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A PLEA FOR A SUITABLE DIVISION OF ROUTINE VOLUNTARY MARINE METEOROLOGICAL WORK AT SEA.

In Work of the Year we stated that:—

“In setting out all proposals careful regard has been given to the fact that the master of a ship and his officers have to deal with all matters in a proper sense of proportion for the efficient and safe running of their ship, and that unless due consideration is given to this, meteorological work at sea in the Merchant Navy cannot progress to the best advantage of all concerned.”

We also stated that:—

“With the Hollerith system and an International Organization for ships' weather telegraphy it will become unnecessary for British ships to make written returns to other meteorological services, for the data collected and transmitted by Wireless may be made available to other services without duplication of this work at sea where under modern conditions the officers have much more clerical work than in the past.”

When the system of voluntary observation at sea for returning marine meteorological data to State Meteorological Offices was first established there were comparatively few Meteorological Offices which collected Marine data. Now there are a great many Meteorological Offices and other institutions in all parts of the World who

wish to collect Marine Meteorological Observations, both by written return and Wireless report.

The demand for this information is incessant and sometimes the desire for the information ashore has been the means of imposing multiplication of work at sea in some ships. There have been cases in recent years where some ships have been making regular written returns for not one or two Meteorological Services but several.

This state of affairs came about because those ashore collecting marine data in the different maritime countries had not fully realised the lack of suitable organisation there was during development and also owing to the fact that they had not sufficient assistants to transcribe and send on the data received to all who required it.

Hence the adoption of the Mechanical System of data extraction and printing in the British and Dutch Marine Divisions, our desire to bring this to the notice of all concerned in Maritime Countries, and the desire for an International Organisation for Ships Weather Telegraphy so that observations returned or reported by British regular observing ships may be made available to all who require them, and without the observing officers having to make more than one written return or report of the same information.

For many years there were a few foreign ships in our list whose Captains and Officers very kindly made returns to the British Marine Division and in doing so they have helped greatly to bring about a better understanding of International co-operation. We are most grateful to them for their good work and for their fine example.

Now the regularly observing fleet list is entirely British, but there are a few ships in it which are registered in the Dominions and Colonies. The Agents have been instructed to refer the Commanders of ships registered in the Colonies and Dominions, who offer to become regular observing ships, to the appropriate Meteorological Service in the Dominions and Colonies where such exist.

As these colonial registered ships drop out they will be replaced by ships on the home register. So it will be seen that we are doing what we can to lessen multiplication of work at sea by not asking Foreign, Dominion and Colonial registered ships to be regular observers for the British Marine Meteorological Service. I write this as an appeal not only on behalf of shipping and seamen, but also in the general interest of the Meteorological Services.

Keen and skilful Marine Observers suitably disposed along all ocean routes, keeping one log or form and making daily routine W.T. weather reports on one plan, can and will do the work much better than Marine Observers who have to do the same work several times over. That only stands to reason.

The principle of a limited number only of "Selected Ships" according to tonnage being invited to make routine Wireless Reports has recently met with strong support. The principle of limiting the number of regular observing ships for all purposes of Voluntary Marine Meteorological work may not be practicable, but a consideration of the World's tonnage and the tonnage and number of ships registered in the different Countries of the World will be useful in seeing how the requirements of Marine Meteorology may be served without imposing hardships upon those Commanders and Officers who are so good as to do this Voluntary Work for the benefit of their own service and of the whole civilized World.

We are indebted to the Committee of Lloyds Register for the following table giving the latest information available of the number and tonnage of steam and motor vessels of over 100 tons. We have added columns giving the number of Selected Ships for routine Ships Wireless Weather Telegraphy and taking the number found most suitable in the British Service for all purposes of voluntary routine Marine Meteorological Work, i.e., 500 regular observing ships with 31.7 per cent. of the World's Tonnage have added another column giving the same proportionate number for each Maritime Country or Dominion.

### Total Merchant Tonnage approximate (Steam and Motor) of the World

(Vessels over 100 tons, Lloyd's Register Book, July, 1928)

#### and Number of Selected Ships required for making W.T. Weather Reports, in all oceans, world wide.

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage	Number of Selected Ships required	Number of Ships fitted for C.W. transmission.	Number of regular observing ships proportionate to 500 ships with 31.7 per cent. of World Tonnage.
	Number	Gross Tons.				
Great Britain and Ireland.	7,810	19,754,001	31.7	174	500	
Australia and New Zealand.	613	709,030	1.1	—	17	
Canada (excluding Lakes).	579	871,985	1.4	—	22	
Hong Kong ...	124	309,376	0.5	—	8	
India and Ceylon	138	175,400	0.3	—	5	
South Africa ...	122	69,922	0.1	—	2	
Other Colonies*	340	298,336	0.5	—	8	
British Empire Total.	9,726	22,188,050	35.6	356†	182	562

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage	Number of Selected Ships required	Number of Ships fitted for C.W. transmission.	Number of regular observing ships proportionate to 500 ships with 31.7 per cent. of World Tonnage.
	Number	Gross Tons.				
Argentina ...	252	264,898	0.4	4	—	6
Belgium ...	230	488,219	0.8	8	6	13
Brazil ...	344	542,092	0.9	9	5	14
Chili ...	116	159,568	0.3	3	—	5
Danzig...	33	127,568	0.2	2	—	3
Denmark ...	627	1,042,209	1.7	17	6	27
Finland ...	239	213,991	0.3	3	—	5
France...	1,482	3,255,832	5.2	52	12	82
Germany ...	2,053	3,738,067	6.0	60	32	95
Greece...	515	1,187,508	1.9	19	—	30
Holland ...	1,270	2,809,375	4.5	45	24	71
Italy ...	1,142	3,348,732	5.4	54	23	85
Japan ...	2,048	4,139,815	6.6	66	—	104
Norway ...	1,765	2,953,944	4.7	47	6	74
Portugal ...	169	219,337	0.3	3	10	5
Russia (Soviet Union).	349	373,836	0.6	6	—	9
Spain ...	789	1,137,813	1.8	18	17	28
Sweden ...	1,239	1,411,730	2.3	23	4	36
Turkey ...	179	159,836	0.3	3	—	5
United States of America (excluding Lakes)	3,104	11,249,288	18.0	180	88	284
Yugo-Slavia ...	145	260,912	0.4	4	—	6
Other Countries	908	1,117,130	1.8	18	3	28
					Not classified 5.	
Total ...	28,724	62,389,750	100.0	1000	423	1,577

\* Including Dominion of Newfoundland.

† The British Empire number of selected ships to be allotted amongst Great Britain and the Dominions by arrangement.

#### British Selected Ships for Routine Wireless Weather Telegraphy.

We know that with 269 British "Selected Ships" well organised 103, or about 38 per cent., are in favourable positions to report weather by W/T in all parts of the World and there is every reason to believe that with 1,000 Selected Ships of all nations properly organised there would be 380 Selected Ships, or thereabouts in favourable positions for reporting at sea in all parts of the World. These 380 Selected Ships favourably placed at sea and such other vessels as are necessary in the Hurricane regions (where sufficient Selected Ships may not be present) can provide just the information which is necessary for the Meteorological Service ashore and all ships at sea in all parts of the World.

Before such a plan can be effectively operated in all parts of the World, International agreement is necessary, for unless each National or Dominion Meteorological Service issuing advice to its National Selected Ships gives the same instructions, the system will fail for the simple reason that the same procedure is necessary if all Meteorological Services are to receive the reports of ships within range of their W/T Stations. For instance, the British Marine Meteorological Service cannot issue instructions to Selected Ships under other than the British flag.

#### Regular Observing Ships.

Now we come to all the other branches of routine Voluntary Marine Meteorological Work requiring written returns from Merchant Shipping.

The British Home Marine Division finds that 500 British home registered ships is the most suitable number of regular observing ships with 31.7 per cent. of the World's tonnage to recruit from. These 500 ships provide all the necessary routine observations.

When there is a severe storm which requires special investigation, copies of the ship's deck log of other ships also are asked for, but this is only occasional and does not involve more than the writing up of more than two or three days' observations.

Now regular observing ships are a selection of ships in all trades from those whose Commanders offer to undertake this work. In them are included "Selected Ships" for Wireless Weather Telegraphy, ships keeping the Meteorological Log requiring entries at the relief of the watch, ships keeping the Ship's Meteorological Report Form 911, entries twice daily, and ships making Telegraphic reports of observations recorded at mid-channel positions in Home Waters.

The majority of these ships make voyages traversing more than one Ocean and many of them make voyages right round the World, the Meteorological Log or Form 911 being kept throughout.

In the British Marine Division to meet our own national demands we have to collect data from all oceans and as British regular observing ships trade to all parts of the World it follows that it is most convenient for them to keep one form of record throughout their voyages.

With the new development in mechanical extraction and printing, observations can be copied and printed in code and so made available to all who require them at small cost and without duplication of written work at sea. Thus British regular observing ships provide data from all parts of the World through the British Home Marine Division for all concerned.

#### British Empire Marine Meteorological Services.

Since the Home Marine Division organised the system of Voluntary Observation in the Merchant Navy the Meteorological Services in the Dominions and Colonies have commenced to collect written returns from shipping.

I have a recollection when as a young officer one of the older of these services used to send a clerk on board to copy the data from the deck log and to compare the barometer. Since then this service has also introduced its own form of written return to be made by the Captains and Officers of ships in neighbouring waters, and so this has grown throughout the Dominions and in many of the Colonies.

The right hand column in *italics* of the table on the previous page already referred to gives a number for each Dominion or Country which is proportionate on tonnage to the 500 regular observing ships which we find most suitable for voluntary work in all parts of the world.

These numbers for the Dominions and Colonies may not be sufficient numbers of regular observing ships for their requirements, and it may be that in some of the Dominions and Colonies there are not enough suitable ships in suitable trades from which to select regular observing ships to supply their needs.

As already stated some regular observing ships on the home register in our list in the MARINE OBSERVER are being requested to make written returns to other services.

We only require regular returns from ships on our list and we ask the Dominion and Colonial Services who require voluntary work from ships other than those on their own register, to help us to avoid causing duplication of work at sea by only asking ships on the Home register, who are not on our list in the MARINE OBSERVER, to make regular returns to them.

There are more than enough British and Colonial registered ships trading to all parts of the world whose officers are willing to perform voluntary specialized Meteorological work at sea from which to choose and it is unnecessary for any ship to duplicate this valuable work.

As the table of the World's tonnage shows if the Marine Meteorological Services of the World will exercise some such discrimination in inviting the co-operation of Merchant shipping there need be no hardship imposed upon Marine Observers as duplication of written work at sea is not necessary.

To those engaged in the administration of Marine Meteorological Services ashore who have not the experience of the actual responsibility of navigating, commanding and operating ships such organisation may prove difficult, but speaking with this experience, in addition to voluntary Meteorological work at sea, and superintending it ashore, I have no hesitation in stating that experienced seamen would have no difficulty in so organizing regular observing fleets without overlapping the work at sea.

It must not be forgotten that to be successful, Voluntary Marine Meteorological Services should be well but loosely organized; sea custom, tradition and practice should be their foundation, the spirit of professional and national pride being the best incentive to this voluntary work.

Simplicity of code and method should be the key to this work at sea. Here is where our meaning is sometimes mistaken. When we say this we say so because simplicity is necessary, for a mistake at sea may mean disaster, and because the officers who are Marine Observers have many duties to perform and therefore Marine Meteorological Work should be so organized as to require the least amount of attention and time *consistent with its being done efficiently.*

MARINE SUPERINTENDENT.

London,  
May 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.

#### STEAMSHIP ROUTE, COLOMBO AND THE EAST TO PERIM, DURING S.W. MONSOON.

THE following report has been received from S.S. *Maidan*, Captain J. P. ROWE.

"The *Maihar* left Colombo 17 hours ahead of us and the *Karimoen* about half an hour after us. The *Maihar* and *Karimoen* are respectively  $\frac{1}{2}$  knot and  $\frac{3}{4}$  knot slower than this ship.

"The *Maihar* went north of Sokotra and the Dutchman made all his westing between Latitude  $7^{\circ}$  and  $7^{\circ} 30'$  N. we hauled up for Guardafui in Latitude  $8^{\circ} 30'$  N. Longitude  $54^{\circ} 30'$  E. I find an almost irresistible desire to make northing about this locality and on this occasion I unfortunately yielded to the impulse. My Dutch friend stood on to at least Longitude  $52^{\circ} 30'$  E. with the, to him, very gratifying result that he passed Guardafui about an hour before us, his day's run being 336 miles, ours 222. We passed him

next day in the Gulf of Aden. We called into Perim for three hours, he passed there two hours after our arrival and we passed him again next day in the Red Sea in  $18^{\circ}$  N. and  $40^{\circ}$  E. The *Maihar* passed Perim 15 hours after us.

The moral is very obvious, viz., "It pays to keep South almost to the meridian of Ras Hafun before going North."

NOTE.—For information as to the homeward route Colombo and the East to Perim in the S.W. Monsoon see pages 127 to 129 and accompanying Charts, Volume VI, No. 66, MARINE OBSERVER. Here again is substantiation of the truth of our saying, "If using the Southern Route keep well to the southward." Many, including the writer of the article referred to, have had that "irresistible desire" experienced by Captain ROWE and have regretted that course was altered too soon to the Northward.

## DISCOLOURED WATER.

## West Indies.

THE following is an extract from the Meteorological Log of S.S. *Ariguani*, Captain J. H. SCUDAMORE, Cristobal to Kingston. Observer, Mr. A. CRONE, 3rd Officer.

"Sunday 19th August, 1928, at 11.50 a.m. M.T.S. (1655 G.M.T.) in Latitude 13° 47' N. Longitude 77° 58' W. passed through several streaks of discoloured water, stretching in an E. and W. direction. No change of sea temperature 82° F. Specific gravity changed from 1024.5 to 1024.0 in green water. A yellowish scum was observed in the streaks. A bucket of the water was full of small seeds, about 3/16 inches long."

## COLOUR OF WATER.

## Formosa Strait.

THE following is an extract from the Meteorological Report of S.S. *Benalder*, Captain J. J. FAIRWEATHER, Singapore to Shanghai. Observer, Mr. L. A. SAYERS, 2nd Officer.

"We left Takoa, Formosa on August 11th, 1928, at 6 a.m. (Standard Time 120° E. Meridian) bound for Shanghai via the Pescadores Channel. The colour of the water was the usual light green, which is generally associated with shallowness of the sea bottom in the vicinity of coastal waters. At 10.20 a.m., when in Latitude 23° 00' N. Longitude 119° 52' E., we crossed what appeared to be a line running approximately N. and S. as far as the eye could see, dividing the light green coloured water and a dark indigo blue. This line of demarcation was extremely pronounced and all along its visible length, flotsam had collected, which consisted chiefly of brown weed and driftwood. The surface of the water where the two colours appeared to blend, was ruffled with rips and eddies. This changing of colour, although so abrupt and marked could be attributed to the increasing depth, as we steamed further away from the mainland to Formosa.

"At noon on the same day when the lighthouse on Tokitsu Sho, bore 269° distant 6 miles, another line of colour difference was crossed, running about N.N.W. and S.S.E.—this time we crossed from the indigo blue to the light green. The sea surface in the vicinity of the mixing colours bore the same characteristics as the former case. The change of colour could not be due to decreasing depth, as reference to the chart showed a fairly constant depth of between 50 and 60 fms. The phenomenal thing about this latter line was that it trended to the N.W.—the deep indigo blue coloured water continuing towards the Pescadores Islands, whilst the light green carried on N. and N.-E'wards towards Mid-Channel and remained the same colour until well into the Formosa Strait, when it gradually turned bluer. From leaving Takao to Noon, the tidal stream ran South and it might here be remarked that the line of demarcation was not unlike that of the Gulf Stream. Heavy rains had been experienced during the past week which might have had something to do with the remarkable difference in colour, an abundant supply of fresh water coming from the numerous rivers and streams on the W. Coast of Formosa probably caused the effect.

"The prevailing weather conditions at the time were as follows:—Wind W. by N. force 3. Clouds Cirrus and Cumulus from N.N.W. visibility 8. Sea W. by N. disturbance 2, Swell W.S.W. 4. Barometer 29.50 in. steady. Temperature Air 80° F. Light green water. Surface Temperature 84° F. Injection Temperature (24 feet below surface), 83° F. Specific Gravity 1.023 ozs. (Both cases) Indigo Blue water—Surface Temperature 82° F. Injection Temperature 82° F. Specific Gravity 1.024 ozs."

## PHOSPHORESCENCE.

## Arabian Sea.

THE following is an extract from the Meteorological Report of S.S. *Rhexenor*, Captain G. L. STOUT, Singapore to Port Said, Observer Mr. A. MARWOOD, 3rd Officer.

"12th August, 1928, approaching East end of Sokotra 8 p.m. to 4 a.m. 13th August A.T.S. Between these hours the whole of the sea from horizon to horizon became frequently covered with a milky appearance. Although a sea and swell of force 6, and a S.W. wind of 7, was the weather at the time, the sea dropped to a calm, and the swell diminished considerably, yet the wind remained the same, whilst the vessel was in these patches.

"The temperature of the air remained at 79° F. the whole night, whilst the sea water ranged between 79° F. and 70° F.

"The sky line appeared to be quite misty during the patches yet the mast head lights of an approaching vessel were visible at least 10 miles."

THE following is an extract from the Meteorological Report of S.S. *Kashmir*, Captain R. MALLALUE, Shanghai to London, Observer, Mr. W. E. RILEY, 4th Officer.

"On August 20th, between 0050 a.m. and 0145 a.m. (Ship's time), we passed through a large patch of 'white water.' The sea became the colour of milk and was slightly luminous and whereas previously the sky had been lighter in appearance than the sea, the reverse now took place. A rough sea was running at the time and the wave tops had been quite conspicuous, but on meeting this discoloured water the sea appeared to calm down and no water came on board during the time the ship was passing through. Its western limit was quite well defined, more so than the eastern edge, and the former was visible quite fifteen or twenty minutes before the ship arrived there. Its track, if it was moving at all, appeared to be from North West to South East. Position at the time Latitude 11° 50' N., Longitude 60° 00' E.

"Weather conditions: Wind S.S.W., force 6-7. Barometer 29.83 in. Temperature, Air 78. Sky clouded over one-third, fr-cu. and st-cu. Sea and swell S.W'ly, rough."

## Banda Sea.

THE following is an extract from the Meteorological Log of S.S. *Arafura*, Captain A. S. GORDON, Sandakan to Thursday Island, Observer Mr. B. W. DUN.

"On August 14th, 1928, at 1900 A.T.S. (1033 M.T.G.) in Latitude 4° 53' S., Longitude 129° 17' E., with approaching darkness the sea was observed to be luminous and when the sky was completely dark the effect was very extraordinary.

"It did not appear to be caused by surface phosphorescence as the bow waves did not give the usual sparkle as when steaming through phosphorescence, but were quite dead.

"The luminosity appeared to proceed from large quantities of phosphorescence deep down in the water, causing a diffused light to brighten up the whole sea.

"This phenomenon continued with varying degrees of intensity throughout the night and at daybreak the following morning the sea was its usual deep blue black.

"At noon, August 14th (0333 M.T.G.), the density of the sea was 1.022½, temperature 80° at 1900 A.T.S., density 1.023½, temperature 76°, at midnight, 1.024, and temperature 78° at 0400 A.T.S. 15th density 1.023, temperature 77°. Bird Island (Manuk) was passed 240° distant, 2.5 miles at 0230 A.T.S. on 15th, and at 0546 stars put ship in Latitude 5° 48' S., Longitude 130° 46' E. Course 125°, speed 9.9 kts. Wind S.E., force 4, sea moderate."

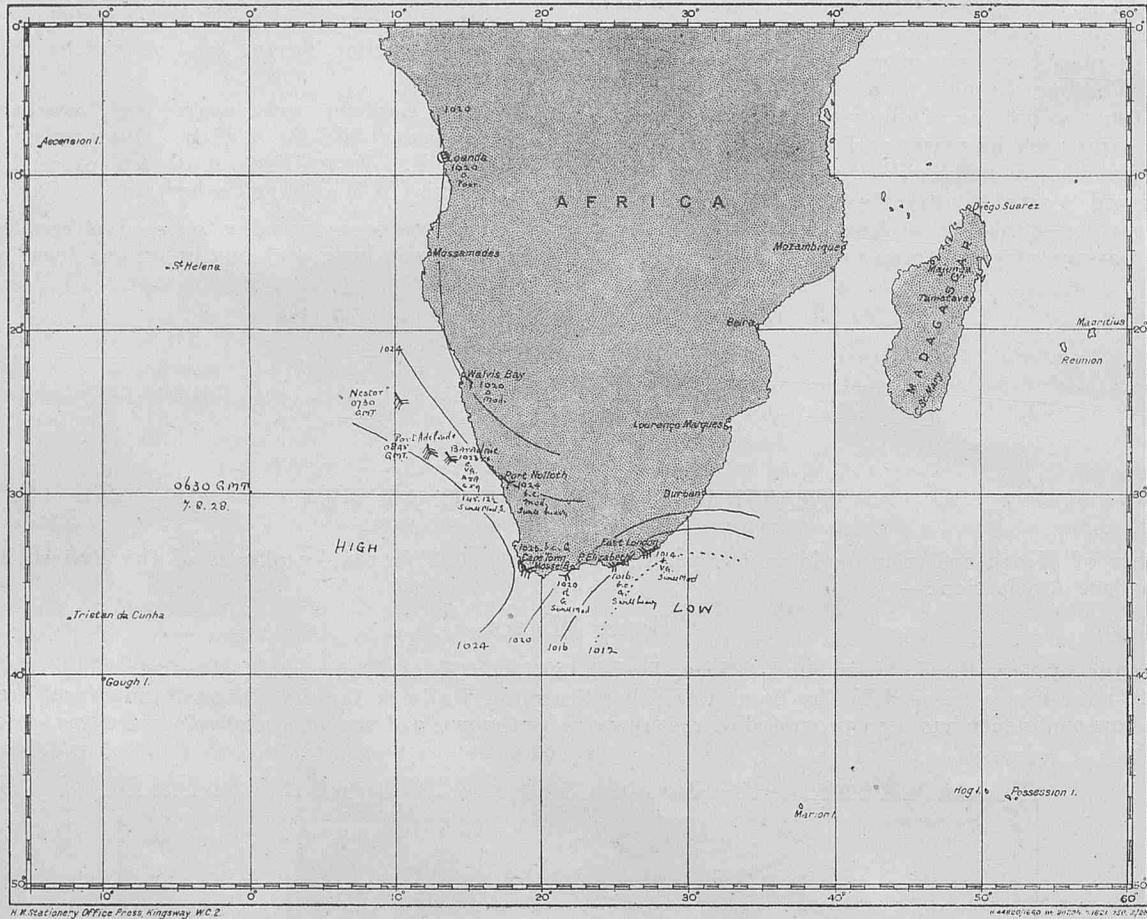


WEATHER CHARTS MADE AT SEA (continued).

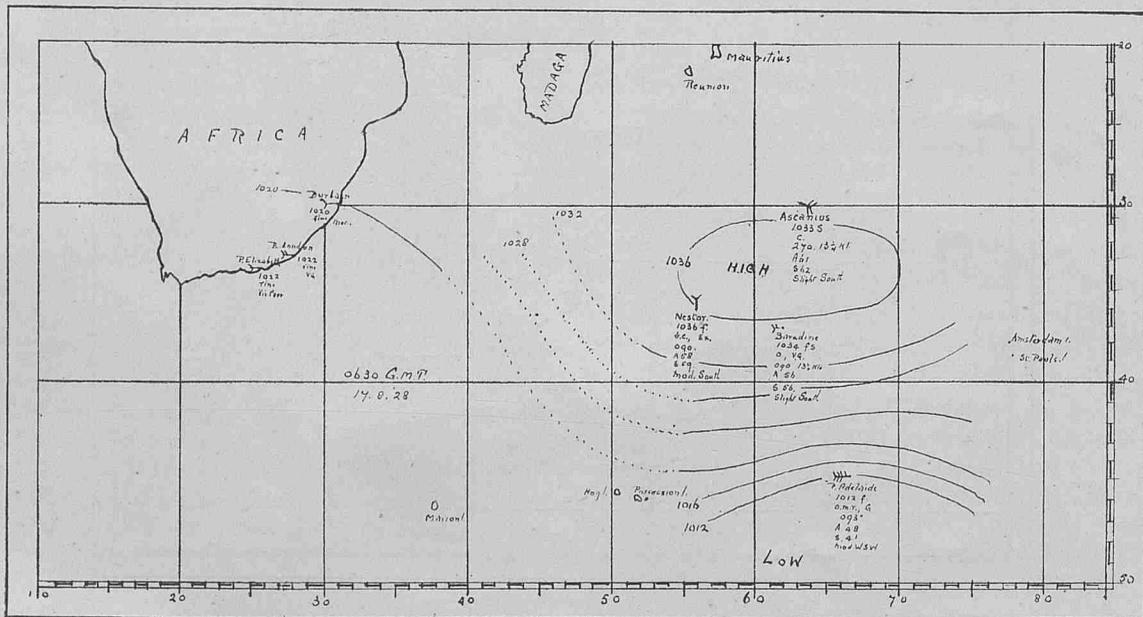
Southern African, Southern Ocean and Australian Waters.

Weather Charts made by Mr. C. B. ROCHE, Chief Officer, S.S. *Baradine*, Captain W. ROLLO, which illustrate how the work of British selected ships in all parts of the world is providing shipping and meteorological services with information by wireless, and by so doing steadily but surely improving the application of Meteorological Wireless Telegraphy as an Aid to Safe Navigation and to weather forecasting in the Southern Dominions of the British Empire.

