	" ... ..	"	" ... ..	Cadets' Met. Log. 16.1.29 to 23.3.29	10.4.29
<i>Abaco</i> ... ..	" ... ..	The Keepers ... ..	Lighthouse Register.	" ... ..	Cadets' Met. Log. 25.1.29 to 17.4.29	19.4.29
<i>Cay Lobos</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.7.28 to 31.12.28	28.5.29
<i>Double Headed Shot</i>	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 9.2.28 to 18.8.28	28.5.29
<i>Inagua</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.3.28 to 31.8.28	28.5.29
<i>Sombrero</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 10.10.28 to 31.3.29	28.5.29
<i>Watling Island</i> ...	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 20.7.28 to 31.12.28	28.5.29
<i>Cape Pembroke</i> (Falkland Is.).	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.7.28 to 31.12.28	5.2.29
					Lighthouse Register 1.7.28 to 31.12.28	28.5.29
					Lighthouse Register 1.7.28 to 31.12.28	19.2.29

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

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., received up to 30.6.29.	Date Received.
<i>Antillian</i> ... ..	Hannaford, W. ... ..	J. L. Crighton ... ..	Leyland ... ..	Water Samples ... ..	15.6.29
<i>Dakotian</i> ... ..	Robb, J. ... ..	W. F. Sloan ... ..	" ... ..	" ... ..	5.4.29
<i>Darro</i> ... ..	Matthews, G. P. ... ..	J. Clark ... ..	R.M.S.P. Co. ... ..	" ... ..	5.10.28
<i>Deseado</i> ... ..	Hannan, F. S. ... ..	J. G. Scott ... ..	" ... ..	" ... ..	18.10.28
<i>Hildebrand</i> ... ..	Peregrine, D. ... ..	E. Jones ... ..	Booth ... ..	" ... ..	3.5.29
<i>Oranian</i> ... ..	Bolton, W. ... ..	T. J. Jones ... ..	Leyland ... ..	" ... ..	19.3.29

September, M.O., 1929.

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