Southern African.

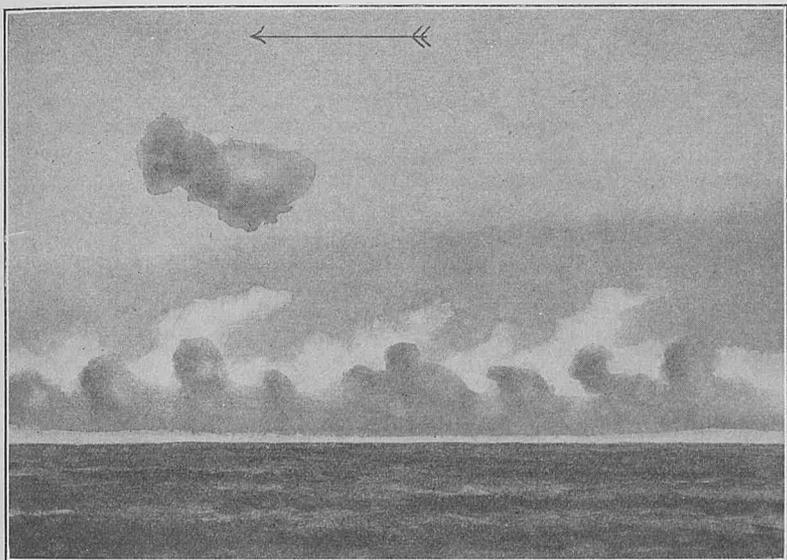
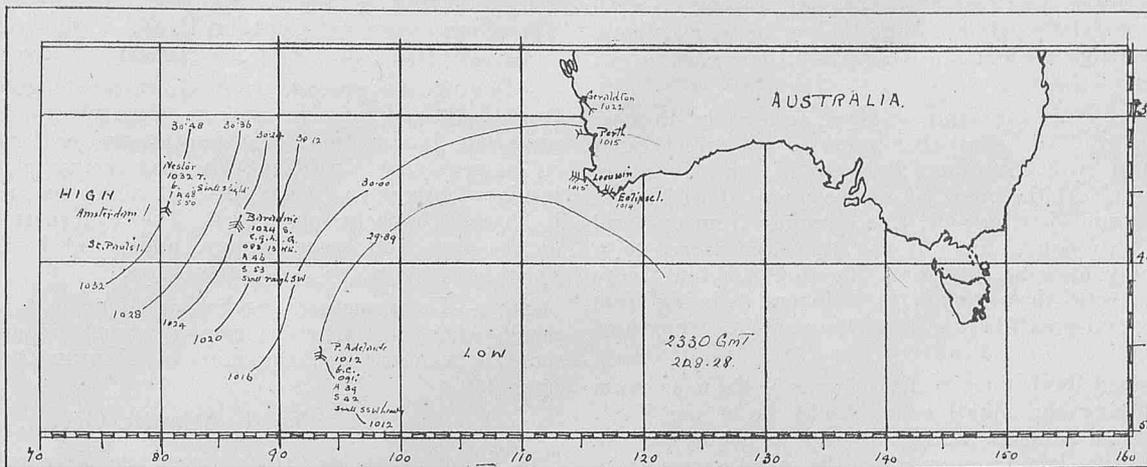


Southern Ocean.



WEATHER CHARTS MADE AT SEA (continued).

Australian Waters.



TRADE WIND CUMULUS.

THE following is an extract from the Meteorological Log of S.S. *Llandoverly Castle*, Captain C. E. STUART, R.D., R.N.R., London to Cape Town via Ascension and St. Helena, Observer Mr. C. H. WILLIAMS.

"The above sketch is of clouds seen on 6th August, 1928, at 3 p.m. in Latitude 3° 50' S., Longitude 15° 16' W. when on passage from London to Cape Town via Ascension and St. Helena.

"The weather was fine, with moderate South East Trade Wind and the usual small detached Strato-Cumulus clouds.

"The clouds shown above were along the Eastern horizon, and the lower clouds were 'staggered' with the direction of the wind, the upper ones the opposite way, the whole moving together slowly with the wind, maintaining their relative positions with but slight changes, for about 15 minutes.

"For the sake of definition, the lower clouds have been purposely drawn darker than the others, although actually there was not much difference in their tints."

NOTE.—This is a very interesting observation since it shows two sets of clouds inclining opposite ways at the same time. In the fourth article on the Trade Winds, MARINE OBSERVER, Volume V, page 32, it was stated that the inclination of the Trade Wind Cumulus, which is usually observed to be against the wind (as shown by the white higher clouds of the accompanying drawing), indicates a rapid falling off of wind velocity above the level of condensation marked by the base. Clouds are however sometimes formed at very low levels in Trade Wind regions and the lower darker clouds in the drawing incline with the wind because they are wholly within the Trade Wind layer. The tops of the higher cloud

indicate the wind just above the Trade Wind, while those of the lower cloud indicate the increase of the force of the Trade Wind with height above the sea.

VERY UNUSUAL RAINFALL.

Mollendo, Peru. 17<sup>o</sup>S

THE following is an extract from the Meteorological Log of S.S. *Orita*, Captain E. E. DUNCAN, West Coast South American Ports, Observer Mr. D. W. HUTCHISON.

"August 2nd, 1928, at Mollendo, Peru, at 2 p.m. (1900 G.M.T.) light rain commenced and continued until 6 p.m. when weather cleared. The visibility from 2 p.m. to 4 p.m. was very poor. 4 p.m. Barometer corrected 1018.7. A most unusual occurrence and Captain DUNCAN said he had never seen rain before at Mollendo, and he has spent many years in the Coast Service of the P.S.N. Co. The surprised and grinning faces of the natives surely verified this statement. We sailed at 2.20 p.m., and the course from 2.45 p.m. was 293°, 14½ knots and Atico light was not seen although well within the range, and there were frequent showers of light rain during morning watch 3rd August."

SUMATRAS.

Squalls in Malacca Strait.

THE following notes forwarded by the Hydrographer of the Navy are by Lieutenant A. B. B. FOULERTON, R.N., H.M. Surveying Ship *Iroquois*.

Periods of observation:—

30th July to 12th August and 14th to 26th September, 1928.

"Eighteen out of twenty-one storms observed reached their climax between 2200 and 0700—so it would appear that they are most prevalent after sunset and before sunrise. Between these times the two maximums are 2330 and 0530 (the fiercest Sumatras blowing at the latter time).

No storms broke between 1200 and 1800.

The banks of Cu-nb. which can be seen many miles off, and herald the approach of a Sumatra, form mostly between S. and S.W., and W. and N.W. Twenty storms came from S. to N.W., while one only formed in the S.E.

Indications.

The storms which break about 2400 or earlier can be seen gathering in the evening in the form of a huge bank of Cu-nb. on the horizon, the top being of billowy white Cumulus, spreading down to a long reach of ugly black cloud on the water-line. As it becomes dark lightning can be seen flashing behind the clouds.

The time between when this gathering of Cu-nb. is first noticeable and the actual breaking of the storm over the ship varies considerably. If the Sumatra is only to be a comparatively mild one, without

much wind, the time may be six to eight hours; whereas for the stronger ones, it is usually only two to three hours.

Very often the Sumatra itself is preceded by a short rain shower, and nearly always followed by, first a stoppage of rain, and then an hour of light rain or drizzle, while during the period of maximum force it rains very heavily, so much so that visibility is often cut down to a mile or less.

The storms come up against the wind, or more accurately, at four to six points to the wind. The wind then veers to the direction of the approaching squall fifteen minutes beforehand, and increases to an average force of 4. At the breaking of the squall it will again freshen to 6, and continue blowing with this strength from one and a half to two and a half hours, when it will then again ease to 4. The wind will probably blow at this force for three or four more hours—thus giving the total duration of the Sumatra as being from four and a half to six and a half hours, depending on the strength of the storm.

During the first period (30th July to 12th August), the maximum force of the wind during the squall came chiefly from the West, but in the latter period from S. and S.W.—due probably to the changing of the monsoon—but in every case the wind starts from four to six points away, and veers to maximum force; then eases to four and remains at that till it eases three hours later, and backs again to the original direction it was blowing from before the Sumatra started.

These remarks are by no means hard and fast rules, but are just the indications given by the majority of the storms observed over the period stated. In many cases there were signs of a Sumatra coming up without the actual squall breaking; these were more noticeable during the day, but should such signs have been observed the chances were great that there would be a storm that night.

Also, some of the storms observed were not true Sumatras, the wind never reaching any great force, nor the rain being very heavy.

And finally, in a very few cases, the Sumatra would come up rapidly, last at maximum force for only fifteen minutes or so, and then die away again as rapidly."

## MIRAGE.

### Vancouver Island.

The following is an extract from the Meteorological Report of S.S. *Logician*, Captain W. GIBBONS, West Coast North America. Observer, Mr. A. G. S. MADRELL, 3rd Officer.

"August 24th, 1928, Latitude 48° 13' N., Longitude 122° 55' W. Light variable airs and slight confused swell. During the night a dense fog had settled over Puget Sound and Juan de Fuca Straits, which, after daybreak, commenced to clear in patches and lift towards the North. By 09.30 (Ship's time) visibility was good and the sun was shining brightly overhead and to the S.E. the sky was clear, but towards the North and West heavy banks of lifted fog remained making the horizon indistinct.

"At 10.30 the buildings of Victoria 22 miles N.W. were observed resembling huge white blocks which gradually appeared to increase in height and finally to separate into two and three portions one above the other. The lighthouse on Trial Island was observed reflected four times whilst Race Rocks lighthouse was observed to the Westward high above horizon and inverted. The land to the East of Trial Island appeared about twice its natural height, having a perfectly flat top on which the fog seemed to be resting.

"The funnels of a steamer bound for Victoria became greatly distorted when at a distance of about four miles to the North. They at first appeared to increase to a tremendous height, then the colours appeared to greatly alter in proportion to each other. This spectacular display continued for about 20 minutes by which time the steamer had increased her distance to about seven miles they then resumed their normal proportions.

"At 12.30 the fog gradually began to settle down and by 14.00 a dense fog was encountered which remained through the night. During the dense fog that followed the mirage an aeroplane on the Vancouver-Victoria-Seattle route came to grief, with the loss of six lives. The barometer at 08.00 was 29.95 in. which gradually fell to 29.85 in. at noon."

## METEORS.

### Mediterranean Sea.

The following is an extract from the Meteorological Report of S.S. *Glan Sinclair*, Captain P. V. TAYLOR, Birkenhead to Port Said. Observer, Mr. J. A. DENNIS, 3rd Officer.

"During the passage from Gibraltar August 9th to Port Said August 16th, numerous meteors were observed radiating from no apparent fixed point, descending at angles varying from 30° to 60° in a southerly direction; the sky being cloudless, duration of luminous streaks in most cases of about one second but extending to three seconds in some cases. The brightness of the meteors being of the first and second magnitudes, and having a reddish tinge somewhat similar to the planet Mars."

NOTE.—These meteors probably belonged to the Perseid shower which when at its height may give meteors at the rate of one or more a minute. See the note in MARINE OBSERVER, Volume IV, page 150.

### North Atlantic Ocean.

The following is an extract from the Meteorological Log. of S.S. *Cumberland*, Captain D. MACMILLAN, Colon to London. Observer, Mr. P. SHAKESPEARE, 3rd Officer.

"August 22nd, 1928, 0203 A.T.S. 0543 G.M.T. observed brilliant meteor bearing N. 86 E. true. First appearing close to Aldebaran, its path flight through an arc of 21° terminated close to Betelgeuse. During the flight which occupied about two seconds the whole sky was brilliantly illuminated, maximum intensity being reached immediately before disappearance. At commencement of flight the colour of light was a vivid bluish white changing to pale pink, and terminating in a flash of orange colour. The wake remained incandescent for a period of about nine seconds after actual disappearance of the meteor so that its position relative to the fixed stars, and arc of extent could be easily ascertained. Barometer 1020.8mb. Wind E.S.E. force 2. Air Dry Bulb 81.1 Wet Bulb 73.8. Sea 83.5. Ships position Latitude 30° N., Longitude 54° W."

## A DESCRIPTION OF A VOYAGE TO KAMCHATKA FOR SALMON.

By Mr. A. J. BROWN, 4th Officer, S.S. *Nellore*, Captain A. H. HIGNETT.

"The S.S. *Nellore* having discharged the last of her outward cargo at Yokohama proceeded to Hakodate on August 2nd, 1928, enroute for the West Coast of Kamchatka to load a full cargo of tinned salmon for Liverpool.

"What Admiralty Charts that exist of this region had already been obtained at Hong Kong, but these being very insufficient were augmented by Japanese Charts from Kobe and Yokohama.

"Two days later we dropped anchor in Hakodate Harbour. This call was made to obtain from the Russian Consul a permit to trade in Russian waters.

"On Saturday 11th August our full permission granted we embarked our tally clerks, hove up anchor, and sailed for Kamchatka. It was deemed safest to take the western route via La Perouse Strait in preference to the eastern one, though it is some eight hours steaming longer. Fog is very prevalent in the Sea of Okhotsk and all along the Kuril Islands. La Perouse Strait however is usually clear, whereas the many small passes between the Kuril Islands are often made unnavigable by dense fog. Only one of the passes has a lighthouse and another drawback is the variety of currents met with in the vicinity of these islands.

"Hakodate breakwater was cleared at 12.51 p.m. and at 4.0 p.m. Benton Jima Lt.Ho. was rounded in fine clear weather, which lasted for the next 24 hours. A weather chart was made the next morning showing E'ly winds in the Sea of Okhotsk (which usually bring fog or mist). Entering La Perouse Strait at 4.0 p.m. (August 12th) the sky became overcast, later a haze descended and the light failed before Naka Sheretoko Misaki was made. There is plenty of sea-room however, a wide berth was given and soundings taken while rounding this point so that at 10.0 p.m. a direct course was set (N41E) for N. Kompakovo Cannery our first loading place.

*if also known as Soga Strait*

"Just at this time those on deck were treated to a most unusual and extraordinary sight. The sea and sky on both sides of the ship were suddenly lit up with a phosphorescent glow giving the impression of a low white luminous cloud stretching from ship to horizon. This phenomenon was put down to the ship running into a large shoal of fish, and being frightened, caused the phosphorescence in the endeavour to escape.

"The weather remained hazy and overcast with frequent small banks of mist which at no time necessitated a reduction in speed, though several times the telegraphs were put the 'stand by' only to be rung off almost immediately as the weather cleared. Sights were unobtainable throughout the day with the exception of an Ex-Meridian which put the ship seven miles North of the D.R. Latitude. The following day was cloudy and even overcast and hazy at times, but nevertheless excellent sights were obtained in the forenoon, noon and in the afternoon. The noon position was:—

Latitude Observed	...	...	...	...	51° 46' N.
Latitude a/c.	...	...	...	...	51° 41' N.
					05' N.
Longitude Observed	...	...	151° 23' E.	Run	
Longitude a/c.	...	...	151° 23' E.	293 miles.	
					00'

The current till noon might be said to be negligible, but the afternoon sight put the ship 10' E. Throughout the morning the wind was N.W. force 4 but at Noon it freshened and backed slowly. A weather chart was made for 6.0 p.m. (Jap. Standard Time) showing a cyclonic disturbance to the Northward moving very slowly in an E.N.E.'ly direction (Barometer 29.28 in. wind West 5-6). Two W/T Direction Finder bearings of S.S. *Kabafuto Maru* at anchor off our destination were taken at 8.0 p.m. and Midnight both of which when crossed with the afternoon position line showed us to be S. and E. about 8 miles. We held on our course however, and sounded frequently on nearing the coast, the nature of the bottom was found to be shingle. At 5.4 a.m. land was sighted to the eastward, the ship was headed for the shore and when some four miles off one of the few buildings in sight was identified as N. Voroskaya cannery, so we turned northward again and came to N. Kompakovo 25 miles further along the coast, where we anchored in the morning of August 15th.

From this cannery we were to work southwards over a stretch of 180 miles of coast lifting cargo at the various canneries enroute. Given normal summer weather 8,000 tons of canned salmon should be loaded in ten days on this coast, but after the middle of August the weather is most unreliable so that instead of the predicted ten days, twenty-six days passed before full cargo was loaded.

"The Sea of Okhotsk seems to experience a type of cyclone rather unique. Each depression as it passes behaves in exactly the same way as the last, though they vary a little in depth and wind force. It appears to me that the same depression that was to the northward of the S.S. *Nellore* on the evening previous to our arrival at Kompakova Cannery, began to make itself felt as we anchored. A very strong southerly wind blew all day and at 2.0 p.m. the barometer was as low as 29.17 in. but then started to rise slowly. Towards evening the wind dropped and a little rain fell and by 8.0 p.m. it was a dead calm. During the night a fresh breeze sprang up from the N.W. and the barometer continued to rise steadily. This nor'wester lasted all day, but the following morning the wind veered to N.E. and decreased to a light breeze. This weather lasted another 24 hours with the barometer high but having a slight tendency to fall again and the next day was calm and clear with exceptional visibility. Mountains 80 miles away were extraordinarily plain, but so fantastically distorted by abnormal refraction that they appeared most ridiculously unreal. This was a most unusual sight, volcanoes turned upside-down and rested peak to peak on top of one another, so as to resemble cotton-reels; other mountains gradually narrowed and became vertically elongated to represent huge telegraph poles and some actually seemed to be suspended in mid-air! This of course foretold bad weather and the barometer was falling all the time, so that when

night came on it was no surprise when a strong wind again sprang up from the south.

"This cycle of events repeated itself with the utmost regularity throughout the whole of our time on the coast. Very often the southerly wind has a second strong blow after once abating but two days or three at the most was its utmost span of life, and when the barometer started to rise the wind immediately veered to the N.W. and blew hard from that quarter. The nor'wester was usually found to be the stronger of the two accompanied by, at times, a very high sea and swell which on one occasion (during the middle watch on September 5th) when at anchor, swept the port accommodation ladder, which was not lowered completely away. The height of this particular sea must have been about 20-30 feet, from crest to trough.

"After another severe nor'wester which was experienced some days earlier when at anchor off Pymta R., the usual calm day followed with very good visibility and at 10.30 a.m. a Solar Halo was observed being very clearly defined and of about 22 degrees radius. Of course the following morning a fresh S.S. Easter sprang up, this time bringing with it rain, mist and fog.

For more than half our stay on the coast the weather was too bad to work cargo, for even moderately bad weather was quite sufficient to do this, owing to the primitive method of loading the lighters. Quite a considerable amount of rain fell and a total of approximately 70 hours of fog and mist were experienced.

"To scientifically navigate this coast was impossible because at present it is insufficiently charted. The only way to find the cannery to which you are next bound is to feel your way along the coast with, figuratively speaking, the lead on the bottom all the time. The canneries are not marked on the chart our only guide to their positions being the rivers after which they are named and in the vicinity of which they are situated. Even the rivers, however, are unreliable for they are apt to find a fresh outlet to the sea from time to time, the new sometimes being several miles from the old one. The distances between the canneries are therefore all very approximate and on one occasion an error of fifteen miles was found in a distance of sixty miles, the ship arriving at her destination an hour and a half earlier than expected. The coastline, except in the south of the peninsula, is very flat and low without any outstanding features which could be easily recognised and used for determining the ship's position.

"A careful watch was kept on the tides but nothing at all definite can be said on the subject, for they seem to be effected in so many different ways. The Flood flows northward and the Ebb southward, but seldom did the ship lie to either flood or ebb! Then again often with a fresh breeze blowing the ship would lie dead across the wind, in fact when a nor'wester was blowing this seemed to be the ship's favourite direction in which to lie. This I am sure points to the presence of a strong current setting in a N.N.W.'rly direction. This current was always experienced when within from two to four miles of the shore.

"Soundings agreed very favourably with those marked on the chart with the exception of those off the mouth of the Bolshaya R. This is a river of considerable size and brings down with it much mud and sand, silting up the mouth and reducing the depth of water for three or four miles out to sea. This useful information was obtained when making the passage from Pymta to S. Kyshka. The weather was hazy and being in the vicinity of our destination we hauled in to the seven fathom line in the endeavour to pick up the cannery and anchor before it became thicker. The lead was in constant use, and the depth decreased from 7 fms. to 4 fms. within two or three minutes. We hauled out immediately the weather was thickening all the time, so when sufficient depth for safety was obtained the anchor was 'let go.' When the weather eventually cleared we found we were off the mouth of the Bolshaya R.

"Good holding ground was always found, the nature of the sea-bottom within five or six miles of the shore being sand, marks of shingle were on the lead arming between the depths of 15 and 35 fms., sand again was found between 35 and 75 fms. and mud forms the bottom in the still deeper water.

"On Sunday 9th September with our full cargo of canned salmon on board we hove up and sailed from Goshegotie Cannery homeward bound."



The Master of the *Rimutaka*,  
1911-1928.

CAPTAIN F. A. HEMMING.

## CAPTAIN F. A. HEMMING.

By one of his Officers.

Captain HEMMING's association with the work of the Meteorological Office has been one of long duration, dating back to 1898, when, in the Canadian Australasian Line, he first commenced, as an associate of Captain CAMPBELL HEPWORTH, who later became Marine Superintendent of the Meteorological Office, London, to make his contributions to **The Work** as a Member of the Voluntary Corps of Marine Observers. He maintained this work constantly, gaining frequent Excellent awards, until his retirement from the service of the New Zealand Shipping Company in August, 1928.

The record of Captain HEMMING's service at sea is one of which he may be justly proud, covering as it does, a period of 48 years, of which the last 31 years were spent in continuous command. This long service is the more remarkable in that he only served in eight ships from first to last, and commanded his last ship, the R.M.S. *Rimutaka* for 17 years without mishap of any kind, this period including the whole of the Great War.

Born in Drummondville, Canada, in 1864, a son of the late Mr. Justice HEMMING, K.C., who had himself served five years at sea in the East Indiaman *Herefordshire* before taking up Law, Captain HEMMING made his first voyage to sea in 1880. He was apprenticed to Messrs. HAMILTON BROS., of Liverpool, and served in their ship *Britannia* for five years. On obtaining his certificate as Second Mate he returned to Canada, joined the Canadian Government Fisheries Service as Second Lieutenant, and spent the next two years in the Gulf of St. Lawrence in the sailing schooners *Lizzie Lindsay* and *Annie C. Moore*. After completing this service he returned to England and joined his first steamship, the S.S. *Dundela*, belonging to CARLISLE and Co., of London. In this vessel he served as Second Mate for a period of six months, and

then, in 1888, obtained his certificate as First Mate. His next ship was the S.S. *Unionist*, belonging to ANGIER BROS., of London, which he joined as Third Mate, and, obtaining his Master's Certificate in 1890, eventually commanded.

In 1893 Captain HEMMING transferred to the Canadian Australasian Line and was appointed to R.M.S. *Miowera* as Third Officer. Within five years he received command of this vessel, and remained in command for a further eleven years, making his total service in the *Miowera* fifteen years. During this time the Canadian Australasian Line had joined services with the New Zealand Shipping Company, Ltd., and in 1908 Captain HEMMING was transferred to London and placed in command of the N.Z.S. Co.'s S.S. *Whakatane*. Three years later, in 1911, he was appointed to the R.M.S. *Rimutaka*, and this vessel he commanded continuously during the last 17 years of his career.

Having commanded in the Colonial Trade for 31 years, Captain HEMMING had become well known to the travelling public, and many notable figures in the Australian Commonwealth and the Dominion of New Zealand number themselves amongst his friends.

A man of remarkable character and ability, maintaining discipline and efficiency without effort, Captain HEMMING was an extremely popular Commander, and the ship in which he commanded was at all times a happy ship for passengers, officers and men. His judgment and knowledge of all matters pertaining to his profession were outstanding.

The many officers who served under him join with his friends in wishing him health, happiness and long life in which to enjoy his well-merited leisure.

G. C. S.

## TYPHOONS OF THE CHINA SEA DURING THE YEAR 1927.

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

The following information regarding the Typhoons which occurred in the China Sea and adjacent waters during the year 1927 is obtained from the report of the Rev. Father E. GHERZI, S. J., Director of the Zi-ka-wei Observatory, to whom seamen owe an immense debt of gratitude for his untiring work on their behalf in the waters of the Far East.

In his report Father GHERZI says:—"We renew here all our best and sincere thanks to all the Cable, Telegraph and Shipping Companies. To all the Masters and Officers of Ships trading in these China Seas, and to all the Far East Observatories for the continued and most valuable help given to the Zi-ka-wei Observatory during the year. The question is frequently asked 'What kind of Storms do we call a Typhoon?' This question is pertinent owing to the fact that in our signals we never call a cyclone first a depression and then when there are signs of real violence 'a typhoon.' This is done by the Central Meteorological Observatory of Tokyo, and all the Masters of the ships trading in the Far east have surely noticed this discrepancy between the two Observatories' warnings.

"Following the practice started by the Rev. Father L. FROC, Director of Zi-ka-wei Observatory, we call 'a Typhoon' every cyclonic storm developed at sea below the belt of the Tropics. We believe that this distinction between the cyclones formed under the tropics and the cyclones formed elsewhere (they have been called extratropical) is quite correct, not only from the point of view of the violence characteristic of the 'typhoons,' but also from the point of view of the constitution of the cyclone itself.

"Besides, the fact of signalling a cyclone first as a depression and later on as a typhoon is and has been dangerous to shipping\* because although there are surely small and large typhoons, the violence in the centre itself is always extremely great.

"The famous typhoon which played havoc in Hong Kong Harbour in 1906 is still in the memory of all in the Far East, and this

\* The cases of the M.S. *Koenigsberg* and the M.S. *Remo*, both caught so to say unaware by a real typhoon to the S. of Nippon in 1926 and in 1928.

typhoon was a 'small' typhoon namely, with a restricted central area."

Chart A shows the tracks of the Typhoons recorded by Zi-ka-wei Observatory during 1927. No Typhoons were recorded during the months of **January** and **April**.

**January.**—No Typhoons were recorded in this month by the Zi-ka-wei Observatory.

**February.**—The first Typhoon of the year was of a severe nature and originated between the 7th and 8th in about Latitude 4° N., Longitude 170° E. It advanced in a W.N.W. direction until the 15th when the S.S. *Elkton* in about Latitude 14° 20' N., Longitude 135° 30' E., was overtaken by it and lost with all her crew of 36 hands. Between the 15th and 18th the storm recurred gradually and moved in a N.E'ly direction. At 6 p.m. on the 18th the centre was in approximately Latitude 20° N., Longitude 140° E. The mean rate of progression was about 9.2 miles an hour.

**March.**—Three typhoons were recorded during this month. The first storm formed during the 1st and 2nd to the S.W. of Rasa in about Latitude 22° 30' N., Longitude 125° E., and moved in an E.N.E. direction. The storm rapidly developed in intensity and the storm field spread over a large area. On the 5th when the centre was situated in approximately Latitude 27° N., Longitude 145° E., moving in a N.E'ly direction the cyclonic circulation was felt over a radius of about 900 miles. The storm dissolved on the 8th near the Alaskan Coasts in about Latitude 50° N., Longitude 155° W., the mean rate of progression being about 9 miles an hour.

The second typhoon probably formed between Latitude 3° and 5° North and appeared on the 17th to the S.E. of Palau Island moving W.N.W.

On the 19th centred in about Latitude 12° N., Longitude 124° E., its course inclined more to the N.W. when it commenced to fill in, between the Vizayas and Luzon. This typhoon was not one of great intensity. Its mean rate of progression was about 8.7 miles an hour.

The third typhoon was formed on the 29th to the S.E. of Formosa. A fall in pressure with winds backing to the N.W. quadrant at the Loochoos, indicated the passing of a cyclone to the E.N.E., but information concerning this storm was insufficient to track it.

**April.**—No typhoons were traced by the Zi-ka-wei Observatory during this month.

**May.**—The only storm recorded during this month formed on the 19th to the S.W. of Ponape and on the following day was centred in approximately Latitude  $11^{\circ}$  N., Longitude  $137^{\circ}$  E., moving W. by N. Between the 26th and 27th the centre passed over Northern Luzon. Violent winds were experienced over the Island causing the wreck of the Inter-Island S.S. *Negros* South of Luzon, with the loss of a number of lives. Reaching the China Sea the storm track inclined to N.W. and N.N.W. and crossed the coast on the 31st in Latitude  $23^{\circ}$  N., Longitude  $116^{\circ} 30'$  E. The mean rate of progression was about 7.2 miles an hour.

S.S. *Autolytus* when to the East of the Patras Shoal on the 30th was forced to steam towards the storm's centre in order to avoid closing the Patras reefs and the dangerous current in that vicinity. Her barometer fell to 980.3 mb. (28.95 in.) and wind from N.W. and N.N.W. force 11 was experienced.

**June.**—Two storms were recorded in this month. The first typhoon formed on the 25th May and on the 26th was centred in about Latitude  $7^{\circ}$  N., Longitude  $142^{\circ}$  E. Travelling in a W.N.W. direction the centre passed close to Korror in the Palau Islands on the 28th where winds of hurricane force were experienced. Between the 2nd and 4th June the path recurved gradually to the N.E. while passing over Formosa, whence it coalesced with a depression on the morning of the 6th when to the East of the Linschoten Islands.

The mean rate of progression was about 10.6 miles an hour when moving N.W. and 26.3 miles an hour after recurvature when moving N.E.

The second typhoon of the month originated to the S.E. of Guam on the 22nd and coalesced with a secondary which had developed to the East of the Loochoos on the 24th. At first moving in a Northerly direction its course later inclined to the N.N.E. until the 27th when it dissolved over the North of the Kurile Islands. Its mean rate of progression was about 16.3 miles per hour.

**July.**—The first storm of the month originated to the E.S.E. of Yap on about the 8th and moved in a W.N.W. direction until the 12th, when centred in about Latitude  $17^{\circ}$  N., Longitude  $130^{\circ}$  E. its course inclined more to the N.W. Continuing in this direction the centre passed close to Koshun in the South of Formosa on the evening of the 16th. On the 17th the centre crossed Formosa Strait and passed inland striking the coast in Latitude  $24^{\circ} 10'$  N., Longitude  $118^{\circ} 05'$  E. The mean rate of progression was about 8.8 miles an hour.

On the 15th, S.S. *Tjikandi* passed into the centre of the typhoon in about Latitude  $19^{\circ} 08'$  N., Longitude  $128^{\circ} 33'$  E. The ship experienced fair weather until 4 a.m. on the 15th when without warning the storm broke and at 6 a.m. the wind was of hurricane force. Captain HILLIGAARD reported that in his opinion the radius of the disturbance was no more than 30 miles. When the blow was at its height it was impossible to see aft as far as the funnel. It was impossible to pass along the decks owing to the mountainous seas which were driving over from all sides. The vessel was frequently without steerage way while in the slight intervals of visibility it was seen that the After Lifeboats were pounded to pieces, rails and davits twisted. At 7 a.m. a brief lull occurred. Mr. L. A. WILLEMSE, Chief Officer, and Mr. P. C. H. VEEN, second officer, with two Chinese Quartermasters and other members of the crew, made their way to secure the winches. It was at this moment that the sea broke with incessant fury and despite the fact that life-lines were being used a welter of swirling waters carried both European Officers into the water ways with the result that the Chief Officer received a terrible wound in the side and the second officer a broken arm. Nothing more was seen of the Chinese Quartermasters. The ship was taken to Hong Kong for repairs.

The second Typhoon originated to the S.E. of Yap and moved in a W.N.W. direction. On the 21st the centre was in about Latitude  $17^{\circ}$  N., Longitude  $127^{\circ}$  E. Passing through the Ballintang Channel on the 23rd it continued in a W.N.W. direction across the China Sea crossing the coast on the 24th in about Latitude  $23^{\circ}$  N.,

Longitude  $116^{\circ} 30'$  E. The mean rate of progression was about 11 miles an hour.

The third Typhoon originated to the S.E. of Guam and moved in a northerly direction. On the 25th when centred to the East of Bonin Islands its course inclined to the N.E. and East, finally filling in on August 1st to the E.N.E. of the Midway Islands. The storm was of moderate intensity and its average rate of progression was about 10 miles an hour.

**August.**—The first typhoon of the month was observed passing to the North of Yap on the 1st in a W.N.W. direction. It continued in this direction until the 4th when centred in approximately Latitude  $20^{\circ}$  N., Longitude  $130^{\circ}$  E. its path recurved N.E. It was last signalled in about Latitude  $35^{\circ}$  N., Longitude  $145^{\circ}$  E. Its average rate of progression was about 17 miles an hour.

The second typhoon developed to the S.E. of Yap between the 1st and 2nd and was on the 5th centred in about Latitude  $15^{\circ}$  N., Longitude  $131^{\circ}$  W., moving N.W. Passing East of Ishigakijima Island on the 7th the path inclined more Northerly, the centre passing close to Gutzlaff on the 9th. The path then inclined gradually through North to East and passing over Korea on the 10th and Yezo on the following day finally dissolved over the Okhotsk Sea. The average rate of progression was about 13 miles an hour.

The third typhoon was well developed on the 11th when it passed between Yap and Guam moving in a W.N.W. direction continuing in this direction until the 13th when centred in about Latitude  $15^{\circ}$  N., Longitude  $132^{\circ}$  E., its course inclined more N.W. whence passing over the South of Formosa at noon on the 15th it crossed the coast next day in about Latitude  $24^{\circ} 20'$  N., Longitude  $118^{\circ} 05'$  E. Its average rate of progression was 12 miles an hour.

The fourth typhoon passed between Yap and Guam on the 15th moving in a W.N.W. direction. On the 19th it passed through the Bashee Channel and crossing the China Sea crossed the coast on the following day, the centre passing about 70 miles south of Hong Kong, where the maximum wind velocity was recorded at 116 miles an hour. Many small craft were blown ashore with loss of life and large ships in Hong Kong Harbour were compelled to steam to their anchors. The average rate of progression was about 15.5 miles an hour.

The fifth typhoon originated in the vicinity of Truck Island on about the 17th and was signalled on the morning of the 21st centred in about Latitude  $13^{\circ}$  N., Longitude  $136^{\circ}$  E., moving W.N.W. The path continued in a N.W'ly direction until the 24th when centred in Latitude  $20^{\circ}$  N., Longitude  $128^{\circ}$  E. it gradually recurved to the N.E. and moved in this direction over the Pacific Ocean. Its mean rate of progression was 10 miles an hour.

The sixth typhoon of the month was observed centred in Latitude  $16^{\circ}$  N., Longitude  $128^{\circ}$  E. on the 26th moving in a N.W'ly direction. During the 28th and 29th its path gradually recurved to the North and N.E. On the 31st when last signalled the centre was situated in about Latitude  $30^{\circ}$  N., Longitude  $134^{\circ}$  E., moving N.E. Its mean rate of progression was 10.4 miles an hour.

The seventh typhoon of the month appeared over the Bashee Channel on the 29th and passed close to the North of Pratas on the evening of the 30th. Reports show it to have been of only slight intensity. Its mean rate of progression was about 8.8 miles an hour.

**September.**—The first typhoon of the month was of small dimensions and appeared on the 6th to the S.E. of Meiacosima. Moving in a N.N.E. direction at first it gradually recurved to the N.W. and passed between Naka and Oshima on the 8th filling in on the following day to the S.W. of Kiusiu. Its average rate of progression was about 9 miles an hour.

The second typhoon passed between Guam and Palau on the 8th moving in a N.W'ly direction. It reached Naha between the 11th and 12th and inclining to the N.N.W. struck the Nagasaki and Kumamoto district on the morning of the 13th causing very heavy damage to property and causing the loss at Kumamoto alone of 1,000 lives. Moving over Kiusiu the storm continued E.N.E. and passed close to Tokyo on the 14th, after which its track inclined more N.E'ly until the 26th when the storm dissolved over the Aleutian Islands. The mean rate of progression was 10.5 miles an hour on its N.W'ly track and 21.2 miles an hour after recurvature to the N.E.

The third typhoon originated between Ponape and Guam in the vicinity of Truck and moved rapidly in a West and W.N.W. direction. On the afternoon of the 17th the centre crossed Luzon to the North of Manila and continuing in a Westerly direction across the China Sea struck the coast early on the 21st between Quangtri and Donghai. The mean rate of progression was about 14 miles an hour.

The fourth typhoon developed in the vicinity of Truck on the 20th and on the following day was observed to the West of Saipan moving N.N.W. On the 23rd it passed near the Bonin and inclining to the N.N.E. moved out over the Pacific Ocean. The mean rate of progression was approximately 18.8 miles an hour.

The fifth typhoon started on the 23rd from the vicinity of the Marianas. It moved in a N.W'ly direction and approached the Loochoos on the 26th, passing between Rasa and Naha when its track inclined gradually to the North and N.E. On the 29th the centre passed to the S.E. of Nippon and continuing in a N.E'ly direction reached the Aleutian Islands filling in over the Behring Strait. The mean rate of progression was about 11.6 miles an hour.

**October.**—The first typhoon signalled in this month formed at the end of September to the S.E. of Guam and passed the north of Saipan on the 28th on a N.W'ly track. On October 1st when centred in about Latitude 25° N. Longitude 139° E. its track recurved to the Northward after which it coalesced with a deep depression moving E.N.E. after crossing Korea. The mean rate of progression was about 13.3 miles an hour.

The second typhoon formed to the South of Truck Island on the 1st and on the 2nd was centred in about Latitude 8° N. Longitude 142° E. moving W.N.W. Its track inclining more Westerly the centre passed over the North of Samar Island on the 5th and reached the China Sea. Its track then inclined N.W'ly and crossing the Macclesfield and Paracels the centre moved inland filling in over the North of Annam on the 8th. The storm was of moderate intensity and its mean rate of progression was about 13.4 miles an hour.

The third typhoon formed on the 7th between Guam and Truck and passed to the North of Yap on the 8th. Moving in a W × N direction the centre crossed Central Luzon to the North of Manila on the 9th. Over the China Sea the centre moved in a Westerly direction and moved inland on the morning of the 11th striking the Annam Coast to the North of Hue. The mean rate of progression was about 16 miles an hour.

The fourth typhoon developed on the 12th in the vicinity of Truck and passed to the East of Guam the following day, moving in an N.N.W. direction. Continuing in this direction at an average speed of about 18.3 miles an hour until the 17th, the storm then recurved to the N.E. greatly increasing its speed and intensity. On the 18th, the centre was situated in about Latitude 45° N. Longi-

tude 153° E. when its course inclined E.N.E. On the 20th the centre was situated in about Latitude 47° N. Longitude 177° W. moving E.N.E., the diameter of the inner storm field was about 360 miles and terrific gales with mountainous seas were reported in all quadrants. Minimum pressure in the centre reached 921 mb. (27.20 in.). The storm filled in over Western Alaska on the 24th. The mean rate of progression when in Far Eastern regions was about 18.3 miles an hour which increased greatly over the North Pacific.

The fifth typhoon formed to the S.E. of Guam, and passed to the North of Yap on the 21st, moving in a Westerly direction. On the 24th, when centred just South of Luzon, the path recurved to the North and N.N.E. and approached the Loochoos Islands on the 27th. Inclining more Eastward, the storm passed close to the North of the Bonin on the 28th, and when over the Pacific Ocean coalesced with a depression which had moved out from Northern Japan. The mean rate of progression was about 10 miles an hour on a Western course, increasing to 18 miles after recurvature to the N.E.

**November.**—The first typhoon of the month developed between Saipan, Guam and Yap on the 18th. It moved N.W. and on the 22nd recurved North, and the following day, N.E. The storm was of slight intensity and its track subsequent to the 23rd is uncertain. The mean rate of progression was about 12 miles an hour on the N.W. branch of its track and about 21 miles an hour on the N.E. branch.

The second typhoon was a secondary centre which formed over the China Sea, North of the Macclesfield, when the first typhoon was recurving North to the East of Luzon. It moved in a N.W. direction and approached the Colony of Hong Kong, but filled up on reaching the land. The mean rate of progression was about 12.5 miles an hour.

The third typhoon formed on the 24th between Truck, Yap and Guam and started in a W.N.W. direction. The path gradually inclined Northward and on the 28th recurved to the N.E. Passing to the West of the Bonin on the 29th, the typhoon probably filled in further to the Eastward over the Pacific Ocean. The mean rate of progression was 12.5 miles an hour when on the N.W. branch of its track and 19 miles an hour after recurvature to the N.E.

**December.**—The first typhoon of the month developed to the West of Truck on the 2nd and progressed in a Westerly direction. Entering the China Sea on the night of the 5th, the path inclined W.N.W. after which the disturbance checked by the high pressure which had spread all over the Annam coast filled in to the S.E. of Tourane. The mean rate of progression was about 11 miles an hour.

The second typhoon originated on the 18th between Latitude 5° and 6° North and advancing Westward was centred at 10 a.m. on the 19th in Latitude 8° N. Longitude 121° E. The storm was of moderate intensity and filled in on reaching the China Sea to the West of Palawan on the 21st. The mean rate of progression was about 11 miles an hour.

## THE BRAVE WEST WINDS AND THE ROARING FORTIES.

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

**General and Historical.**—The subject of the present article is the westerly winds of the temperate latitudes of the northern and southern hemispheres. These are known to meteorologists by the name of "westerlies" or "the temperate westerlies." In the picturesque and forceful phraseology of the sea it is usual to make a distinction, the westerlies of the northern hemisphere being called the "brave west winds" and those of the southern hemisphere, the "roaring forties." The name "roaring forties" was originally applied to the region between the Cape of Good Hope and Australia by the seamen of the early days of the sailing-ship route to Australia. A good deal of confusion seems however to have arisen with regard to these names and they have often been wrongly applied, even in standard works.

There is not very much to be said about these winds from the historical point of view. They must have been familiar to the Phoenicians in their voyages in the Eastern Atlantic and also to the Norse sea-raiders. The latter did not confine their activities to the narrow seas but colonised Iceland in about 850 A.D. and established themselves on Greenland in 982 A.D., passing thence to

parts of the eastern shores of North America in the tenth and eleventh centuries. In the first article on the Trade Winds it was stated that COLOMBUS made his return from the re-discovery of America by steering to the north before he turned westwards, thus avoiding the Trade Wind and entering the zone of the westerly winds. This quickly became the recognised method of navigating the transatlantic and transpacific passages.

The following quotation is taken from R. BOHUN'S "A Discourse concerning the Origine and Properties of Wind," Oxford, 1671.

"Wee might likewise venture at a better account, than has hitherto been given, why the Western Wind blows most commonly on this side the Tropiques; for the whole current of Air being carry'd from East to West, it recoyls back again; and by reason of this repercussion, from about 30 degrees Latitude where the Trade Wind ceases, the Western begins. Here in England, the Eastern usually govern the spring, and wee have sometimes variable Winds, but generally the Western ingrosse the greatest part of the yeare, which indeed are no more then the Tropicall Wind at rebound: for not being able to return back against the stream (the Trade Winds still raining in the Torrid Zone) it must needs bee diverted towards the

Poles, and sometimes produces the West, and otherwhile the Laterals, North and South West, as the Angles are more direct or acute in their reflexion.

Thus, from the same Latitude where the Trade Wind ends, there usually begins a motion contrary to the course of the Sun, by which we sail from West to East, and so much the more or lesse, as it deflects towards either of the Poles, wherefore those who navigate from the Moluccas to the Western parts of America, being never able to hold on their course in the middle, and beare up against the Generall Wind, fetch a compasse beyond the Tropiques, sometimes to 36, and otherwhile to 40; as the course of the Sun, and consequently the Winds and Tydes, incline more or lesse towards the North or South. And so those that sail from Barbados, St. Domingo or Jamaica, are forc'd to steer their course towards the Gulf of Florida, to the 36, and in Summer sometimes beyond the 40 degrees of N. Latitude; where they meet with the Reverse, or Western Winds to conduct them into Europe. The same likewise happens in the voyage from Brasile to Angola: if the Sun illustrates the Southern world, it extrudes the Generall Wind to at least the 36 degree of S. Latitude; where afterwards they meet with perpetuall Currents and Winds from the West: but in the other part of the yeare when the Trade Wind makes a lesser Arch towards their Hemisphere, it will be sufficient if you take a compasse to the 25, or 26 degrees of Latitude.

So not only the Tropicall Brise, but the Western (which are kind of perennial or Stationary Winds without the Tropiques) observe their just distance from the *Æquinocthiall*, always proportionable to the course of the Sun: and if this were better understood by some of our less curious navigators, they would find the motions of the Trade Winds, though it meets them in severall Latitudes, sometimes neerer, and otherwhile remoter from the line, not so Fortuitous as they commonly imagine: and some more accurate observations of this nature, would not only instruct them, where to expect the Trade Wind in their voyages to the New World, but how farre they should make a circuit without the Tropicks, to fetch their Western Winds when they are Homeward bound."

Captain WILLIAM DAMPIER, who was a pioneer in the collection of practical information concerning the distribution of the wind over the oceans, did not refer to the Westerly winds in the "Discourse" which he published at the end of Volume II of his "Voyages and Descriptions" in 1699.

#### The Surface Circulation and the Extent of the Westerlies.

The belts of westerly wind extend in each hemisphere from about latitude 40° to 60°. Reference to the charts of average surface pressures for the world for January and July, reproduced at the end of this number, will show that the conditions for these latitudes are very different in the two hemispheres. In the southern hemisphere the isobars at all seasons run approximately parallel to the circles of latitude right round the globe, traversing open ocean throughout, with the exception of the extreme south of South America. The isobars therefore appear to represent the outer part of a great cyclonic circulation centred at the South Pole. It is however known that south of Latitude 60° S., roughly speaking in the neighbourhood of the Antarctic Circle, the pressure begins to rise again, but available information is yet insufficient to say whether the south polar regions are covered by a permanent anticyclone. The low-pressure area of the southern hemisphere thus constitutes a belt round the entire globe with higher pressure both to the north and south of it. This pressure distribution, which gives predominant westerly winds all the year round, is therefore a simple one owing to the absence of land areas with consequent unequal heating of land and sea.

In the Northern Hemisphere there is more land than sea between Latitudes 40° and 60°. While the winds of these latitudes in the North Atlantic and North Pacific Oceans are predominately westerly the pressure distribution is quite different to that which produces the Roaring Forties. The average chart for January shows a great low-pressure area centred between Iceland and Greenland and another centred over the Aleutian Islands. The westerly winds of the two oceans are mainly associated with these low-pressure areas, the oceanic anticyclones to the south being reduced in size and also somewhat in intensity at this season. In summer, as shown by the July chart, the reverse is the case. In the North Atlantic the anticyclone is further north, larger and more intense and the Icelandic

low-pressure area is also further north and much weaker so that the westerly circulation of temperate latitudes is mainly an anticyclonic one, coming from the north of the high-pressure area rather than from the south of the low-pressure area. In summer in the North Pacific the extension of the anticyclone is even more striking and there is no enclosed low-pressure area to the northward of it, the region being occupied by a portion of the outlying part of the great summer Asiatic low-pressure area. The difference in the character of the westerly winds of the northern and southern hemispheres resulting from the difference in the pressure distributions giving rise to them will be dealt with in a later paragraph.

The westerly belts share the seasonal motion in latitude shown by the Trade Wind areas and the Doldrums. On account of the variability of the westerly winds it is not possible to lay down limits, especially as there is a region between the Trade Wind area and the westerly area which is called, in the case of the North Atlantic Ocean, the Horse Latitudes, where calm and light winds often prevail. This name arose from the old practice of throwing overboard horses which were being transported to America or the West Indies when the ship's passage was unduly prolonged owing to absence of wind, with consequent shortage of supplies, also to the old practice of the "Dead Horse," when the month's advanced wages had been earned. The Horse Latitudes are found between Latitudes 30° and 40° N. in the North Atlantic, but the area is ill-defined and often non-existent, particularly in winter. It corresponds with the central region of the oceanic anticyclone and hence is most prominent in Longitudes 25° W. to 45° W. In the North Pacific the same applies but the anticyclone of that ocean in summer lies rather further to the northward and is less central in the ocean so that the greatest number of calms is experienced in Latitude 35° N. to 45° N., Longitude 135° W. to 165° W. The proportion of calms in these regions in both oceans is at a maximum during August when it reaches about 20-25 per cent. of observations. In winter the percentage is reduced to 6-12.

#### The Brave West Winds and the Roaring Forties.

We have seen that the Brave West Winds and the Roaring Forties are regions of westerly wind in similar latitudes of the northern and southern hemispheres, the circulation depending upon conditions of average pressure which are somewhat different in the two hemispheres. It will be interesting to examine briefly the points of resemblance and difference between the two regions. The essential feature of these winds is their variability, in marked contrast to the steadiness of the Trade Winds and the Monsoons, so that winds from any direction may be actually experienced. The explanation of this variability is the fact that the actual daily pressure distributions may bear no resemblance to the average pressure distribution for the month or season. This is because the latitudes of the westerly wind are those which are subject to the passage of moving cyclonic depressions. The great bulk of these depressions, outside the much more infrequent tropical cyclone, have their birth, life and death within the regions we are considering. Hence the pressure distribution of the moment is governed by the presence or absence of one or more of these temporary and often rapidly-moving disturbances. In this connection we may note a point of difference between the two hemispheres. The westerly current of the Roaring Forties is much more constant than that of the Brave West Winds, and the actual conditions at any time in the Roaring Forties approximate much more closely to the average conditions than is the case in the northern hemisphere. During the passage of a depression in the Roaring Forties, any wind direction in accordance with the relative position of the ship and the centre of the depression may be experienced. The depressions, secondary and V-shaped depressions can however be regarded as mere incidents in the general drift from West towards East. This is not the case in the northern hemisphere. The unequal heating of land and water produces not only a somewhat different average pressure distribution, but also causes the departures from the average condition to be much more marked. This does not mean merely that the average isobars are temporarily disturbed owing to the passage of a large depression, for the storms of the Roaring Forties may be fully as widespread. The North Atlantic and North Pacific Oceans are subject to entire interruption or displacement in latitude of the general westerly current. This happens for example with northerly or easterly winds and anticyclonic conditions such as are often experienced in the British Isles. A full discussion of this subject cannot be entered into here

but we may mention one or two cases. There may be an extension of the winter Siberian anticyclone westward, or an extension of the oceanic anticyclone northward with a consequent displacement of the westerly current to the north, or again, the low-pressure area of the North Atlantic may be displaced in a southerly direction. Hence the variability of the Brave West Winds is greater than that of the Roaring Forties, and often for a long time on end the prevailing westerly wind of the northern hemisphere may only make itself manifest in the general averages.

All the phenomena associated with the passage of depressions are thus experienced in the region of the westerly winds. As examples may be mentioned the heavy gales of the deep depressions and of some secondary depressions, the thunderstorms associated with the trough or cold front of many depressions in winter, and the line squall, also associated with this part of V-shaped depressions. The line squall gives a sudden shift of wind from S.W. to N.W. in the northern hemisphere and from N.W. to S.W. in the southern hemisphere, necessitating quick action in the days of the sailing ship to prevent the ship being caught by the lee.

**The Brave West Winds.**—The information which follows for these winds and the Roaring Forties is the best that can be given from the wind charts at present available. The predominant directions for these winds are W. and S.W. throughout the year in the North Atlantic Ocean, but there is a considerable proportion of N.W. wind also. The same applies to the summer season in the North Pacific: during the winter there is more N.W. wind than S.W. in the western part of the ocean. In winter the average force of the westerly winds is Beaufort 6 but the average force of all winds is somewhat less than this. In summer the average force of the westerly winds is from Beaufort 4 to 5. This applies to both the North Atlantic and North Pacific Oceans. The percentage of gales (Beaufort Force 8 and above) in the North Atlantic varies somewhat in different longitudes but may be taken on the average as from 20-30 per cent. in winter and 3-6 per cent. in summer. As far as information goes the percentage is not so great in the North Pacific, from 12-23 per cent. in winter, in the western part of the ocean and less in the eastern part, and from 1-3 per cent. in summer. There is much fog in the western North Atlantic in summer, especially in the region of the Newfoundland Banks where the percentage rises as high as 60-65 in June. In this region the percentage is never less than 30 at any time of the year. In the central and eastern Atlantic the percentage seldom exceeds 10 to 15. In summer in the North Pacific the average percentage of the fog rises to 40-45 in the neighbourhood of the Aleutian Isles.

**The Roaring Forties.**—As the name implies the winds of this region are fierce and frequently of full gale strength with high rough seas maintained for days at a time. As a whole the average pressure gradient of this region is the steepest for any oceanic wind to be found on the charts of average pressure. The passage of depressions is in general more continuous than in the Brave West Winds and is less broken by intervals of settled fine weather. Though the latitude of the centres of depressions varies with the season the great majority pass well to the southward of 50° S., so that ships passing between Latitude 40° S. and 50° S. usually experience the sequence of weather associated with a position to the north of the depression, viz., a freshening of the wind from about N.W. followed by a backing to S.W. The average force of the predominant wind between the parallels of 45° and 50° is Beaufort 6 at all times of the year and hence is about the same as that of the Brave West Winds in winter. Calms are infrequent, but in some regions may be as high as 5 per cent. of the observations. In winter the frequency of north-easterly winds increases to about 20 per cent. in parts of the southern Indian and Atlantic Oceans, while to the westward of Cape Horn as far as Longitude 160° W. up to 40 per cent. of winds from some easterly point may be encountered. These results are due to the more northerly track of depressions in winter. Gales are frequent, especially south of Latitude 45° S., amounting to about 20-30 per cent. in winter and 5-15 per cent. in summer.

Cloudy skies are the rule, the average cloud amount for the whole year being about 7/10. Rain, hail and snow are frequent, the average total fall for the year being equivalent to about 40 inches of rain. These remarks on the weather refer to the region between the parallels of 45° S. and 50° S. No information about the occurrence of fog is available for the South Atlantic or South Pacific Oceans, but

there are observations for the South Indian Ocean. These show that fog is most prevalent about the longitude of the Crozet Isles from December to February and from May to July, reaching a frequency of 20-30 per cent. During the rest of the year in this region and during most of the year elsewhere fog frequency is generally below 15 per cent. Southward of Australia the frequency seems to be less than 5 per cent.

The Dutch charts of the Indian Ocean show that the resultant wind in July is nearly due west for the parallels of 39° S. to 43° S. between Longitude 10° E., west of the Cape of Good Hope, and 90° E. In more southerly latitudes and also in the whole of the region east of 90° E., southward of Australia, the resultant wind is N.W. or even N.N.W. in places.

In P. H. GALLE'S "Klimatologie van den Indischen Oceaen" the following mean monthly results were obtained for the strength and direction of the westerly winds of the Roaring Forties. The figures apply to the region of Latitude 25° S. to 45° S., Longitude 70° E. to 80° E., and were derived from more than 50 years observations by Dutch ships. Corresponding figures for Monsoon and S.E. Trade regions were given in the second article of the series on the Monsoons.

Table 1.

WIND, MEAN FORCE AND DIRECTION, LATITUDE 35° S. TO 45° S., LONGITUDE 70° E. TO 80° E.

	Jan.	Feb.	March.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Beaufort Force ...	1.5	1.3	1.6	1.9	2.9	2.9	3.6	3.3	3.5	3.2	2.8	2.6
Direction in degrees	331	311	294	304	285	281	288	285	283	286	294	308

These winds appear weak in comparison with the average force of 6 given above, but it must be remembered that the area lies to the north of that previously referred to and includes the central part of the oceanic anticyclone.

The following information about the wind at Cape Pembroke, Falkland Islands, observed six times daily during the period 1906-1915, is taken from a paper by Dr. C. E. P. BROOKS, "The Climate and Weather of the Falkland Islands and South Georgia," in Geophysical Memoirs No. 15.

Table 2.

PERCENTAGE OF WINDS OF DIFFERENT DIRECTIONS AT CAPE PEMBROKE, 1905-1915.

	Jan.	Feb.	March.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Calm ...	2	1	1	1	1	1	1	1	1	0	1	2	1
N. ...	13	15	19	15	16	14	15	18	21	18	16	16	16
N.E. ...	9	6	6	6	6	7	7	7	5	6	5	9	7
E. ...	3	2	1	1	2	2	2	2	1	1	2	4	2
S.E. ...	3	2	1	2	2	6	3	2	1	2	1	5	3
S. ...	6	6	6	6	8	11	8	6	3	7	5	6	7
S.W. ...	24	21	20	18	14	14	14	15	15	18	24	24	18
W. ...	20	25	20	25	24	21	27	24	23	20	23	15	22
N.W. ...	20	22	26	26	27	24	23	25	30	28	23	19	24

Table 3.

PERCENTAGE OF TIME DURING WHICH WINDS OF BEAUFORT FORCE 4-7 AND GALES BLEW AT CAPE PEMBROKE, ALSO MEAN WIND FORCE, 1905-1915.

	Jan.	Feb.	March.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Gales, per cent. of time.	1.9	3.3	3.5	4.1	3.0	2.6	3.1	1.7	1.8	2.8	2.6	1.8	2.7
Wind, Force 4-7, percent. of time.	67	70	71	70	69	66	64	65	70	69	74	65	68
Mean Force Beaufort.	4.4	4.6	4.6	4.6	4.4	4.3	4.3	4.3	4.5	4.5	4.6	4.2	4.4

**Sailing Ship Passages.**—In KAEMTZ'S "Complete Course of Meteorology," published about 1840, it was stated that as an average of six year's sailings, the packets from Liverpool to New York took 40 days, the return passage being made in 23 days. The effect of the westerly winds upon the sea passages of that date was therefore very marked. MAURY wrote "The route that affords the bravest winds, the fairest sweep and the fastest running for ships is the route to and from Australia." Under the influence of the Roaring Forties the ships made some amazing passages running the easting down from the Cape of Good Hope to Australia. According to BASIL LUBBOCK in "Colonial Clippers" the following is a list of all daily runs of 400 miles and over made by Clipper Ships:—

March 1st, 1854...	...	...	<i>Lightning</i> , 436 miles.
March 19th, 1857	...	...	<i>Lightning</i> , 430 miles.
February 6th, 1855	...	...	<i>James Barnes</i> , 423 miles.
February 28th, 1855	...	...	<i>Donald MacKay</i> , 421 miles.
June 18th, 1856	...	...	<i>James Barnes</i> , 420 miles.
February 27th, 1854	...	...	<i>Red Jacket</i> , 413 miles.
January 27th, 1855	...	...	<i>James Barnes</i> , 407 miles.
July 6th, 1854	...	...	<i>Red Jacket</i> , 400 miles.

**Upper Air.**—The upper air currents over the region of the westerlies are also westerly, the strength increasing with height. In the northern hemisphere even with an extensive temporary circulation giving easterly winds at the surface, these winds are found by observation not to extend upwards very far, the westerly wind being found above them. In the article on the General Circulation in the series on the Trade Winds it was seen how the Counter-Trade of the North Atlantic by passing successively from S.E., S. and S.W. with increasing North Latitude finally became westerly in the latitude of the Azores thus merging into the general westerly upper current of the temperate latitudes. The Counter-Trade of the southern hemisphere passes successively through the direction N.E., N. and N.W. merging into the westerly current over the Roaring Forties. It was also seen that at heights above 26,000 feet the circulation resolves itself into two great polar cyclones with their westerly winds, covering the whole globe save for a belt of easterly wind around the equator.

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

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1917		No reports received.				
1927	6	48° 20' S.	57° 01' W.	2 bergs		S.S. <i>Mamari</i> .
	6	48° 17' S.	56° 57' W.	Berg	260 ft. high (vertical sextant angle), 4,000 ft. long (horizontal sextant angle), 500 ft. wide (estimated).	S.S. <i>Matakana</i> .
	6	48° 09' S.	56° 53' W.	Berg	260 ft. high, 2,000 ft. long (estimated)	do.
	16	48° 03' S.	56° 07' W.	Several bergs and 1 growler		M.V. <i>Larchbank</i> .
		From 47° 43' S.	55° 09' W.			S.S. <i>Arna</i> .
		To 47° 12' S.	55° 56' W.	Icefield	5 miles long, 2 miles wide	do.
	20	46° 35' S.	55° 00' W.	Berg		S.S. <i>Mamari</i> .
5	49° 21' S.	53° 38' W.	Struck large berg		M.V. <i>Larchbank</i> .	
17	46° 21' S.	51° 25' W.	Berg			
1928	16	44° 58' S.	63° 53' E.	Small berg	Estimated dimensions 130 ft. high and 200 ft. long, approximately circular and almost cone shaped.	S.S. <i>Port Adelaide</i> .

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

**WEATHER SIGNALS.**

**II.—WIRELESS WEATHER SIGNALS.**

**WIRELESS WEATHER BULLETINS.**

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

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

Canada, Nova Scotia, Newfoundland and Labrador, etc.

(Spark Issues.)

The following stations broadcast weather bulletins, giving forecasts,\* the wavelength used being 600 metres (spark) in all cases. Where the times of transmission are omitted, forecasts are sent on request. Stations marked with an asterisk (\*) are open during the season of navigation only.

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.

Country.	W/T Station.	Call Sign.	Position (approx.).		Time, G.M.T.
			Lat. N.	Long. W.	
Canada (Nova Scotia).	†Lurcher Lt. Vsl. ...	VDR	43 49	66 32	—
	Yarmouth ...	VAU	43 46	66 07	0200, 1400
	Chebucto Head ...	VAV	44 30	63 31	0130, 1330
	North Sydney ...	VCO	46 13	60 15	—
	Sable Island ...	VCT	43 56	60 02	—
Canada	§Louisburg ...	VAS	46 09	59 57	0400, 1600
	Grindstone Island ...	VON	47 23	61 54	—
	*Fame Point, Que. ...	VCG	49 07	64 36	0145, 1345
	*Clarke City, Que. ...	VCK	50 11	66 37	—

Country.	W/T Station.	Call Sign.	Position (approx.)		Time, G.M.T.
			Lat. N.	Long. W.	
Canada—cont.	*Father Point, Que.	VCF	48° 31'	68° 28'	—
	Quebec ... ..	VCC	46° 48'	71° 12'	—
	*Montreal ... ..	VCA	45° 34'	73° 38'	—
	*Heath Point Lt. Vsl. (Anticosti I.).	VCI	49° 03'	61° 30'	—
Canada (New Brunswick).	St. John ... ..	VAR	45° 14'	66° 03'	—
Newfoundland and Labrador.	†Belle Isle ... ..	VCM	51° 53'	55° 22'	0230, 1430
	Cape Race ... ..	VCE	46° 39'	53° 04'	0215, 1415
	Point Amour ... ..	VCL	51° 27'	56° 50'	—
St. Pierre and Miquelon Is.	St. Pierre ... ..	HYS	46° 47'	56° 11'	0100, 1300

† The station keeps watch for the first half of every odd hour from 1200 to 0000, and from 0300 to 0330, G.M.T.  
 ‡ Wavelength, 600 metres (I.C.W.).  
 § Wavelength, 2,804 metres (I.C.W.).

**Wireless Telephony R/T Issues.**

The following stations broadcast weather forecasts,\* issued by the Canadian meteorological service, by word of mouth.

Country.	Station.	Call Sign.	Position (approx.)		Time G.M.T.	Wave-length R/T.
			Lat. N.	Long. W.		
Canada (New Brunswick).	St. John... ..	CFBO	45° 14'	66° 03'	0400, 1200	337 m.
Canada (Nova Scotia).	Sombro Outer Bank Lt.-V.	VCX	44° 22'	63° 26'	1200, 1730	323 m.
	Louisburg ...	VAS	46° 09'	59° 57'	0800, 1700	434 m.

\* Details of areas, periods and elements not available.

**United States of America (Atlantic Coast).**

**G.W. Issues.**

**Washington.—Arlington W/T Station**, approximate Latitude 38° 52' N., Longitude 77° 05' W., call sign **NAA**, broadcasts weather bulletins at 0300 G.M.T., on wavelengths of 2653 metres (I.C.W.) and 4409 metres (C.W.) simultaneously, and at 1500 G.M.T. on wavelengths of 18.6 and 2,677 metres (I.C.W.) simultaneously.

The bulletins are divided into two parts and begin with the words "Weather Bureau Bulletin."

**First Part.**

**Part 1** of the 0300 and 1500 G.M.T. bulletins contains observations taken at 0100 and 1300 G.M.T., respectively, from the stations in the list below. Upper air observations are included in this part from those stations marked with a dagger (†) if received in time, and also weather reports from ships at sea.

Indicator Letters.	Station.	Position (Approx.) Lat. Long.	Indicator Letters.	Station.	Position (Approx.) Lat. Long.
*J	St. Johns, N.F.	47°34'N. 52°42'W.	CN	Cincinnati, Ohio...	39°03'N. 84°24'W.
*S	Sydney, N.S.	46°10'N. 60°10'W.	PB	Pittsburg, Pa. ...	40°27'N. 80°01'W.
*CK	Cochrane, Ont.	49°20'N. 81°00'W.	F	Buffalo, N.Y. ...	42°52'N. 78°54'W.
*FP	Father Point, Que.	48°31'N. 68°19'W.	D	Detroit, Mich. ...	42°21'N. 82°45'W.
*ML	Montreal, Que.	45°30'N. 73°35'W.	L	Alpena, Mich. ...	45°05'N. 83°28'W.
E	Eastport, Me.	44°53'N. 67°02'W.	M	Marquette, Mich. ...	46°30'N. 87°20'W.
N	Northfield, Vt.	44°08'N. 72°42'W.	CH	Chicago, Ill. ...	41°53'N. 87°37'W.
T	Nantucket, Mass.	41°17'N. 70°05'W.	DU	Duluth, Minn. ...	46°47'N. 92°06'W.
NY	†New York, N.Y.	40°28'N. 74°00'W.	LC	La Crosse, Wis. ...	43°45'N. 91°18'W.
AC	†Atlantic City, N.J.	39°21'N. 74°26'W.	SL	St. Louis, Mo. ...	38°36'N. 90°18'W.
WA	†Washington, D.C.	38°52'N. 77°03'W.	KC	Kansas City, Mo. ...	39°07'N. 94°38'W.
NF	†Norfolk, Va.	36°50'N. 76°18'W.	O	Omaha, Nb. ...	41°23'N. 96°01'W.
LB	Lynchburg, Va.	37°18'N. 79°01'W.	OK	Oklahoma City, Okla.	35°32'N. 97°28'W.
AV	Asheville, N.C.	35°32'N. 82°28'W.	DA	Dallas, Tex. ...	32°46'N. 96°31'W.
H	Hatteras, N.C.	35°14'N. 75°32'W.	EP	El Paso, Tex. ...	31°50'N. 106°20'W.
C	Charleston, S.C.	32°43'N. 79°52'W.	SE	Seattle, Wash. ...	47°38'N. 122°25'W.
B	Bermuda ...	32°17'N. 64°46'W.	RO	Roseburg, Oreg. ...	43°11'N. 123°10'W.
CO	†Columbia, S.C.	34°02'N. 80°57'W.	SF	San Francisco, Calif.	37°50'N. 122°30'W.
JA	Jacksonville, Fla.	30°19'N. 81°51'W.	DI	San Diego, Calif. ...	32°42'N. 117°15'W.
K	†Key West, Fla.	24°33'N. 81°48'W.	BS	Boise, Idaho ...	43°40'N. 116°00'W.
AT	Atlanta, Ga.	33°42'N. 84°26'W.	LD	Lander, Wyo. ...	41°40'N. 108°40'W.
TA	Tampa, Fla.	27°35'N. 82°29'W.	DV	Denver, Colo. ...	39°48'N. 105°05'W.
P	†Pensacola, Fla.	30°21'N. 87°19'W.	*ED	Edmonton, Alberta	53°32'N. 113°05'W.
MG	Montgomery, Ala.	32°21'N. 86°23'W.	*SC	Swift Current, Sask.	50°30'N. 107°45'W.
VK	Vicksburg, Miss.	32°22'N. 90°57'W.	*BK	Bismarck, N. Dak.	—
NO	New Orleans, La.	29°57'N. 90°02'W.	*HT	Horta, Azores ...	38°32'N. 28°38'W.
LR	Little Rock, Ark.	34°45'N. 92°20'W.			
GV	Galveston, Tex.	29°19'N. 94°48'W.			
NV	Nashville, Tenn.	36°10'N. 86°47'W.			

\* Cloud reports not included.

The stations are indicated by the letters given above and are followed by two or more groups of five figures in each group. The first two groups contain surface observations. The remaining groups contain observations of clouds and upper air data.

An X will be substituted for any missing data.

Code used: Special (United States Meteorological).

**Explanation of first and second Groups.**

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

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

5th figure gives the wind force by Beaufort scale; the letters W (whole gale) S (storm) H (hurricane) will be sent for forces 10, 11 and 12 respectively.

**Second Group.**—1st figure gives the present weather (state of weather at surface, Table XXXIX).

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

3rd figure gives the past weather during the preceding 12 hours (Table XLI).

4th and 5th figures give the air temperature in whole degrees Fahrenheit. When the temperature is zero or 100°, the 4th and 5th figures will be 00; when between 2° and 8°, inclusive, the 4th figure will be 0 and the 5th figure the temperature; when below zero, the correct temperature can be obtained by subtracting the code figures sent from 100°. The initial figure 1 is omitted for temperatures of 100° or more. No confusion should arise in decoding temperatures below zero or above 100°, if the season of the year and the position of the reporting stations are considered, for example:—

- Duluth DU 74 = 74° in summer and —26° in winter.
- Kansas City KC 04 = 104° in summer and 4° in winter.
- Chicago CH 00 = 100° in summer and zero in winter.

**Ship Reports.**—Weather reports from ships in the Atlantic Ocean, and during the hurricane season additional reports from ships in the Gulf of Mexico and Caribbean Sea, follow the land stations' reports as follows:—

**0300 G.M.T. bulletin** contains 0000 G.M.T. observations; also Noon G.M.T. observations which were received too late for inclusion in the 1500 G.M.T. bulletin.

**1500 G.M.T. bulletin** contains Noon G.M.T. observations; also 0000 G.M.T. observations received too late for inclusion in the 0300 G.M.T. bulletin.

NOTE.—Ship reports of previous observations are only included when conditions are unusual.

The reports from ships are given in two five-figure groups for each ship preceded by the call sign of the ship.

**First Group.**—1st two figures give the latitude (north) to the nearest degree.

3rd, 4th and 5th figures give the longitude (west) to the nearest degree.

**Second Group.**—1st three figures give the barometric pressure in inches and hundredths, the initial 2 or 3 being omitted. (To convert to mbs, see Table XLII.)

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

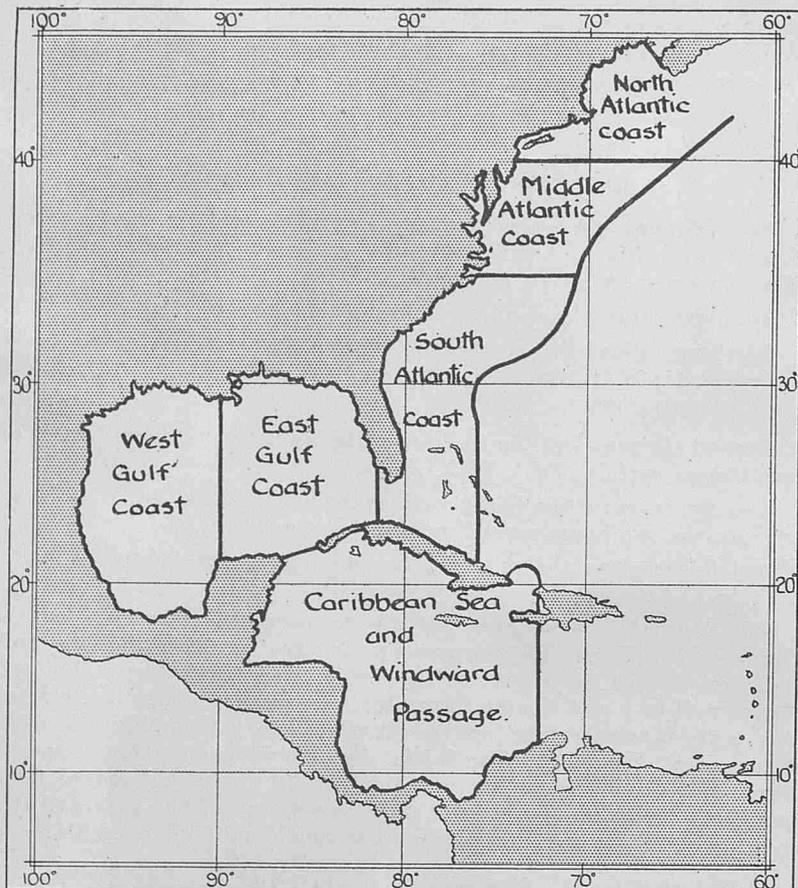
5th figure gives the wind force by Beaufort Scale.

**Second Part.**

**Part II** of the bulletin is in plain language, and consists of a summary of general pressure distribution, including the location of high and low areas, and the barometer readings at their centres; wind and weather forecasts for the areas shown on the CHARTLET on p. 184.

Storm warnings are also broadcast for these areas, and flying weather forecasts for each of six aviation zones.

CHARTLET OF U.S. MARINE FORECAST AREAS.



Weather Information broadcast for the benefit of Shipping approaching New York Harbour.

The following W/T stations broadcast weather conditions at Sandy Hook from observations made one hour previous to the times of transmission. The information will include barometric pressure, temperature, wind direction and force, state of sky, state of sea, and visibility.

W/T Station.	Call Sign.	Position (approx.).		Time, G.M.T.	Wavelength, Metres.
		Latitude.	Longitude		
Tuckerton, N.J....	WSC	39° 33' N.	74° 23' W.	1400, 2200	650 (I.C.W.).
Chatham (Marion), Mass.	WCC	41° 43' N.	70° 46' W.	1400, 2200	2,200 (C.W.).

United States of America, Caribbean Sea, Gulf Coast and West Indian Islands.

Weather bulletins are broadcast from the under-mentioned W/T stations. They are of the same general character and can be similarly decoded. They are based upon observations taken in the U.S.A. at 0100 and 1300 G.M.T., and one hour earlier at stations in the Gulf of Mexico and Caribbean Sea. The bulletins are divided into two parts.

**Part I** is broadcast in special code (United States Meteorological) and contains observations from stations in the following lists.

The observations from these stations are given in a five-figure group for each station preceded by the indicator letter or letters of the station.

If observations from any station cannot be supplied, the indicator letters and code figures will be omitted altogether. If only a portion of the observations are missing, the letter "X" will be sent in lieu.

Explanation of Group.

1st, 2nd and 3rd figures of group give the corrected barometer reading in inches and tenths, the first figure (2 or 3) being omitted. (See Table XLII for conversion of ins. to mbs.)

4th figure of group gives the wind direction true. (Table XXXVIII).

5th figure of group gives the wind force (Beaufort Scale). The letters W, S, or H will be used for forces 10, 11 and 12 respectively.

**Part II.**—Sent in plain language, consists of wind and weather forecasts, storm and hurricane warnings for the various areas shown on the CHARTLET.

For particulars of storm and hurricane warnings, see p. 186.

W/T Stations from which the Bulletins are Broadcast. (C.W. and Spark Issues.)

**Almirante-Panama**—by arrangement with the United Fruit Co. (owners of the W/T station).

Approximate Latitude 9° 20' N., Longitude 82° 17' W.

Call Sign **UB**. Wavelength, 4,075 metres (C.W.).

Times of broadcast, 0445 and 1730 G.M.T.

At 1730 G.M.T. **Part I**, observations from following stations broadcast *only during the hurricane season*, June to November inclusive. **Part II** broadcast *daily throughout the year*.

Observation Stations in Part I. of Bulletin.			Part II. of Bulletin.
Indicator Letters.	Station.	Position (approx.). Lat. Long.	Storm and Hurricane Warnings. Wind and Weather forecasts for West Gulf of Mexico. Wind and Weather forecasts for East Gulf of Mexico. Wind and Weather forecasts for Caribbean Sea and Windward Passage. (See Chartlet, p. 184.)
CG	Cape Gracias, Nic.	15° 00' N. 83° 13' W.	
BZ	Belize, Honduras	18° 00' N. 88° 20' W.	
BFD	Bluefields, Nic.	12° 00' N. 83° 45' W.	
W	Willemsstadt, Curaçao.	12° 10' N. 69° 00' W.	
SJ	San Juan, P.R.	18° 28' N. 66° 06' W.	
PP	Port au Prince, Haiti.	18° 37' N. 72° 17' W.	
CFG	Cienfuegos, Cuba	22° 11' N. 80° 33' W.	
GUE	Guane, Cuba	- - -	
KN	Kingston, Jamaica	18° 10' N. 76° 48' W.	
TI	Turks I., Bahamas	21° 31' N. 71° 08' W.	

At 0445 G.M.T., **Part II** only of bulletin, broadcast *daily throughout the year*.

*Note.*—The above bulletins are sent by W/T to **Almirante W/T** station from the **Tropical Radio Telegraph Station at New Orleans La.**, call sign **WNU** at 0430 and 1630 G.M.T. on a wavelength of 3,331 metres (C.W.) and ships are invited to intercept them.

**Key West, Fla.**—Approximate Latitude 24° 33' N., Longitude 81° 48' W.

Call sign **NAR**. Wavelength, 2,653 metres (I.C.W.).

Time of broadcast, 0400 G.M.T.

Observation Stations in Part I. of Bulletin.			Part II. of Bulletin.
Indicator Letters.	Station.	Position (approx.). Lat. Long.	Wind and Weather forecasts for South Atlantic Coast. Wind and Weather forecasts for East Gulf of Mexico. Wind and Weather forecasts for West Gulf of Mexico. Wind and Weather forecasts for Caribbean Sea and Windward Passage. Storm and Hurricane Warnings. (See Chartlet, p. 191.)
H	Hatteras, N.C.	35° 14' N. 75° 32' W.	
C	Charleston, S.C.	32° 43' N. 79° 52' W.	
JA	Jacksonville, Fla.	30° 19' N. 81° 51' W.	
MI	Miami, Fla.	39° 35' N. 84° 13' W.	
K	Key West, Fla.	24° 33' N. 81° 48' W.	
P	Pensacola, Fla.	30° 21' N. 87° 19' W.	
BW	Burwood, La.	28° 57' N. 89° 23' W.	
GV	Galveston, Tex.	29° 19' N. 94° 48' W.	
BV	Brownsville, Tex.	25° 53' N. 97° 26' W.	
FW	Fortworth, Tex.	32° 30' N. 97° 40' W.	
KN	Kingston, Jam.	18° 01' N. 76° 48' W.	
TI	Turks Island	21° 31' N. 71° 08' W.	
HA	Havana, Cuba	23° 10' N. 82° 22' W.	
GO	Guantanamo Bay (Cuba).	19° 54' N. 75° 12' W.	
CG	Cape Gracias, Nic.	15° 00' N. 83° 13' W.	
SJ	San Juan, P.R.	18° 28' N. 66° 06' W.	

**Key West W/T Station** also broadcasts wind and weather forecasts, storm and hurricane warnings for the Florida, South Atlantic and east Gulf of Mexico Coasts at 1800 G.M.T. on a wavelength of 2,653 metres (I.C.W.).

**San Juan P.R.** (July 1 to November 15, inclusive).—Approximate Latitude 18° 28' N., Longitude 66° 06' W.

Call sign, **NAU**.

Time of broadcast, 0045 G.M.T.

Wavelengths, 6,246 metres (C.W.) and 2,653 metres (I.C.W.).

Observation Stations in Part I. of Bulletin.			Part II. of Bulletin.	
Indicator Letters.	Station.	Position (approx.). Lat. Long.		
SJ	San Juan, P.R.	18° 28' N. 68° 06' W.		
ST	St. Thomas, Virgin Is.	18° 23' N. 64° 55' W.		
BT	Basseterre, St. Kitts	17° 18' N. 62° 43' W.		
RS	Roseau, Dominica	15° 17' N. 61° 24' W.		
BB	Bridgetown, Barbados.	13° 09' N. 59° 35' W.		
SD	Santo Domingo, D.R.	18° 28' N. 69° 53' W.	}Hurricane Warnings.	
PL	Puerto Plata, D.R.	19° 49' N. 70° 42' W.		
LU	Castries, St. Lucia	14° 01' N. 61° 00' W.		
W	Willemstadt, Curaçao.	12° 10' N. 69° 00' W.		
PS	Port of Spain, Trinidad.	10° 40' N. 61° 30' W.		
SM	St. Martins, D.W.I.	18° 02' N. 63° 04' W.		

**Repetition of "Arlington" bulletin.**

San Juan W/T Station re-broadcasts Part I and portions of Part II of the 0300 and 1500 G.M.T., Washington-Arlington (NAA) bulletins, previously explained on p. 183, at 0400 and 1600 G.M.T., respectively, on a wavelength of 6,246 metres (C.W.). This re-broadcast is **not** made when conditions do not permit the reception of the Arlington bulletin at San Juan.

**Repetition of "San Juan" bulletin.**

Guantanamo, Cuba, approximate Latitude 19° 55' N., Longitude 75° 09' W.

Call sign, **NAW**.

Time of broadcast, 0115 G.M.T.

Wavelength, 2,653 metres (I.C.W.).

During the hurricane season, July 1 to November 15, inclusive, this W/T station repeats the 0045 G.M.T. bulletin broadcast by San Juan, explained above, at 0115 G.M.T.

**Barbados.**

Bridgetown W/T station, approximate position latitude 13° 06' N, longitude 59° 37' W, call sign **VPO**, broadcasts the following weather information, received from the Meteorological Station, Codrington (latitude 13° 07½' N., longitude 59° 36' W.), when unsettled weather conditions prevail or indications of stormy weather are observed:—

Barometric pressure, barometric tendency, wind direction and force (or velocity in miles per hour), weather at time of observation, and G.M.T. of the observation.

If possible the approximate position of the centre of a tropical cyclonic disturbance will be broadcast.

The above information may be transmitted in code in which case the following tables should be used:—

1st figure—Wind direction—0 = N, 1 = NE, 2 = ENE, 3 = E, 4 = ESE, etc.

2nd figure—Wind force—1 = calm, 2 = light air, 3 = gentle breeze, 4 = fresh breeze, 5 = gusty, 6 = moderate gale, 7 = strong gale, 8 = dangerous gale, 9 = hurricane.

3rd and 4th figures—Barometric pressure in inches:

- 00 = 30.00in.
- 01 to 09 = 30.01 to 30.09.
- 10 to 19 = 30.10 to 30.19.
- 90 to 99 = 29.90 to 29.99.
- 80 to 89 = 29.80 to 29.89 and so on.

5th figure—Barometric tendency—1 = falling rapidly, 2 = falling slowly, 3 = stationary, 4 = pumping or oscillating, 5 = rising slowly, 6 = rising rapidly.

6th figure—Movement of centre, etc. :—

- 0 = No general apprehension felt here of abnormal conditions.
- 1 = Weather stormy but not threatening a hurricane.
- 2 = Weather stormy appears to threaten a hurricane.
- 3 = Storm centre appears to be approaching from the South.
- 4 = Storm centre appears to be approaching from the South-East.

- 5 = Storm centre appears to be approaching from the East.
- 6 = Storm centre appears to be passing N. of this island.
- 7 = Storm centre appears to be passing S. of this island.
- 8 = Storm centre appears to have passed S. of this island.
- 9 = Storm centre appears to have passed N. of this island.

7th figure—Weather:—

- 0 = sky overcast. 1 = sky clear, cirrus clouds. 2 = sky clear, nimbus clouds. 3 = sky clear, cirro-cumulus clouds. 4 = sky clear, cumulus clouds. 5 = showery or frequent showers. 6 = heavy rain squalls. 7 = raining steadily. 8 = thunder and lightning with rain squalls.

8th and 9th figures are for inter-island communication.

Reports to ships during the hurricane season may be obtained *on request*, but as at present there is only one voluntary observer at this station, it is anticipated that such requests will only be made when conditions warrant them.

**Ships Wireless Weather Signals.**

During the hurricane season (July to October) when unsettled weather conditions prevail or indications of stormy weather are observed, vessels within range of Barbados, Bridgetown W/T Station, should address their reports to **VPO** as well as to **CQ**.

For particulars and sample of Ships' Wireless Weather reports see Chapter I of "Wireless and Weather an aid to Navigation" and pages 17-19, Volume VI, No. 61 of this Journal.

**SPECIAL WEATHER TELEGRAPHY TABLES.**

**NOT NEW INTERNATIONAL CODE.**

**Code Tables and their Meanings, used in connection with the "Arlington" Bulletins (U.S.A.).**

**Table XXXVIII.—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 XXXIX.—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 XL.—Barometric Change during two hours preceding Observation.**

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

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

**Table XLI.—Past Weather.**

**Information concerning occurrence of thunderstorms, high winds, and precipitation during the preceding 12 hours.**

Code Figure.

- 1 = Thunderstorm without high winds and less than .06 inch precipitation.

- 2 = Thunderstorm without high winds and with .06 inch or more precipitation.
- 3 = Thunderstorm with high winds and less than .06 inch precipitation.
- 4 = Thunderstorm with high winds and .06 inch or more precipitation.
- 5 = Precipitation less than .06 inch.
- 6 = Precipitation from .06 to .16 inch inclusive.
- 7 = Precipitation more than .16 inch.
- 8 = High winds without thunderstorm and without precipitation in excess of .06 inch.
- 9 = High winds without thunderstorm and with precipitation in excess of .06 inch.
- 0 = No precipitation or high winds.

Hurricane warnings are broadcast when necessary and repeated at 2-hour intervals by:—

- Jupiter W/T Station, NAO, until 0500 G.M.T.
- St. Augustine W/T Station, NAP, until 2300 G.M.T.
- Savannah W/T Station, NEV, until 0100 G.M.T.
- Charleston W/T Station, NAO, for 24 hours.
- Norfolk W/T Station, NAM, for 12 hours.

United States of America (Caribbean Sea, Gulf Coast) and West Indian Islands.

(C.W. and Spark Issues.)

STORM and hurricane warnings are broadcast by the following W/T Stations for the various areas etc. shown on the CHARLETT, p. 184. When a storm exists that is likely to affect an area, the location and expected direction of movement of the storm centre will be given, followed by any storm or hurricane warnings and advices to shipping that have been issued.

**Almirante, Panama.**—Call sign **UB**. Wavelength 4,075 metres (C.W.). Times, 0445 and 1730, G.M.T., *daily, throughout the year.*

This station broadcasts storm warnings in Part II of Weather bulletin explained on p. 184, for the Gulf of Mexico and Caribbean Sea, also warnings of "Northers" during the winter months. When a hurricane is in progress, information regarding its location, direction and progress, etc., will be broadcast every two hours, at the even hour, after issue by the Weather Bureau.

**Brownsville, Tex.**—Approximate Latitude 25° 52' N., Longitude 97° 26' W., call sign **NAY**. Wavelength 2,883 metres (I.C.W.):—

At Midnight and 1700 G.M.T., broadcasts storm warnings for west Gulf Coast etc.

Hurricane warnings also broadcast, when issued by local weather bureau. These are repeated at 2 hour intervals until 0500 G.M.T.

**Galveston, Tex.**—Approximate Latitude 29° 19' N., Longitude 94° 47' W., call sign **WGV**. Wavelength 830 metres (I.C.W.):—

At 1630 G.M.T. (except Sundays and holidays) and 2300 G.M.T., broadcasts storm warnings for west Gulf Coast etc.

Hurricane warnings also broadcast, same routine as Brownsville.

**New Orleans, La.**—Approximate Latitude 29° 57' N., Longitude 90° 02' W., call sign **NAT**. Wavelength 2,883 metres (C.W.):—

At 1600 and 2200 G.M.T., broadcasts storm and hurricane warnings for south Atlantic and Gulf Coasts.

**Key West Fla.,** call sign **NAR**:—

At 0400 G.M.T. on a wavelength of 2,653 metres (C.W.), broadcasts storm warnings for south Atlantic Coast (Hatteras to Key West) and for east and west Gulf Coasts (Key West to Brownsville) and all hurricane warnings. At 1800 G.M.T., on a wavelength of 2,653 metres (C.W.), broadcasts storm and hurricane warnings for the Florida, south Atlantic and east Gulf of Mexico Coasts. Storm and hurricane warnings are also broadcast on 600 metres.

**San Juan P.R.,** call sign **NAU**, July 1 to November 15, inclusive.

At 0045 G.M.T., on 6,246 metres (C.W.) and 2,653 metres (I.C.W.), broadcasts hurricane warnings. These form Part II of the weather bulletin explained on p. 183. In the absence of a tropical storm the words "Weather normal over eastern Caribbean" will be sent each day. Hurricane warnings and information relating thereto are broadcast whenever issued by the Weather Bureaux at Washington D.C. and San Juan and repeated at 2 hour intervals until 0500 G.M.T.

**Guantanamo (Cuba)**—**NAW**—2,653 (I.C.W.)

**Port au Prince (Haiti)** **NSC**—2,271 (spk.)

**St. Croix** } Virgin Islands { **NNI**—438 (I.C.W.)

**St. Thomas** } { **NBB**—2,271 (spk.)

**St. John's** } { **NBO**—600 (spk.)

**Santo Domingo**—**HIA**—600 (spk.)

**Ensenada (Porto Rico)**—**WPR**—600 (spk.)

{ These W/T stations broadcast hurricane warnings when issued by the Weather Bureaux at Washington D.C. and San Juan, and repeat them at about 4-hour intervals.

Table XLII.

To convert Inches into Millibars.

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

WIRELESS STORM WARNINGS.

United States of America (Atlantic Coast).

Storm warnings are broadcast when necessary by the following stations, at the times indicated:—

W/T Station.	Call Sign.	Position. (Approx.) Latitude, Longitude.	Time. G.M.T.	Wavelength. (Metres.)
Jupiter, Fla. ...	NAO	26° 57' N. 80° 05' W.	1630, 2300	1,621 (I.C.W.).
St. Augustine, Fla. ...	NAP	29° 53' N. 81° 17' W.	1700	1,621 (Spark).
Savannah, Ga. ...	NEV	32° 05' N. 81° 06' W.	1600, 2330	1,621 (I.C.W.).
Charleston, S.C. ...	NAO	32° 52' N. 79° 58' W.	1530, 2300	2,458 (I.C.W.).
Norfolk, Va. ....	NAM	36° 50' N. 76° 18' W.	0130, 0900, 1330, 1600, 2100, 0300*	2,458 (I.C.W.).
Washington (Arlington)	NAA	38° 52' N. 77° 05' W.	1500*	2,677, 8,328 I.C.W. simultaneously. 18.6, 2,677 I.C.W. simultaneously.
Philadelphia ...	NAI	39° 53' N. 75° 11' W.	1545, 2200	2,883 (I.C.W.).
New York ...	NAH	40° 28' N. 74° 00' W.	1530, 2130	2,939 (C.W.).
Boston, Mass. ...	NAD	42° 21' N. 70° 57' W.	1600, 2200	2,939 (C.W.).

\* In Part II of the Weather Bulletin.

NOTE.—Guantanamo W/T station repeats the San Juan bulletin, containing hurricane warnings, explained on p. 186, during the hurricane season, July 1 to November 15, inclusive, on a wavelength of 2,653 metres (I.C.W.) at 0115 G.M.T.

**Barbados.**

See Weather Bulletins issued as necessary during the hurricane season, page 184.

No information of a regular Wireless Storm Warning Service has yet come to hand, but these messages will go some way in supplying warnings for shipping.

In addition to which Bridgetown W/T station re-broadcasts urgent weather reports from ships in or near hurricanes.

Marine Observers visiting Barbados are advised to consult the Harbour Master at Bridgetown and to give him every assistance in working up this service.

**WIRELESS ICE WARNINGS.**

Canada, Nova Scotia, Newfoundland and Labrador, etc.

(Spark I.C.W. and C.W. Issues.)

The following W/T stations broadcast ice warnings. Stations marked with an asterisk (\*) are open during the season of navigation only.

W/T Station.	Latitude N. (approximate).	Longitude W. (approximate).	Call Sign.	Wave length (Metres).	G.M.T. of issue.
St. John, N.B....	45° 14'	66° 03'	VAR	600 (Spk.)	On request.
†Lurcher Lt.-V....	43° 49'	66° 32'	VDR	600 (Spk.)	On request.
Yarmouth ...	43° 46'	66° 07'	VAU	600 (Spk.)	0200 1400 0130 1330
Chebucto Head ..	44° 30'	63° 31'	VAV	600 (Spk.)	On request.
Sable Island ...	43° 56'	60° 02'	VCT	600 (Spk.)	On request.
North Sydney ...	46° 13'	60° 15'	VCO	600 (Spk.)	On request.
†Louisburg ...	46° 09'	59° 57'	VAS	2804 (C.W.)	0400, 1600.
‡Grindstone Island	47° 24'	61° 51'	VCN	600 (Spk.)	On request.
*Fame Point ...	49° 07'	64° 36'	VCG	600 (Spk.)	0145 1345 0200 1400
*Father Point ...	48° 31'	68° 28'	VCF	600 (Spk.)	On request.
*Montreal ...	45° 34'	73° 38'	VCA	600 (Spk.)	On request.
*Clarke City ...	50° 11'	66° 37'	VCK	600 (Spk.)	On request.
*Heath Pt. Lt.-V.	49° 03'	61° 30'	VCI	600 (Spk.)	On request.
Cape Race ...	46° 39'	53° 05'	VCE	600 (Spk.)	0215 1415
Pt. Amour ...	51° 27'	56° 50'	VCL	600 (Spk.)	On request.
Belle Isle ...	51° 53'	55° 22'	VCM	600 (I.C.W.)	0230 1430

† The station keeps watch for the first half of every odd hour from 1200 to 0000, and from 0300 to 0330, G.M.T.

‡ Broadcasts Gulf of St. Lawrence Ice Patrol report giving ice conditions between C. Race and Quebec and recommended route to be followed.

**III. WIRELESS TIME SIGNALS.**

Canada (Nova Scotia).

Spark Issue.

Chebucto Head D/F Station, Latitude 44° 30' 01" N., Longitude 63° 31' 20" W., call sign VAV broadcasts a time signal daily (Sundays excepted) at 14h. 00m. 00s., G.M.T., on a wavelength of 600 metres (spark).

The procedure is as follows:—

G.M.T.	Signal.
h. m. s. h. m. s.	
13 58 00 to 13 58 57	A dot (●) is transmitted at each second.
13 59 00	(●) Time signal.
13 59 03 to 13 59 50	A dot (●) is transmitted at each second.
14 00 00	(●) Time signal.

For the purpose of these signals the observatory at St. John (New Brunswick) is connected by land telegraph to Chebucto Head D/F Station.

**United States of America (Atlantic Coast).**

C.W. Issues.

Time Signals are broadcast according to the United States System (See Diagram of Washington—Annapolis W/T Time Signals below), from the following W/T Stations:—

Washington—Arlington, Latitude 38° 52' 05" N., Longitude 77° 04' 47" W., call sign NAA on wavelengths\* of 24.9, 37.4, 74.7 and 2,653 metres (I.C.W.) on high power, at 3h. 00m. 00s., and 17h. 00m. 00s., G.M.T.

The time signals are broadcast daily and are controlled by the Naval Observatory, Washington. They are broadcast simultaneously on the above-mentioned wavelengths.

In case of error or failure the time signals will be broadcast 1 hour after the times given above. In the case of the time signal at 17h. 00m. 00s., if it is not possible to broadcast this at 18h. 00m. 00s., it will be sent at 19h. 00m. 00s. In the case of the 3h. 00m. 00s. signal, no further attempt will be made after 4h. 00m. 00s.

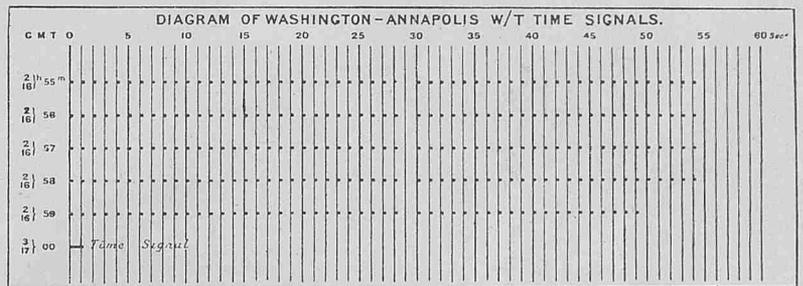
The error of the time signal is generally less than 0.1 second.

Washington—Annapolis, Latitude 38° 59' 00" N., Longitude 76° 27' 00" W., call sign NSS, on a wavelength of 16,844 metres (C.W.) at 3h. 00m. 00s., and 17h. 00m. 00s. G.M.T.

The time signals are relayed from the U.S. Naval Observatory and are broadcast on high power.

See Washington—Arlington for alternative broadcast times in case of failure.

The error of the time signal is generally less than 0.1 second.



The following W/T Stations broadcast a time signal at 17h. 00m. 00s., G.M.T., only when Washington—Arlington is out of action (Sundays and holidays excepted):—

	Latitude.	Longitude.	Call Sign.	Wavelength. Metres.
New York ...	40° 48' 00" N.	73° 50' 00" W.	NAH	2,939 (C.W.)
Norfolk ...	36° 49' 33" N.	76° 17' 46" W.	NAM	2,458 (I.C.W.)
Charleston ...	32° 51' 36" N.	79° 57' 49" W.	NAO	2,458 (I.C.W.)

\* Sharp tuning to the transmitting wavelengths is necessary in order to receive satisfactorily.

**Panama.**

(C.W. Issues.)

W/T Stations.	Call. Sign.	Wavelength metres.	Time of Signal being made G.M.T.	
Colon - - -	NAX	2,271 (I.C.W.)	h. m. s. h. m. s. 3 55 00- 4 00 00	} Sent daily.
Lat. 9° 22' 09" N. Long. 79° 54' 07" W.			17 55 00-18 00 00	

**United States of America, Gulf Coast.**

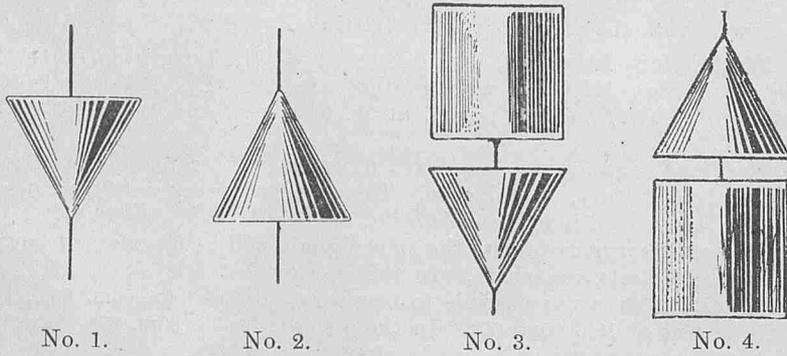
(C.W. Issues.)

W/T Stations.	Call. Sign.	Wavelength metres.	Time of Signal being made G.M.T.	
New Orleans - - -	NAT	2,883 (C.W.)	h. m. s. h. m. s. 16 55 00-17 00 00	} Sent daily.
Lat. 29° 56' 50" N. Long. 90° 02' 18" W.				
Key West - - -	NAR	2,828 (C.W.)	16 55 00-17 00 00	} "Lag" of Key West time signal is 0.5 second or more.
Lat. 24° 33' 22" N. Long. 81° 48' 21" W.				

NOTE.—The Key West time signals are operated by long distance telegraphic control lines from Washington D.C.

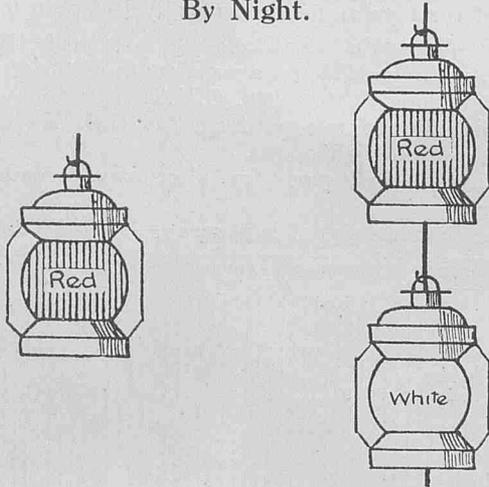
IV. VISUAL STORM WARNINGS.

Canada.  
By Day.



No. 1. No. 2. No. 3. No. 4.

By Night.



Nos. 1 or 3. Nos. 2 or 4.

Storm signals are hoisted on warning being received from the Meteorological Office, Toronto, at Camperdown (Halifax), Canso, Digby, Halifax, Liscomb, Liverpool, and Yarmouth, Westport (Brier Island) in Nova Scotia; at Point Lepreau, St. Andrews, St. John in New Brunswick; Eastport (State of Maine), at several places on the coasts of Cape Breton island, New Brunswick, Prince Edward Islands, Quebec, Newfoundland and British Columbia.

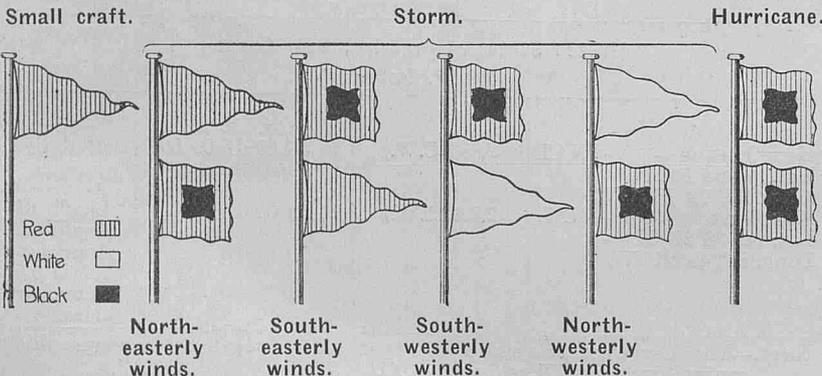
Signification: Day or Night Signals.

- No. 1, hoisted to indicate the probability of a gale; at first, from an easterly direction.
- No. 2, hoisted to indicate the probability of a gale; at first, from a westerly direction.
- No. 3 hoisted to indicate the probability of a *heavy* gale; at first, from an easterly direction.
- No. 4, hoisted to indicate the probability of a *heavy* gale; at first, from a westerly direction.

It must be borne in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

United States of America.

Visual, Small-Craft, Storm and Hurricane Warnings.



Flags, 8 feet square. Pennants, 8-foot hoist, 15-foot fly.  
Storm warnings are displayed by the U.S. Weather Bureau at some 380 stations on the Atlantic, Gulf and Pacific coasts of the United States, and on the Great Lakes.

Explanation of Warnings.

*The Small-Craft Warning.*—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small-craft warnings is made.

*The North-East Storm Warning.*—A red pennant *above* a square red flag with black centre displayed by day, or two red lanterns, one above the other, displayed by night, indicate the approach of a storm of marked violence, with winds beginning from the *North-East*.

*The South-East Storm Warning.*—A red pennant *below* a square red flag with black centre displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *South-East*.

*The South-West Storm Warning.*—A white pennant *below* a square red flag with black centre displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *South-West*.

*The North-West Storm Warning.*—A white pennant *above* a square red flag with black centre displayed by day, or a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence, with winds beginning from the *North-West*.

*Hurricane or Whole Gale Warning.*—Two square flags, red with black centres, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane or of one of the extremely severe and dangerous storms which occasionally move across the Great Lakes.

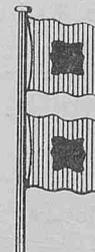
These warnings are also displayed at certain places in the following West Indian Islands:—St. Kitts, Porto Rico, Jamaica (Kingston), Vieques Island, Santa Domingo, Haiti, Dominica, St. Thomas, Virgin Islands of the U.S.A., Grand Turk Island, Swan Island, Turks Island and Cuba.

Barbados.

Storm signals are hoisted at the following places on the island to give warning of the approach of a hurricane:—

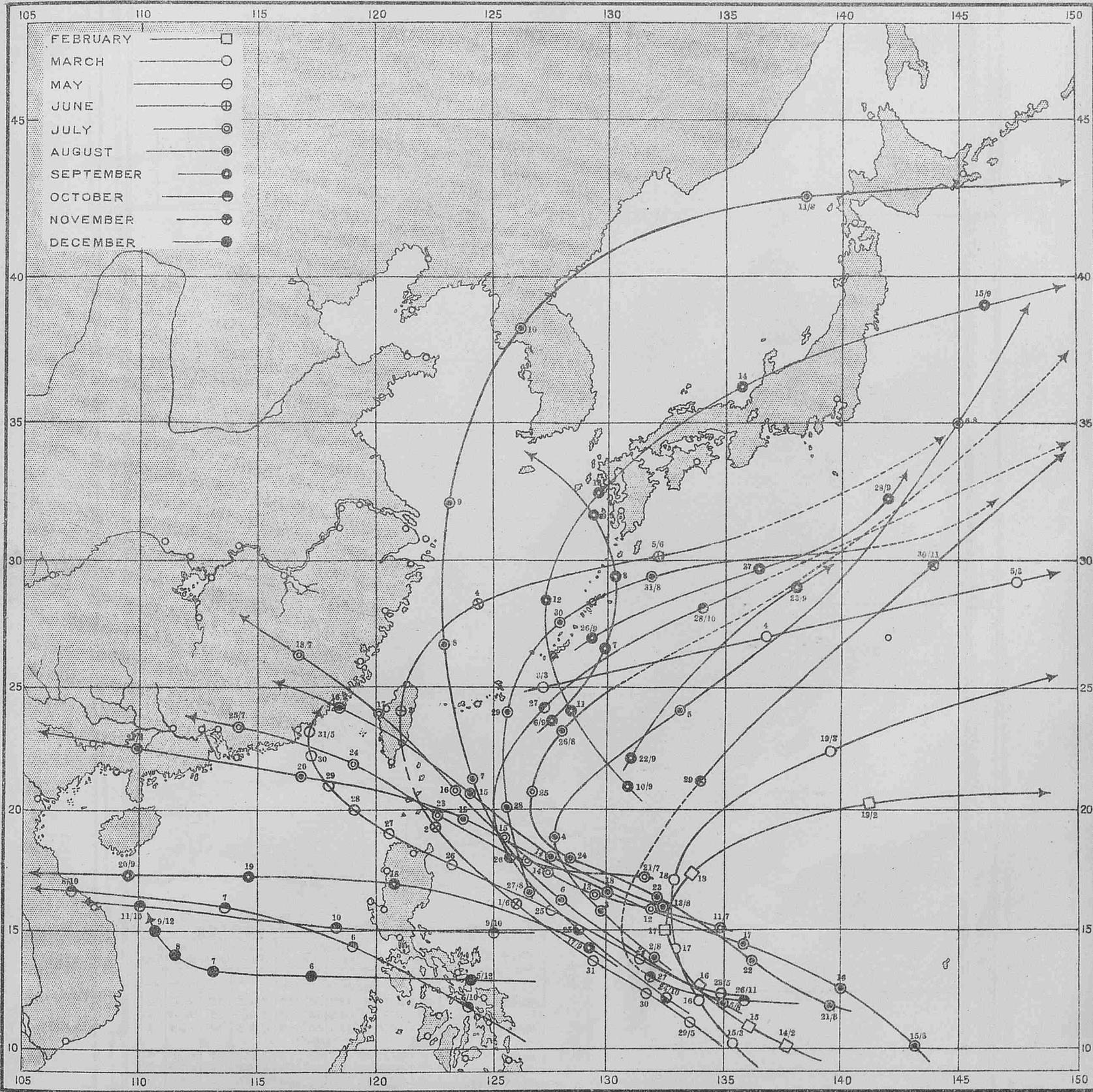
- Mount Standfast, St. James.
- South Point Lighthouse.
- Harrison's Point Lighthouse.
- Commercial Hall.
- Crane Hotel, Saint Philip.
- Beaumont Hotel, Bathsheba.
- Highgate Signal Station.
- Districts B, C, D, E and F Police Stations.

By Day:—



By Night:—Three rockets fired in rapid succession from the Harbour Police Station and two red lights, one above the other, displayed from the flagstaff of the station.

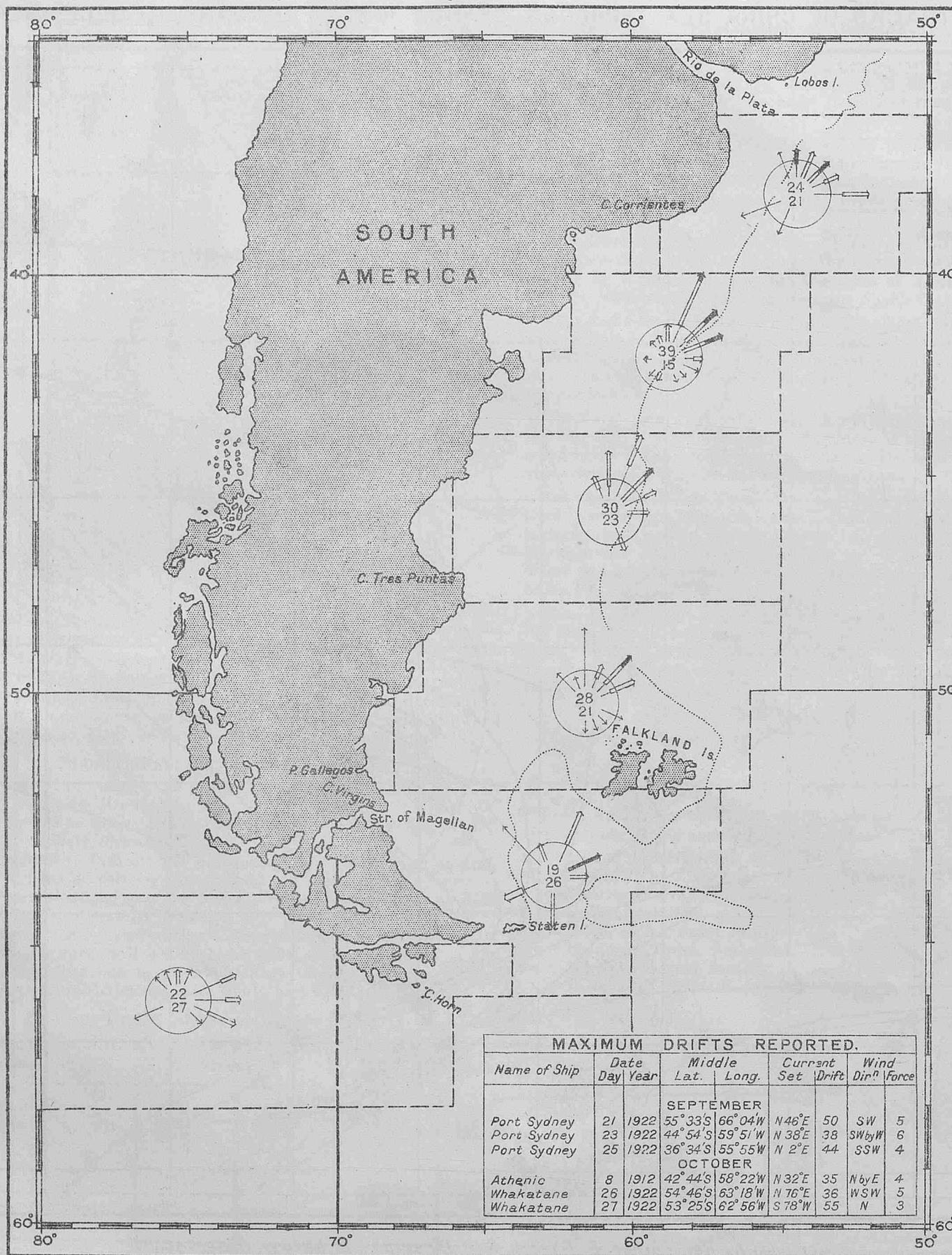
TRACKS OF CHINA SEA TYPHOONS, SEASON 1927, FEBRUARY TO DECEMBER.



Compiled by Rev. Father E. Gherzi S.J., Director, Zi-ka-wei Observatory.

CURRENTS ON THE TRACKS FROM THE LATITUDE OF THE PLATE  
TO MAGELLAN STRAITS AND CAPE HORN.  
AUGUST, SEPTEMBER AND OCTOBER.

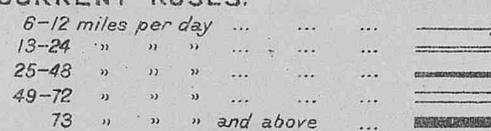
Observations of ships regularly observing for the British Meteorological Office 1910-1927.



EXPLANATION OF CURRENT ROSES.

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

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

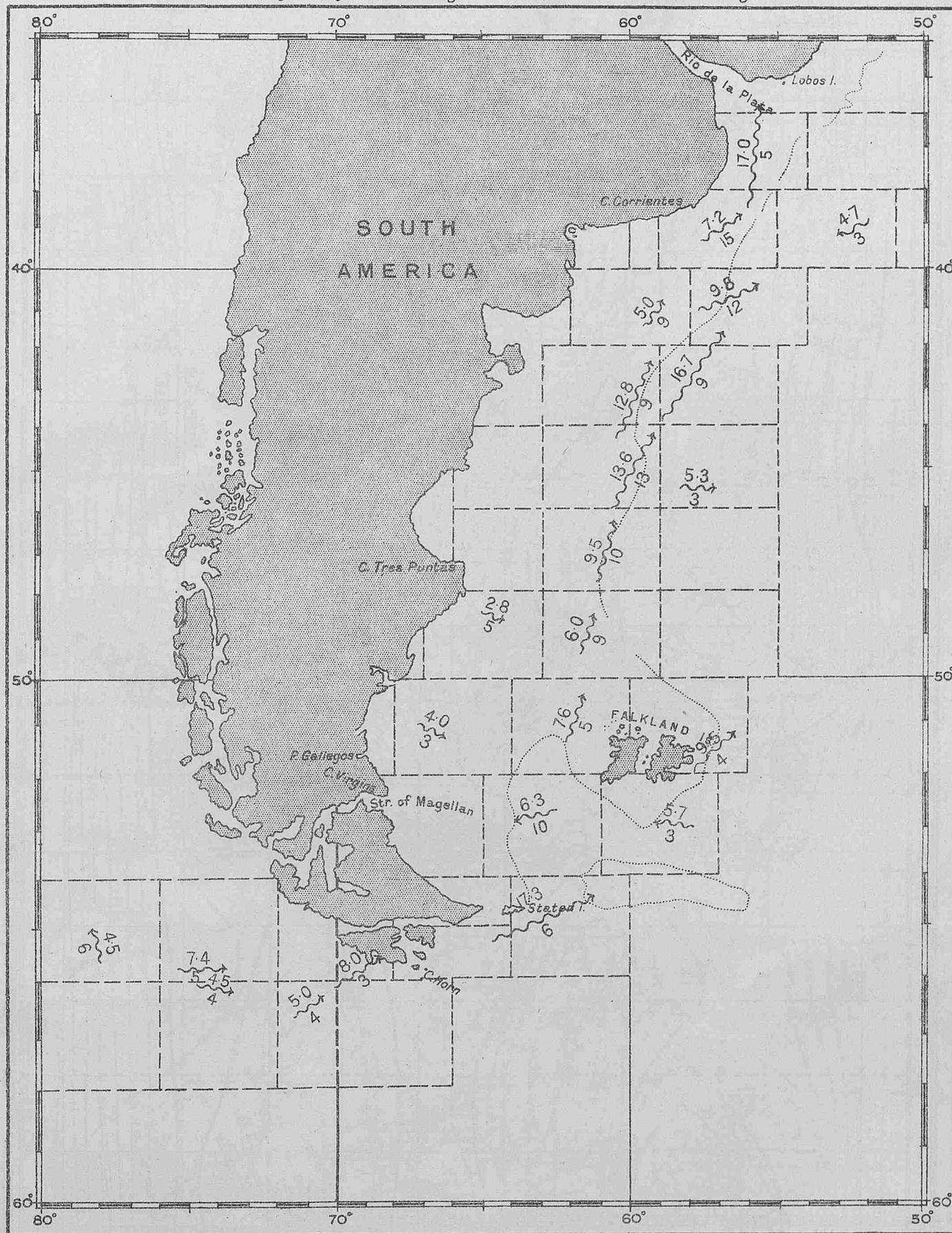


Distance from tail of arrow to circle represents 5%. Scale 0 10 20 30 40 50%

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

CURRENTS ON THE TRACKS FROM THE LATITUDE OF THE PLATE  
TO MAGELLAN STRAITS AND CAPE HORN,  
AUGUST, SEPTEMBER AND OCTOBER.

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



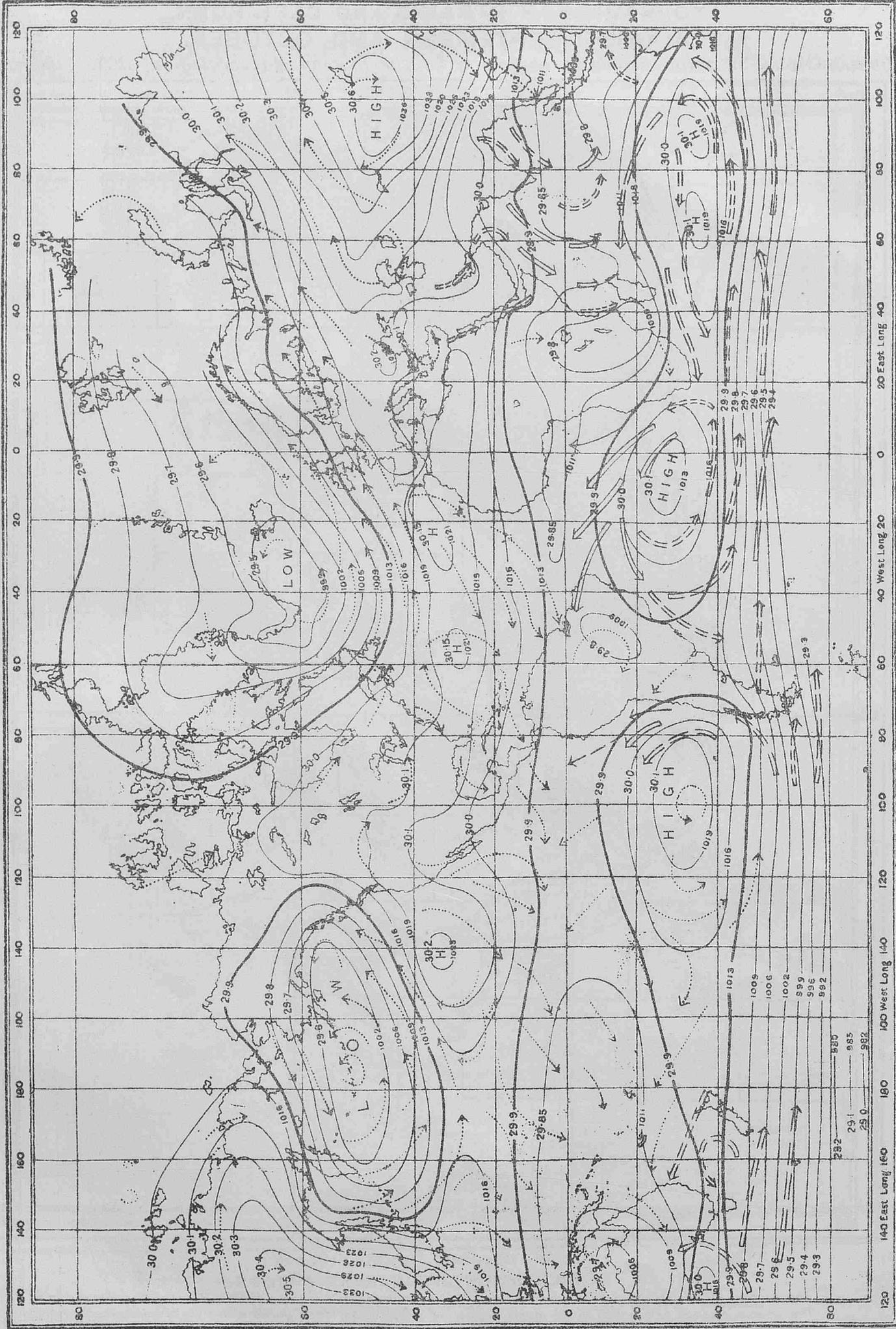
EXPLANATION OF CURRENT ARROWS.

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.

CHART OF THE WORLD.

PRESSURE AND WIND

JANUARY.



STEADINESS {  
 Light 1-3  
 Moderate 4-7  
 Strong 8 or above

WIND FORCE {

Frequency less than 50% of all observations

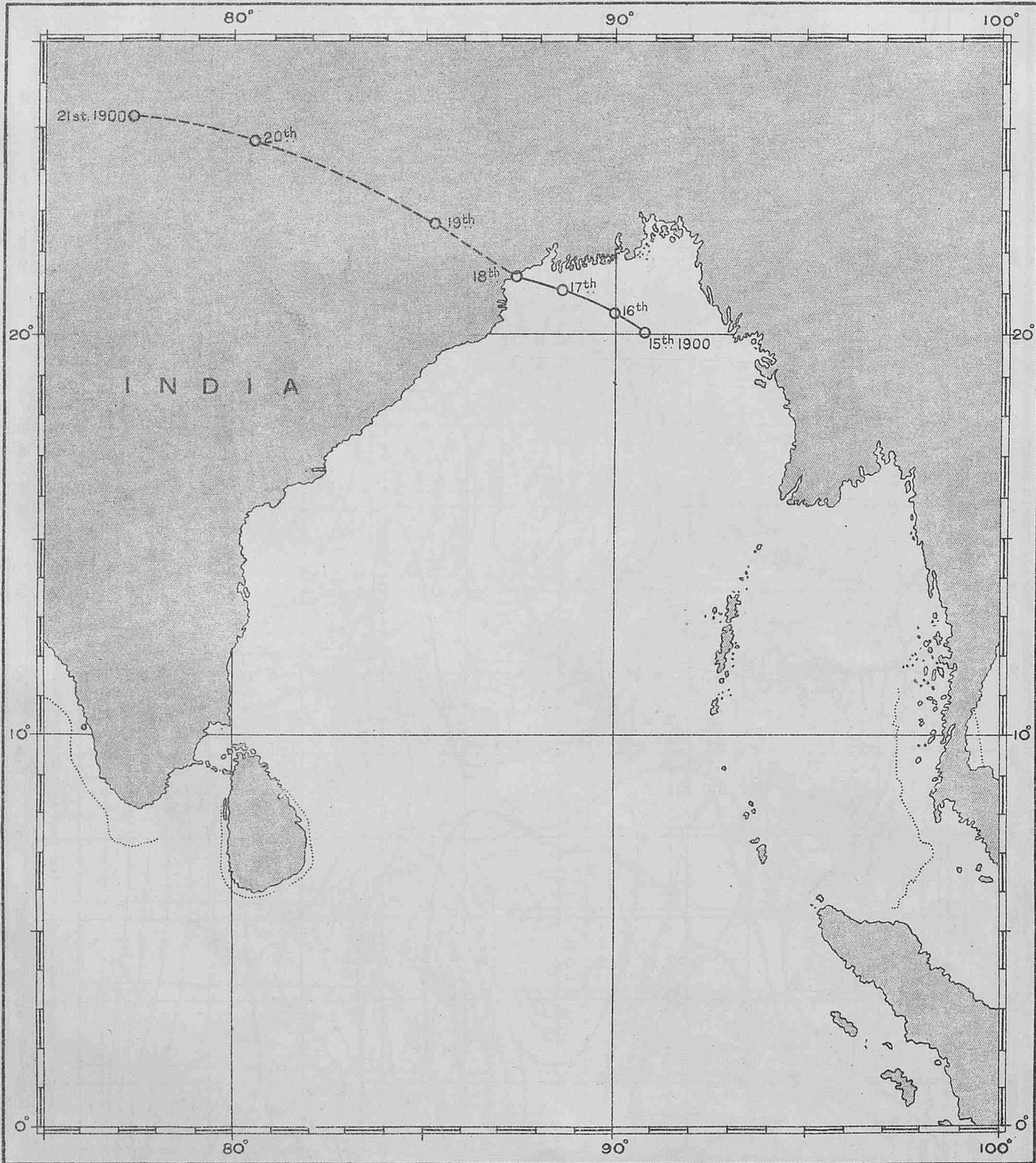
Frequency 50 to 75%

Frequency above 75%

Direction only



TRACK OF SEVERE CYCLONE IN THE BAY OF BENGAL  
AUGUST.  
DURING THE YEARS 1891-1923.



The above is the track of a severe storm taken from "Storm Tracks in the Bay of Bengal" compiled by Dr. C.W.B. Normand and published by the India Meteorological Department.

## VERY IMPORTANT.

## TEMPORARY ARRANGEMENTS FOR WIRELESS WEATHER REPORTS BY SELECTED SHIPS

IN THE  
MEDITERRANEAN AND RED SEAS.

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

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

0700 and 1800 G.M.T.

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

**GHA. Malta (Calafrana W/T)**

These reports should be transmitted on:—

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

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

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

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

**GHK Ismalia W/T**

These reports should be made on

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

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

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

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

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

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

## REQUESTS FOR REPLACEMENTS OF INSTRUMENTS, ETC.

The attention of Marine Observers is invited to the list of Nautical Officers and Agents of the Marine Division, overleaf.

Correspondence, delay and inconvenience may be saved if the Commanders and Officers of observing ships will kindly make their requests for replacements of instruments, logs, etc., to the appropriate Agency.

The Agents have the necessary gear, information and instruction to supply the needs of regular observing ships and to give advice upon questions of Marine Meteorology to any officers of the Merchant Navy who may desire it.

## 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.

## "WIRELESS AND WEATHER AN AID TO NAVIGATION."

Price Five Shillings.

This book, which provides full information and guidance in the modern application of Marine Meteorology, by means of Wireless Telegraphy, for general use of the officers of the Sea Service, can be purchased from H.M. Stationery Office, or through any bookseller.

## CURRENT OBSERVATION.

It is very desirable that good current data should be recorded. Spaces are provided for current experienced throughout the day and for current determined at shorter intervals in Meteorological Logs, while Form 911 provides for either or both.

Generally the difference between the *Dead Reckoning Position* at noon, reckoned from previous noon, and the *observed position* has been accepted as attributable to a single current for the whole 24 hours.

It is necessary to make careful distinction between *Dead Reckoning Position* and *Estimated Position*, the former being the position as reckoned from the last fix by courses steered and distances run, corrected for all known errors and disturbances *except* current. When a fix cannot be obtained, an estimation for current (when one is known generally to exist) is sometimes applied to the D.R.; the result may then be conveniently termed the *Estimated Position*.

If this estimated position is given in the Meteorological Log or Form 911, it should be clearly stated, otherwise it may be misleading.

Currents of varying velocity and direction may be experienced along the track made in 24 hours; therefore, when reliable fixes such as by Stellar observations at twilight are obtained, the current should be determined for the intervals, and all should be checked with the noon to noon result. Each of these currents determined at shorter intervals than 24 hours should be entered in the Meteorological Log in the appropriate column, and the time and latitude and longitude of each observation position should be given in the latitude and longitude columns. The times given on Form 911 indicate the interval. The period of short interval currents should usually not be less than, say, six hours. The best interval is probably from twilight to twilight.

It is desirable that whenever possible two methods of ascertaining the distance run through the water should be used, as recent investigation goes to show that with one means of measuring the speed the inclination has been to credit the ship. When possible it is recommended that both patent log and revolutions should be used.

For working out the set and drift of current the position *from* as well as the position *to* must always be *fixes*. Some observers have used an *estimated position from*, which makes the set and drift false. The same remarks apply to course allowances for set; the latter are naturally necessary to make an *estimated course*.

## DESPATCH OF INFORMATION

## REQUIRED IMMEDIATELY FOR THE CONDUCT OF THE WORK AT SEA.

Shipowners, Marine Superintendents and all concerned in the despatch of mails to Ships abroad are asked to kindly facilitate the despatch and delivery of postal matter received at their offices from the Meteorological Office and Air Ministry Publication Depot to their Ships abroad.

This matter addressed to the Commanders of Ships contains information which is required for the Conduct of Marine Meteorological Work at Sea and is most effective if received by the Commanders at the earliest possible date.

Much of the information referred to is published in the Marine Observer and is of a seasonal nature. This journal also contains advice to Regular Observing Ships which enables them to perform voluntary service by Wireless Communication for the benefit of all shipping

# ICE CHART. WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

NOTE.—In case of necessity owing to extreme southerly drift of ice, operative dates will be fixed for Track A. (see Copy of letter from Cunard S.S. Co. on this Chart)

- (B) From 1st February to 31st August, inclusive.
  - (F) From 16th May to Opening of Belle Isle route and to 30th November when not using the Belle Isle route. Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race. Eastbound, steer from position 25 miles S. of Cape Race.
  - (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.	Lat.	Long.	Remarks.
Aug. 12, 1903	S.S. Saxon Prince ...	37°52' N.	71°30' W.	Piece 3 ft. high, 40 ft. long.
" 7, 1908	S.S. Caronia ...	50°31' N.	18°55' W.	2 pieces 10 ft. square and 15 ft. square.
" 2, 1909	S.S. Shimosa ...	37°16' N.	42°06' W.	Piece 18 ft. by 5 ft., 2 ft. out of water.
" 14, 1912	S.S. Ulstermore ...	43°55' N.	39°16' W.	Piece.
" 27, 1912	S.S. Lux ...	42°30' N.	15°28' W.	50 ft. sq., 4 ft. out of water.
" 10, 1915	S.S. St. Louis ...	41°02' N.	48°00' W.	Berg.
" 16, 1915	S.S. St. Leonards ...	41°09' N.	58°43' W.	—
" 21, 1915	S.S. Strathgarry ...	40°48' N.	68°20' W.	Growler.
" 1915	Do.	39°30' N.	48°20' W.	Piece 20 ft. long, 4 ft. high.
" 29, 1920	U.S. Hyd. Bulletin	40°30' N.	47°52' W.	Berg.

Reports of Ice sighted between June 1st and June 30th, 1929, which have been received by the Meteorological Office, are shown in the position reported, the figures indicating the day of the month.

**ICE IN GREENLAND WATERS.**

SUMMARY OF INFORMATION FROM CABLEGRAMS RECEIVED FROM DANISH METEOROLOGICAL INSTITUTE, COPENHAGEN.

- May 31..... "Off FREDERIKSHAAB, western edge of ice 40 miles off shore, northern limit could not be stated. No open coastal water. Fog, but presumably few icebergs."
- June 7..... "Off ARSUK, western edge of ice 50 miles off shore, northern limit could not be stated. No open coastal water."
- June 19..... "Edge of open ice 30 miles off Cape Farewell with icebergs inside."

**LATEST ICE REPORT FROM CANADA.**

The following cablegram, dated 12th June, 1929, was received from the Canadian Signal Service, Quebec:—  
Belle Isle Strait—heavy open and heavy close packed ice everywhere, numerous bergs; other points no ice in sight.

**IMPORTANT.**

The following is a copy of a letter from the Cunard S.S. Co., dated 11th June, 1929:—

**North Atlantic Lane Routes.**

"We desire to inform you that owing to the presence of ice in the vicinity of Track 'B,' the following changes have been brought into effect:—

- Eastbound—Steamers to divert to Track 'A' immediately.
- Westbound—Steamers to make the corner 41° North and 47° West until 18th June, after which date vessels proceed on 'A' Track.

This information has been sent to all Lines party to the above Agreement."

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LATE PRESS.

**DERELICTS AND FLOATING WRECKAGE.**

Date.	Position.		Description.
	Latitude.	Longitude.	
<b>BALTIC.</b>			
7.6.29	Between Lysegrund and Anholt.		Drifting wreck.
<b>NORTH SEA.</b>			
1.6.29	53°11'N.	1°30'E.	Boat floating bottom up, apparently ship's lifeboat, dangerous to navigation.
7.6.29	56°58'N.	7°40'E.	Broken wooden mast about one metre above water.
8.6.29	51°42'N.	2°42'E.	Black light buoy drifting.
11.6.29	55°07'N.	6°30'E.	Wreckage.
<b>IRISH SEA.</b>			
14.6.29	54°12'N.	5°02'W.	Spherical buoy.
<b>ENGLISH CHANNEL.</b>			
10.6.29	5 m. E. of Royal Sovereign wreck buoy.		Capsized coble boat with sails attached.
11.6.29	48°09'N.	5°34'W.	Red conical buoy.
16.6.29	49°45'N.	6°—W.	Black conical can buoy.
23.6.29	3 m. S. 75°E. of Owers Light V.		Obstruction similar to torpedo, red end, dangerous to navigation.
<b>NORTH ATLANTIC.</b>			
1.6.29	41°22'N.	48°23'W.	Log about 20 ft. long and 2 ft. in diameter.
1.6.29	40°55'N.	50°37'W.	Tall white cage lattice top buoy surmounted by a black square top, letter A on side, lower part of buoy covered with marine growth.
3.6.29	48°33'N.	5°16'W.	Capsized lifeboat, teak coloured wood.
3.6.29	40°37'N.	56°05'W.	Spar floating upright, apparently attached to submerged wreckage.
3.6.29	40°15'N.	47°30'W.	Short spar about 3 ft. in diameter.
3.6.29	40°28'N.	48°37'W.	Red iron cylinder about 40 ft. long and 6 ft. in diameter.
6.6.29	40°05'N.	44°16'W.	Cylindrical iron tank about 18 ft. long and 3½ ft. in diameter, no marks visible, apparently long time in water.
9.6.29	47°18'N.	26°06'W.	Heavy piece of timber 40 ft. by 20 ft.
10.6.29	44°03'N.	58°50'W.	Schooner <i>Mary Sears</i> on fire and abandoned.
11.6.29	49°35'N.	7°58'W.	Upturned boat about 20 ft. long, covered with marine growth.
12.6.29	49°18'N.	13°31'W.	Red conical buoy.
17.6.29	43°34'N.	10°02'W.	Submerged wreckage, 2 spars, showing above water about 3 ft.
18.6.29	48°14'N.	5°28'W.	Large red conical buoy adrift, dangerous to navigation.
21.6.29	48°09'N.	20°19'W.	Big bell buoy, dangerous to navigation.

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

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

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

**Agents.**

**BELFAST ...** ... Captain J. MCINTYRE, Harbour Master, Harbour  
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(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-  
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(Telephone No.: *Central 2283-4*).

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

**Agents (contd.).**

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

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

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

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

**SYDNEY, New South Wales.** ... Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R.,  
Deputy Director of Navigation.  
Captain C. LINDBERGH.  
Customs House.  
(Telephone No.: *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.: *Seymour 3309*).

LIST OF VOLUNTARY OBSERVING SHIPS

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

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

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

Only in special cases will individual letters be sent.

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

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

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

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

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

Explanation of Abbreviations.

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

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

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

No. = No Meteorological Office instrumental equipment on board.

M = Ship's barometer *mercurial*.

A = Ship's barometer *aneroid*.

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

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

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

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

\*\* = Short range transmission and reception.

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

Selected Ships.

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

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.6.29.	Date Received.
Abinsi ...	Millson, H. E. ...	S. H. Worsley ...	No. A.	Elder Dempster ...	Form 911 17.4.29 to 6.5.29...	28.5.29
†† Accra ...	Wright, J. B. ...	R. Jones, R. B. Ellis, B. C. Haigh, S. H. Griffiths.	" M.	" " ...	Met. Log. 13.2.29 to 1.5.29...	9.5.29
*† Achilles ...	Williams, D. T. ...	A. G. Phillips, N. Anderson, F. W. Hilton.	M.L.	A. Holt ...	" 1.12.28 to 13.4.29 ...	16.5.29
*† Actor ...	Haylett, E. ...	E. Pearce, F. M. Eales, G. Morrice.	"	Harrison ...	" 27.8.28 to 9.11.28 ...	22.11.28
† Adda, M.V. ...	Toft, J. T. ...	S. A. Boswell ...	No. M.	Elder Dempster ...	Form 911 24.4.29 to 27.5.29 ...	30.5.29
††50 Adriatic ...	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. 6.5.29 to 25.5.29... Form 911 5.5.29 to 25.5.29...	28.5.29 27.5.29
Aeneas ...	Wallace, W. K. ...	D. R. Bannerman ...	No. A.	A. Holt ...	" 31.3.29 to 4.5.29 ...	10.6.29
Agapenor ...	Christie, W. ...	B. Bell ...	" A.	" ...	" 20.4.29 to 7.5.29 ...	27.5.29
Aidan ...	Evans, L. ...	N. Caris ...	" A.	Booth ...	" 25.4.29 to 7.5.29 ...	6.6.29
Alban ...	Buck, R. H. ...	M. Thomas, W. Brearley ...	" A.	" ...	" 28.3.29 to 22.5.29 ...	30.5.29
*† Alipore ...	Dawson, E. E. N. ...	" ...	" M.	P. and O. ...	" 27.3.29 to 30.4.29 ...	27.5.29
Almanzora ...	Clarke, E. O. ...	" ...	" A.	R.M.S.P. ...	" 21.3.29 to 6.5.29 ...	16.5.29
††63 Albertie ...	Summers, F. F., R.D., Commr. R.N.R.	W. F. Demison, W. Hill, R. H. Shaw.	W.T.	White Star ...	W.T. Reg. 29.4.29 to 19.5.29 ... Form 911 3.3.29 to 24.3.29...	23.5.29 26.3.29
Alondra ...	Scott, L. S. ...	H. Peters ...	No. A.	Yeoward ...	Form 911 4.5.29 to 25.5.29...	29.5.29
Alybank ...	Clayton, W. E. ...	R. A. B. Ardley ...	" A.	A. Weir & Co. ...	" 16.4.29 to 18.5.29 ...	11.6.29
† Andaluca ...	Thomas, R. J. ...	H. Austen ...	" M.	Blue Star ...	Form 911 1.4.29 to 12.5.29 ...	21.5.29
Anchises ...	Woodgett, R. J. ...	R. Fountain, J. F. Browning ...	" A.	A. Holt ...	" 11.3.29 to 30.5.29 ...	31.5.29
† Andes ...	Smith, W. E., D.S.O., R.D., Capt. R.N.R.	H. Whittle, H. Sang, A. Nicholls, R. N. Mayo.	M.L.	R.M.S.P. Co. ...	Met. Log. 27.10.28 to 6.2.29 ...	18.2.29
Antillian ...	Hannaford, W. T. ...	" ...	No. A.	Leyland ...	Form 911 11.5.28 to 24.7.28 ...	26.7.28
Antiochus ...	Salter, G. H. ...	A. C. Abbott ...	" A.	A. Holt ...	" 18.1.29 to 10.3.29 ...	19.3.29
*† Aorangi ...	Crawford, R. ...	E. V. Bilger, R. Kendall ...	M.L.	Canadian-Australasian	Met. Log. 17.10.28 to 31.1.29 ...	12.3.29
††30 Aquitania ...	Diggle, E. G., R.D., Capt. R.N.R.	R. W. Bee, J. Locke, G. Duguid.	W.T.	Cunard ...	W.T. Reg. 28.4.29 to 14.5.29 ... " 17.5.29 to 5.6.29...	21.5.29 7.6.29
††62 Arabic ...	Bulman, J. B. ...	W. Hesketh, F. Wills, W. Clackby.	"	White Star ...	" 29.4.29 to 17.5.29 ...	21.5.29
*† Arafura ...	Gordon, A. S. ...	F. R. Miller, B. W. Dun, C. Stratford.	M.L.	Eastern and Australian	Met. Log. 4.5.28 to 2.11.28...	21.12.28
*† Argyllshire ...	Wallace, J. ...	R. W. Cook ...	No. M.	Federal ...	Form 911 9.3.29 to 15.4.29...	7.5.29
*† Ariguani ...	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
Ariosto ...	Biggins, R. L. ...	" ...	No. A.	Ellerman Wilson ...	Form 911 17.12.28 to 29.12.28 ...	4.2.29
†† Armadale Castle ...	Owen, S. H. ...	" ...	M.L.	Union Castle ...	Met. Log. 12.4.29 to 1.6.29...	5.6.29
*† Arracan ...	Macfarlane, W. M. F.	J. Henderson, J. Morrison, F. Scott.	"	P. Henderson ...	" 18.10.28 to 7.3.29 ...	27.3.29
Arundel ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly. ...	Telegraphic Report 4.4.29 ...	4.4.29
Arundel Castle ...	Owen, S. H. ...	P. Clissold ...	No. A.	Union Castle ...	Form 911 8.2.29 to 31.3.29...	4.4.29
*† Astronomer ...	Richards, J. ...	A. Frew, E. B. Stephens, W. B. Littlechild.	M.L.	Harrison ...	Met. Log. 5.9.28 to 31.1.29...	14.2.29

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line	Last Log, Register, or Report Contributed. Received up to 14.6.29.	Date Received.
*† <i>Ascanius</i> ...	Wilson, C. A. ...	T. Robb, E. M. Robb, W. H. Elliott.	M.L.	A. Holt ...	Met. Log. 28.10.28 to 1.3.29 ...	18.3.29
<i>Atrous</i> ...	Wilkinson, T. G. ...	H. Nicholas ...	No. A.	A. Holt ...	Form 911 10.5.29 to 21.5.29 ...	10.6.29
*† <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. ...	" ...	" 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 ...	" 8.3.29 to 28.4.29 ...	11.5.29
*† <i>Balranald</i> ...	Townshend, W. P., Capt., R.N.R.	H. Stinn, G. Owen, F. Ward, L. Bailey.	" M.	P. & O. Branch ...	Met. Log. 13.9.28 to 10.1.29 ...	23.1.29
†51 <i>Baltic</i> ...	Warner, G. E., R.D., Capt., R.N.R.	A. C. FAnson, J. C. Boyce, J. K. Crawford.	W.T.	White Star ...	W.T. Reg. 20.5.29 to 7.6.29 ...	11.6.29
<i>Bampton Castle</i> ...	Hutchings, A. H. ...	E. Hamlyn ...	No. A.	Union Castle ...	Form 911 19.5.29 to 9.6.29 ...	11.6.29
*† <i>Banffshire</i> ...	Westropp, T. G. ...	A. Mc L. Pilcher ...	" M.	Turnbull Martin ...	" 28.4.28 to 4.8.28 ...	23.8.28
*† <i>Baradine</i> ...	Rollo, W. ...	C. B. Roche, B. H. Pollitt, P. Haworth, J. H. Anderson.	M.L.	P. & O. Branch ...	Met. Log. 19.7.28 to 20.11.28 ...	22.11.28
*† <i>Barpeta</i> ...	Rudge, J. G., Chandler, H. V.	N. Apps ...	No. M.	British India ...	Form 911 1.4.29 to 30.4.29 ...	3.6.29
*† <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. ...	" ...	" A.	Hudson's Bay Co. ...	" 5.10.28 to 19.11.28 ...	3.12.28
†59 <i>Belgenland</i> ...	Morehouse, W. A. ...	F. Good, C. H. Otterson, F. Clitty.	W.T.	Red Star ...	W.T. Reg. 19.5.29 to 8.6.29 ...	11.6.29
*† <i>Beltana</i> ...	Rollo, W. ...	G. V. Legassick ...	No. M.	P. & O. Branch ...	Form 911 10.2.29 to 1.3.29 ...	25.3.29
<i>Bendader</i> ...	Fairweather, J. J. ...	D. T. McCullum ...	" A.	Ben Line ...	" 3.4.29 to 20.4.29 ...	28.5.29
*† <i>Benalla</i> ...	Sheepwash, J. H. ...	D. E. C. Otter ...	" M.	P. & O. Branch ...	" 13.4.29 to 26.5.29 ...	31.5.29
† <i>Bendigo</i> ...	Nicholl, R. N. C. ...	G. G. Mason ...	" M.	" ...	" 9.8.28 to 28.9.28 ...	3.10.28
*† <i>Benefactor</i> ...	Jones, C. W. ...	S. M. Smith, R. Huntingdon	" M.	Harrison ...	" 15.4.29 to 13.5.29 ...	23.5.29
†31 <i>Berengaria</i> ...	Prothero, W., Rostrom, 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. 5.5.29 to 21.5.29 ...	24.5.29
*† <i>Berrima</i> ...	Short, C. E. ...	G. H. Durrant ...	No. M.	P. & O. Branch ...	Form 911 25.5.28 to 3.6.28 ...	27.8.28
<i>Brenda</i> ...	Lamont, A. ...	N. Ross ...	" A.	Scottish Fishery Bnd. ...	" 2.5.29 to 30.5.29 ...	5.6.29
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	G.C.	Southern Railway ...	Telegraphic Report 11.5.29 ...	11.5.29
*† <i>British Dominion</i> ...	Taylor, R. J. ...	" ...	No. M.	British Tankers ...	" ...	"
*† <i>British Merchant</i> ...	Pitt, R. O. ...	C. Low ...	" M.	" ...	Form 911 1.4.29 to 6.5.29 ...	27.5.29
<i>Bruyere</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. ...	" 30.3.29 to 30.5.29 ...	10.6.29
*† <i>Buteshire</i> ...	Page, W. J. ...	" ...	M.L.	Turnbull Martin ...	" ...	"
†65 <i>Calgaric</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 15.5.29 ...	15.5.29
*† <i>Cambridge</i> ...	Williams, R. ...	" ...	M.L.	Federal ...	" ...	"
† <i>Cameronia</i> ...	Gemmell, W. ...	D. Chamberlain ...	M.L.	Anchor ...	Met. Log. 28.4.28 to 15.9.28 ...	6.11.28
† <i>Camito</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. ...	E. Hamilton ...	No. A.	Canadian Gov. Mercantile Marine. ...	Form 911 19.3.29 to 16.4.29 ...	7.5.29
*† <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> ...	Lamont, J. ...	W. S. Bartlett ...	No. A.	Lyle S.S. Co. ...	" 30.1.29 to 11.3.29 ...	2.4.29
†35 <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. 28.4.28 to 31.5.28 ...	6.6.29
† <i>Carnarvon Castle</i> ...	Stanley, W. F., R.D., Commr. R.N.R.	H. L. Shaw, G. D. Pennick, S. S. Smith.	M.L.	Union Castle ...	Met. Log. 19.1.29 to 12.5.29 ...	23.5.29
†34 <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. 13.5.29 to 1.6.29 ...	5.6.29
<i>Casanare</i> ...	Bryne, S. ...	" ...	No. A.	Elders & Fyffes ...	Form 911 15.4.29 to 3.5.29 ...	7.5.29
† <i>Cathay</i> ...	Griffin, R. H., O.B.E., R.D., Capt. R.N.R.	" ...	" M.	P. & O ...	" 20.4.29 to 28.5.29 ...	31.5.29
<i>Cavina</i> ...	Riseley, A. D. ...	R. C. Harradon ...	" A.	Elders & Fyffes ...	Form 911 9.4.29 to 11.5.29 ...	14.5.29
†52 <i>Cedric</i> ...	Kearney, J., Lt.-Commr. R.N.R.	J. H. Walker, W. Nicoll, N. E. Banks.	W.T.	White Star ...	W.T. Reg. 13.5.29 to 2.6.29 ...	5.6.29
*† <i>Centaur</i> ...	Ward Hughes, J. ...	N. L. Thompson, J. Cockburn, B. L. Brind.	M.L.	A. Holt & Co. ...	Met. Log. 16.7.28 to 14.12.28 ...	18.2.29
<i>Ceramic</i> ...	Musgrave, T. ...	H. A. R. Daman ...	No. A.	White Star ...	Form 911 13.4.29 to 20.5.29 ...	25.5.29
*† <i>Change</i> ...	Gambrill, F. C. ...	T. Tyler, D. Baigent, D. H. O'Hulton.	M.L.	Yull & Co. ...	Met. Log. 1.9.28 to 17.1.29 ...	20.3.29
<i>Changuinola</i> ...	Thorburn, R. A., R.D., Commr. R.N.R.	B. R. Coe ...	No. A.	Elders & Fyffes ...	Form 911 4.5.29 to 4.6.29 ...	7.6.29
<i>Chindwin</i> ...	Paterson, G. ...	" ...	" A.	Henderson ...	" 26.11.28 to 7.2.29 ...	8.3.29
*† <i>Chirripo</i> ...	Sapsworth, S. A. ...	S. J. Jackson ...	" A.	Elders & Fyffes ...	" 13.3.29 to 12.4.29 ...	17.4.29
*† <i>City of Baroda</i> ...	McMillan, J. ...	J. E. Jenkins, W. Faichney, F. T. Mallett.	M.L.	Ellerman ...	Met. Log. 1.1.29 to 22.4.29 ...	30.4.29
<i>City of Benares</i> ...	Anderson, W. W. ...	P. C. Wilson ...	No. A.	" ...	Form 911 5.11.28 to 16.2.29 ...	13.3.29
*† <i>City of Bombay</i> ...	Brown, O. C. ...	E. H. Roberts ...	" M.	" ...	" 16.1.29 to 7.4.29 ...	12.4.29
*† <i>City of Bristol</i> ...	Jenkins, D. ...	K. G. Crockett ...	" M.	" ...	" 11.11.28 to 1.12.28 ...	7.1.29
<i>City of Canterbury</i> ...	Stanley, A. ...	R. H. Hodgson ...	" A.	Ellerman ...	" 9.4.29 to 8.5.29 ...	21.5.29
<i>City of Carlisle</i> ...	Mordue, J. A. ...	" ...	" A.	" ...	" 23.4.29 to 9.5.29 ...	3.6.29
*† <i>City of Chester</i> ...	Letton, F. W. ...	C. C. Duncan, P. C. Arthur, M. J. Mc Nicol.	M.L.	" ...	Met. Log. 7.10.28 to 13.2.29 ...	25.2.29
<i>City of Hong Kong</i> ...	Walton, H. L., O.B.E., R.D., Commr. R.N.R.	H. Saunders ...	No. A.	" ...	Form 911 1.5.29 to 25.5.29 ...	31.5.29
<i>City of Khios</i> ...	Reay, A. S. ...	R. E. Thornton ...	" A.	" ...	" 19.2.29 to 10.3.29 ...	2.4.29
<i>City of London</i> ...	Nicoll, L. ...	" ...	No. A.	" ...	Form 911 2.2.29 to 17.4.29 ...	3.5.29
*† <i>City of Osaka</i> ...	Smith, W. H. ...	R. K. Walker ...	No. M.	" ...	" 29.3.29 to 10.4.29 ...	1.5.29
*† <i>City of Rangoon</i> ...	Jones, P. ...	E. R. Wildermuth, R. H. Stewart, F. E. Broadbent.	M.L.	" ...	Met. Log. 28.3.28 to 9.7.28 ...	1.8.28
<i>City of Yokohama</i> ...	Singleton, J. G. ...	H. Nish ...	No. A.	" ...	Form 911 16.2.29 to 24.2.29 ...	23.4.29
<i>Clan Alpine</i> ...	Lyall, A. B. ...	J. O. H. Kirkwood ...	" A.	Clan ...	" 7.4.29 to 6.5.29 ...	28.5.29
<i>Clan Kenneth</i> ...	Young, A. H., Commr. R.D., R.N.R.	H. C. Carter ...	" A.	" ...	" 12.4.29 to 6.5.29 ...	10.6.29
<i>Clan Lindsay</i> ...	Giles, H. J., R.D., Commr. R.N.R.	J. P. Dunkley ...	" A.	" ...	" 6.4.29 to 25.4.29 ...	27.5.29
<i>Clan MacBean</i> ...	Worthington, J. H. ...	W. A. Nicholas ...	" A.	" ...	" 20.2.29 to 6.3.29 ...	15.4.29
<i>Clan Macbeth</i> ...	Hannay, L. G. ...	J. C. Robertson ...	" A.	" ...	" 19.3.29 to 9.4.29 ...	30.5.29
<i>Clan Macgadyen</i> ...	Laird, C. ...	R. L. Smallbone ...	" A.	" ...	" 24.3.29 to 16.4.29 ...	30.4.29
<i>Clan Macfarlane</i> ...	Redford, L. F. ...	T. A. Pearson ...	" A.	" ...	" 28.10.28 to 14.12.28 ...	21.1.29

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.6.29.	Date Received.
<i>Clan Macgillivray</i>	Mackinlay, A.	F. H. Thornton	No. A.	Clan	Form 911 11.1.29 to 30.1.29	26.2.29
<i>Clan Macindoe</i>	Holman, W. G.	H. Lockyer	" A.	"	" 27.4.29 to 21.5.29	11.6.29
<i>Clan Mackellar</i>	Phillips, G. P.	E. Crowther	" A.	"	" 24.4.29 to 13.5.29	3.6.29
<i>Clan Macphee</i>	Gourlay, J. B.	E. H. Stone, K. C. Simpson, L. R. Legg.	M.L.	"	Met. Log. 11.6.28 to 12.12.28	28.1.29
<i>Clan Macnaughton</i>	Clark, J.	A. H. Hersee	No. A.	"	Form 911 1.4.29 to 1.6.29	10.6.29
<i>Clan Macquarrie</i>	West, W. F.	T. P. Cranwill	" A.	"	" 5.1.29 to 7.2.29	12.2.29
<i>Clan MacTaggart</i>	Higgins C. J.	D. McAllister	" A.	"	" 5.3.29 to 23.3.29	22.4.29
<i>Clan Macwhirter</i>	Low, A.	F. B. Barker, H. M. Watkins	M.L.	"	Met. Log. 18.6.28 to 16.1.29	11.2.29
<i>Clan Malcolm</i>	George, L. S.	J. Masters, R. L. Ranford, J. F. Hubbard, R. L. Martin.	"	"	" 7.7.28 to 21.10.28	19.11.28
<i>Clan Morrison</i>	Porterfield, W. M. Lt.-Commr., R.N.R.	L. C. Cuthbert	No. A.	"	Form 911 4.4.29 to 28.4.29	10.5.29
<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.	"	" 17.3.29 to 11.4.29	26.4.29
<i>Clan Sinclair</i>	Taylor, P. V.	J. H. Dennis	" A.	"	" 17.3.29 to 29.3.29	8.4.29
<i>Colonial</i>	Worthington, B.	A. S. Milne	" M.	T. & J. Harrison	" 18.9.28 to 23.3.29	6.4.29
<i>Comorin</i>	Borland, J. Mc.I., C.B., D.S.O., R.D., Capt., R.N.R.	E. C. White	" M.	P. & O.	" 22.2.29 to 2.4.29	21.5.29
<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.	H. D. Cooper, R. N. Fletcher, W. S. Thomas.	" A.	Union Castle	"	"
<i>Culebra</i>	Goble, C. J., R.D., Commr., R.N.R.	P. Shakespear, F. Loughead, T. Shillito, J. Lennox.	M.L.	R.M.S.P. Co.	Met. Log. 6.1.29 to 13.3.29	1.4.29
<i>Cumberland</i>	Macmillan, D.	C. B. P. Anderson	"	Federal	" 29.10.28 to 29.3.29	5.4.29
<i>Cyclops</i>	Cosker, W.	"	No. A.	A. Holt	Form 911 4.4.29 to 23.4.29	11.5.29
<i>Daga</i>	Wiles, N.	A. Olding	" M.	P. Henderson	" 16.11.28 to 9.12.28	22.12.28
<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	" 2.4.29 to 18.4.29	21.5.29
<i>Darro</i>	Turner, E. H.	"	" M.	R.M.S.P. Co.	" 16.5.29 to 28.5.29	13.6.29
<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	" 19.2.29 to 31.3.29	6.6.29
<i>Delta</i>	Townshend, W. P., R.D., Capt., R.N.R.	D. M. Stafford	" M.	P. & O.	" 11.3.29 to 30.3.29	13.5.29
<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 Commonwealth	" 21.4.29 to 9.6.29	12.6.29
<i>Denis</i>	Harris, F. C. P.	J. H. Stokes	" A.	Booth	" 6.12.28 to 25.2.29	6.4.29
<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	" M.	A. Holt	" 10.4.29 to 29.4.29	10.6.29
<i>Devon</i>	Kinnell, G.	S. C. Bradley	" A.	Federal	" 5.3.29 to 22.4.29	6.5.29
<i>Dieppe</i>	Marmery, S.	Mr. Parsons	C.C.	Southern Railway	Telegraphic Report 16.5.29	16.5.29
<i>Dimboola</i>	Dawson, J.	S. J. Griffith	No. A.	Melbourne S.S. Co.	Form 911 15.2.29 to 10.4.29	13.5.29
<i>Domala, M.V.</i>	Kitson, A. G.	H. Robertson	" M.	British India	" 21.10.28 to 29.12.28	14.1.29
<i>Domitia, C.S.</i>	Campos, V., O.B.E., Lt.-Commr., R.N.R.	S. A. Garnham, A. S. Muir, L. J. Hegarty, W. F. Anderson.	M.L.	Telegraph Construction & 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>Dorica</i>	Cole, N.	F. E. Patchett, J. Farrell, S. A. Jones.	W.T.	White Star	" 5.5.29 to 25.5.29	28.5.29
<i>Dorington Court</i>	Clarke, E. J.	P. Jones	No. A.	Haldin & Co.	W.T. Reg. 5.5.29 to 25.5.29	29.5.29
<i>Dromore Castle</i>	MacMahon, J., R.D., Commr., R.N.R.	J. A. Sowden	" A.	Union Castle	Form 911 7.1.29 to 14.2.29	16.3.29
<i>Dryden</i>	Major, T. W.	"	" M.	Lampton & Holt	" 15.4.29 to 9.5.29	5.6.29
<i>Duchess of Atholl</i>	Griffiths, E.	"	" M.	Canadian Pacific	" 21.10.28 to 14.1.29	7.2.29
<i>Duchess of York</i>	Stuart, R.N., V.C., D.S.O., Commr., R.N.R.	"	" M.	"	"	"
<i>Dunaif 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.	" 9.5.29 to 17.5.29	21.5.29
<i>Duquesa</i>	Barker, A. W.	J. G. Freeman	" M.	Furness Withy	" 13.1.29 to 14.3.29	19.3.29
<i>Durenda, M.V.</i>	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.	D. M. Range	" A.	Elder Dempster	" 6.2.29 to 14.4.29	15.4.29
<i>El Argentino</i>	Ellis, F.	"	" M.	Houlder	"	"
<i>Eldon Park</i>	Burns, R.	D. Rankine	" M.	Denholm S.S. Co.	" 5.3.29 to 10.5.29	1.6.29
<i>Elpenor</i>	Gordon, A. L.	E. Roberts, A. Pearson, J. E. Hiff.	M.L.	A. Holt	Met. Log. 9.12.28 to 13.4.29	22.4.29
<i>Elstree Grange</i>	St. Pierre, P.	"	No. M.	Houlder	Form 911 10.2.29 to 16.5.29	30.5.29
<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.	"	Canadian Pacific	" 11.10.28 to 9.2.29	13.3.29
<i>Empress of France</i>	Robinson, S., C.B.E., R.D., Commr., R.N.R.	A. G. Simmons	"	"	" 28.11.28 to 2.3.29	3.4.29
<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>	Law, E. F. B., Commr., R.N.	P. Barlow, S. J. Hennessey, W. M. Passmore, M. B. Thomas.	"	His Majesty's Ship	" 15.11.28 to 14.3.29	8.4.29
<i>Enterprise</i>	Pridham-Wippell, H.D., Capt., R.N.	"	"	"	"	"
<i>Essequibo</i>	Kirkwood, J. H.	J. H. E. Evans	No. M.	R.M.S.P. Co.	Form 911 12.7.28 to 26.9.28	16.11.28
<i>Eumaeus</i>	Read, J. W.	D. W. Stroud	" A.	A. Holt	" 12.4.29 to 27.4.29	6.5.29
<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.	" 3.5.29 to 29.5.29	5.6.29
<i>Ferndale</i>	Thompson, W.	R. S. Hartrick	" M.	Aberdeen Commonwealth.	" 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 14.6.29.	Date Received.
*† <i>Fordsdale</i> ...	Richardson, A. V. ...	F. Vaughan ...	No. M	Aberdeen Common-wealth.	22.2.29 to 18.3.29	4.4.29
<i>Francisco</i> ...	Scales, H. ...	W. F. Hewetson ...	" A.	Ellerman Wilson ...	Form 911 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. Macbryde.	M.L.	A. Holt & Co. ...	Met. Log. 11.9.28 to 15.2.29	24.4.29
*† <i>Glamorganshire</i> ...	Purvis, A. ...	E. A. E. Littlewood ...	No. M.	R.M.S.P. Co. ...	Form 911 17.9.28 to 19.10.28	25.10.28
*† <i>Glenamoy, M.V.</i> ...	Homan, C. E. ...	R. W. Emerson, R. W. Brooks, J. R. Taylor.	M.L.	Glen Line ...	Met. Log. 25.6.28 to 7.11.28	6.12.28
<i>Glenapp</i> ...	Ingram, T. F. ...	...	No. A.	"	Form 911 19.1.29 to 27.2.29	2.4.29
<i>Glenbeg</i> ...	Newing, L. ...	A. D. Brown ...	" A.	"	27.10.29 to 18.1.29	22.1.29
*† <i>Glengarry</i> ...	Angier, J. ...	F. C. White, D. C. Evans ...	" M.	"	7.3.29 to 9.5.29...	15.5.29
<i>Glenluce</i> ...	Kenner, W. H. ...	H. B. Porter ...	" A.	"	25.4.29 to 10.5.29	21.5.29
<i>Glenshane</i> ...	Suter, S. C. ...	...	" A.	"	10.11.28 to 1.4.29	6.4.29
<i>Glentworth</i> ...	Kilgour, H. A. ...	W. C. Wright ...	" A.	R. S. Dalgleish ...	3.3.29 to 16.4.29...	10.5.29
<i>Gloucestershire</i> ...	Robin, E. ...	W. Moore ...	" A.	Bibby ...	1.12.28 to 8.2.29...	12.2.29
<i>Gloxinia</i> ...	Pool, F. G. ...	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 ...	10.2.29 to 28.4.29	28.5.29
<i>Haliartius</i> ...	Felton, W. J. ...	F. D. Bonney ...	" A.	"	13.11.28 to 8.2.29	28.2.29
*† <i>Hardbooke Grange</i> ...	Fowler, W. H. ...	...	" M.	Houlder ...	20.1.29 to 20.3.29	2.4.29
<i>Harmonides</i> ...	Elwell, F. R. ...	E. H. Pape ...	" A.	R. P. Houston ...	4.5.29 to 1.6.29...	5.6.29
*† <i>Hatimura</i> ...	Parkin, J. W. ...	D. M. Heath ...	" M.	British India ...	13.2.29 to 14.3.29	16.3.29
*† <i>Hauraki, M.V.</i> ...	Norton, A. T. ...	D. M. McLeish, C. H. George, F. C. Cochran.	M.L.	Union S.S. Co., N.Z. ...	Met. Log. 17.4.28 to 25.10.28	4.1.29
<i>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>Herminius</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>Hestone</i> ...	McComish, A. B. ...	...	No.	R. P. Houston ...	...	...
<i>Hibernia</i> ...	Roberts, W. Ivor, M.B.E.	R. Woodall, A. Marsh ...	O.C.	L.M. & S. Railway ...	Telegraphic Report 11.5.29	11.5.29
*† <i>Highland Chieftain, M.V.</i> ...	Robinson, R. H. ...	Cables, J. H. ...	No. M.	Nelson ...	...	...
<i>Highland Ladie</i> ...	Jones, T. J. ...	E. F. Smart ...	" A.	"	Form 911 22.4.28 to 12.6.28	9.7.28
*† <i>" Piper</i> ...	Collings, D. ...	R. G. Owen, A. Southgate, W. Stephen.	M.L.	"	Met. Log. 23.6.28 to 10.1.29	21.1.29
<i>" Pride</i> ...	Robinson, R. H. ...	F. Quelch ...	No. A.	"	Form 911 8.9.28 to 3.11.28	7.11.28
<i>" Prince</i> ...	Taylor, F. ...	W. A. Hall ...	" A.	Prince ...	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. ...	D. S. Davies ...	" A.	Booth ...	13.3.29 to 24.4.29	30.4.29
*† <i>Hobson's Bay</i> ...	Kydd, O. J. ...	R. Pearce, J. Worrall, D. Horn, R. S. Winnall.	M.L.	Aberdeen Common-wealth.	Met. Log. 30.10.28 to 11.2.29	5.3.29
<i>Holbein</i> ...	Gough, W. A. ...	F. Delaney ...	No. A.	Lampport & Holt ...	Form 911 6.1.29 to 17.3.29	2.4.29
*† <i>54 Homeric</i> ...	White, E. R., R.D., Commr. R.N.R.	H. G. Morgan, W. T. Poustie, D. K. Gawford.	W.T.	White Star ...	W.T. Reg. 16.5.29 to 30.5.29	5.6.29
<i>Hororata</i> ...	Barnett, H. ...	E. A. Quick ...	No. A.	New Zealand S.S. Co. ...	Form 911 17.1.29 to 8.2.29	18.3.29
<i>Hubert</i> ...	Briscoe, W. ...	G. G. Westhorp ...	" A.	Booth ...	2.1.29 to 1.3.29	23.3.29
<i>Huntingdon</i> ...	Field, H. G. B. ...	H. G. Letts ...	" A.	Federal ...	16.2.29 to 5.3.29...	25.3.29
*† <i>Huntsman</i> ...	Russell, H. ...	J. Richardson ...	" M.	Harrison ...	13.4.28 to 16.8.28	3.9.28
*† <i>Hydaspes</i> ...	Williams, P. E. ...	P. McMillan ...	" M.	R. P. Houston ...	27.3.29 to 24.4.29	2.5.29
*† <i>Ingoma</i> ...	Gibbins, W. ...	W. E. Williams ...	" M.	Harrison ...	Form 911 23.3.29 to 2.5.29	6.5.29
<i>Inkum</i> ...	Meethan, J. T. ...	...	" A.	J. H. Welford ...	10.4.28 to 15.4.29	3.6.29
*† <i>Iris, C.S.</i> ...	Hughes, H. E. ...	D. MacDonald, T. Vickers, J. Hare, G. Holthouse	M.L.	Pacific Cable Board...	Met. Log. 23.2.28 to 10.1.29	15.3.29
<i>Iroquois</i> ...	Nares, J. D., D.S.O., Capt. R.N.	A. B. Foulleston...	"	His Majesty's Ship ...	1.9.28 to 30.11.28	8.1.29
*† <i>Ixion</i> ...	Collins, H. M. ...	...	"	A. Holt ...	Form 911 9.10.28 to 26.10.28	19.12.28
<i>Javanese Prince</i> ...	Smith, J. ...	J. B. Morrison ...	No. A.	Prince ...	7.5.29 to 20.5.29...	5.6.29
*† <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>Katsar-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> ...	Cornewall Jones, B.	W. R. B. Noal ...	" M.	P. & O. ...	9.3.29 to 21.4.29...	10.5.29
*† <i>Kangaroo</i> ...	Norris, H. C. ...	J. Sinclair, J. S. Airey, E. Hutchinson, J. Edward, H. Reynolds, V. L. Gilbert.	M.L.	State Service Aus-tralia.	Met. Log. 3.9.28 to 24.2.29...	27.5.29
*† <i>Karamea</i> ...	McIntosh, A. ...	...	" M.	Shaw, Savill & Albion	15.9.28 to 17.1.29	23.1.29
*† <i>Karapara</i> ...	Miller, A. C. ...	J. Smail ...	No. M.	British India...	Form 911 10.4.29 to 28.4.29	28.5.29
*† <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, Aus-tralia.	24.7.28 to 6.9.28...	15.10.28
*†† <i>Laconia</i> ...	Doyle, M. ...	E. W. Connell, A. B. Fasting, F. G. Russell ...	W.T.	Cunard ...	W.T. Reg. 4.4.29 to 12.4.29...	16.4.29
<i>Laguna</i> ...	Dunn, R. E., O.B.E. ...	R. W. Hanson ...	No. A.	Pacific S.N. Co. ...	Form 911 21.4.29 to 12.5.29	16.5.29
*† <i>Lahore</i> ...	Gordon, L. M., R.D., Commr. R.N.R.	E. B. Elcoate ...	" M.	P. & O. ...	Form 911 29.3.29 to 12.5.29	15.5.29
<i>Lalande</i> ...	Hamill, H. ...	...	" A.	Lampport & Holt ...	9.4.29 to 28.4.29	1.5.29
<i>Lancashire</i> ...	de Legh, P. ...	W. H. Campe ...	" A.	Bibby ...	15.5.28 to 29.6.28	12.7.28
*†† <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. 20.5.29 to 4.5.29...	11.6.29
<i>Laomedon</i> ...	Hatfield, F. ...	O. P. H. Wynne...	No. A.	A. Holt... ...	Form 911 19.5.29 to 6.6.29...	10.6.29
					Form 911 28.3.29 to 31.5.29	13.6.29

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.6.29.	Date Received.
*† La Paz, M.V.	Benson, C. W.	E. Hicks ...	No. M.	Pacific S.N. Co.	Form 911 13.4.29 to 1.5.29...	21.5.29
††55 Lapland ...	Harvey, H.	L. A. Williams, J. C. Flett, J. Gladstone.	W.T.	Red Star ...	W.T. Reg. 5.5.29 to 23.5.29 ... Form 911 5.5.29 to 25.5.29 ...	28.5.29 27.5.29
*† Largs Bay ...	Jenkyn, W. M.	... ..	No. M.	Aberdeen Common-wealth.	Form 911 25.1.29 to 4.5.29 ...	7.5.29
††64 Laurentic ...	Trant, E. L., R.D., Commr. R.N.R.	J. W. Peters, R. Hawkyms ...	W.T.	White Star ...	W.T. Reg. 28.4.29 to 18.5.29 ... Form 911 28.4.29 to 18.5.29 ...	21.5.29 21.5.29
*† Lautaro, M.V.	Leyne, R. W.	J. T. Denley ...	No. M.	Pacific S.N. Co.	Form 911 27.11.28 to 12.1.29 ...	22.1.29
*† Leicestershire ...	English, G. L.	R. S. Evans H. G. Walton, E. D. Brand, A. Thomson.	M.L.	Bibby ...	Met. Log. 2.2.29 to 10.4.29 ...	17.4.29
Leighton, M.V.	Lindesay, J. M.	... ..	No. A.	Lampport & Holt	Form 911 1.5.28 to 20.5.28 ...	19.6.28
*† Limerick ...	Molyneux, P. L.	G. Chaplin ...	" M.	Federal... ..	" 18.1.29 to 24.2.29 ...	18.3.29
Llandaf Castle ...	Gilbert, E. F.	W. A. Cooke ...	M.L.	Union Castle ...	" 29.12.28 to 16.1.29 ...	12.2.29
*† Llandoverly Castle ...	Stuart, C. E., Capt. R.N.R.	C. H. Williams, G. Moon, P. Clissold.	M.L.	" ...	Met. Log. 15.11.28 to 21.1.29 ...	1.2.29
Llanstephan Castle	Whitfield, G. J.	... ..	No. A.	" ...	" ...	" ...
*† Lobos, M. V.	Pape, E. R.	S. E. Ayland ...	" M.	Pacific S.N. Co.	Form 911 22.5.29 to 9.6.29 ...	12.6.29
Loch Kabrine ...	Schlanbusch, O. V.	D. A. Mallinson ...	" A.	R.M.S.P. Co. ...	" 3.2.29 to 5.5.29 ...	10.5.29
*† Logician ...	Herschel, R. F.	A. G. S. Madrell ...	" M.	Harrison ...	" 23.2.29 to 18.4.29 ...	30.4.29
*† London Importer ...	Nuttall, E. L.	F. F. Feint, J. H. Metcalfe, J. G. Freeman.	" M.	Furness Withy ...	Met. Log. 8.1.28 to 31.3.28 ...	14.4.28
Lord Antrim ...	Jarvis, F. E.	... ..	" A.	Ulster S.S. Co.	Form 911 4.1.29 to 19.1.29... ..	23.1.29
Loriga, M.V.	Clapham, E. C.	D. P. Morgan ...	" A.	Pacific S.N. Co.	" 8.2.29 to 27.2.29... ..	3.6.29
*† Losada, M.V.	Ross, J.	D. Beamer ...	" M.	" ...	" 5.3.29 to 19.4.29 ...	29.4.29
†† Macedonia ...	(Morton, A. J., Harrison, R.)	C. J. L. Hayward ...	" M.	P. & O. ...	" 27.2.29 to 8.5.29... ..	16.5.29
*† Macharda ...	Hanna, R. G.	A. C. Hocking, H. M. Russell	" M.	Brocklebank ...	" 4.5.29 to 21.5.29 ...	6.6.29
Macquarie ...	Heyen, G. H.	... ..	No.	On Chang & Co.	" ... ..	" ...
*† Maharaja ...	Elliott, G. F.	... ..	" M.	Asiatic S.N. Co.	" 6.3.29 to 24.4.29 ...	10.6.29
*† Mahronda ...	Sharpe, G.	L. Lee ...	" M.	" ...	" 20.5.29 to 29.5.29 ...	6.6.29
*† Mahsud ...	Kershaw, R. W.	J. D. Paisley ...	" M.	" ...	" 15.4.29 to 24.4.29 ...	22.5.29
*† Maidan ...	Robertson ...	... ..	" M.	" ...	" 1.5.29 to 3.6.29 ...	11.6.29
*† Maihar ...	Charlton, W. L.	J. W. B. Robertson, C. Cadwallader, A. D. Spring.	M. L.	" ...	Met. Log. 2.11.28 to 10.3.29 ...	8.4.29
*† Maimoa ...	Johnson, J. W.	D. Aitchison, A. D. Masters, R. Belford.	"	Shaw, Savill & Albion	" 11.11.28 to 15.3.29 ...	19.3.29
Maimyo ...	Smith, G. C.	H. M. Drummond ...	No. A.	Brocklebank ...	Form 911 18.8.28 to 14.11.28 ...	29.11.28
††58 Majestic ...	Marshall, W., C.B., D. S. O., R. D., Commadore R.N.R.	W. W. Pearson, A. Fisher, W. T. Fitz Gerald, A. H. Young.	W.T.	White Star ...	W.T. Reg. 3.5.29 to 16.5.29 ... " 24.5.29 to 6.6.29 ...	21.5.29 11.6.29
*† Makalla ...	Maugham, J. W.	A. L. Harrop ...	No. M.	Brocklebank ...	Form 911 25.3.29 to 2.5.29 ...	10.5.29
*† Makambo ...	Williams, D. J., McLean, J., (Martin, W., Brown, J. F. S.)	R. Perry, R. A. Williams S. Sandison, W. A. Todd, J. Billingham, G. Edwards.	M.L.	Burns Philp ...	Met. Log. 30.6.28 to 20.11.28 ...	4.1.29
*† Makura ...	Donaldson, A.	L. Millar ...	"	Canadian-Australasian	" 3.10.28 to 16.2.29 ...	16.4.29
*† Malabar, M.V.	Adamson, F. L.	N. Grayson ...	No. M.	Burns, Philp & Co. ...	" 5.5.28 to 14.10.28 ...	2.1.29
*† Malakuta ...	Whitham, F.	... ..	" M.	Brocklebank ...	Form 911 30.11.28 to 9.4.29 ...	6.5.29
*† Malancha ...	Gray, T. N.	... ..	" M.	" ...	" 11.2.29 to 21.2.29 ...	26.3.29
*† Malda ...	Browning, J. B., R.D., Commr. R.N.R.	A. D. Dennis ...	" M.	British India	" 11.2.29 to 20.3.29 ...	4.4.29
†† Maloja ...	Stringer, R. H., O.B.E., R.D., Commr. R.N.R.	G. C. Case, F. D. Shaw ...	" M.	P. & O. ...	" 14.3.29 to 18.4.29 ...	29.4.29
*† Malwa ...	Stott, C. H.	J. H. Round, H. Boyce, E. E. Bonnaud.	" M.	" ...	" 19.4.29 to 2.5.29 ...	23.5.29
*† Manchester Brigade	Makin, T.	J. F. Whitly ...	M.L.	Manchester Liners ...	Met. Log. 25.8.28 to 4.2.29 ...	15.2.29
Manchester Corporation.	Riley, J. E., Barclay, J.	H. Anderton, J. H. Emmett, H. Dobson, A. Ricketts, A. Grant.	No. A.	" ...	Form 911 26.2.29 to 13.4.29 ...	20.4.29
*† Manchester Hero	Struss, F. D.	... ..	M.L.	" ...	Met. Log. 24.3.28 to 12.10.28 ...	19.10.28
Manchester Producer	Maples, S. H., Mulchay, G., Cochran, G. N., Pengelly, J., Hudson, H. T., Commr. R.N.R.	... ..	No. A.	" ...	Form 911 2.3.29 to 31.3.29 ...	3.4.29
*† Manela ...	Green, F. V., Cornish, N. P., Martin, W., McNeil, S. G.S., R.D., Capt., R.N.R.	... ..	" M.	British India...	" 21.4.29 to 27.5.29 ...	6.6.29
*† Mangalore ...	W. Mortimer ...	... ..	" M.	Brocklebank ...	" 23.3.29 to 11.4.29 ...	3.6.29
*† Manipur ...	W. Gibson ...	... ..	" M.	Brocklebank ...	" 4.3.29 to 1.4.29 ...	22.4.29
*† Manistee ...	A. J. Herbert ...	... ..	" M.	Elders & Fyffes	" ... ..	" ...
*† Maunora ...	R. H. C. Crawford, C. B. Osborne, B. J. P. Tuck.	... ..	" M.	British India...	Form 911 30.12.28 to 28.3.29 ...	2.4.29
†† Mantua ...	Davis, H. C., D.S.C., Commr. R.N.R.	... ..	" M.	P. & O. ...	" 4.11.28 to 7.2.29... ..	25.2.29
*† Marella ...	Mortimer, S.	... ..	M.L.	Burns Philp ...	Met. Log. 3.7.28 to 18.9.28... ..	19.1.29
*† Marengo ...	Curle, J.	H. Bryan, G. W. Revell, F. Foyal, S. Butcher.	"	Ellerman Wilson	" 18.7.28 to 6.1.29... ..	22.1.29
Maresfield ...	Berry, V.	T. Connolly ...	No. A.	Woods, Tyler & Brown	Form 911 3.5.28 to 19.5.28... ..	9.6.28
†† Margha ...	Hughes, C. G.	P. Wright, H. Watkins ...	M.L.	British India...	Met. Log. 1.12.28 to 28.2.29 ...	5.3.29
*† Marguesa ...	Smiles, R. S.	L. Owen... ..	No. M.	Furness Houlder ...	Form 911 17.1.29 to 29.3.29 ...	15.4.29
*† Marsina ...	Mitchie, W.	... ..	" A.	Burns, Philp & Co. ...	" 15.3.29 to 17.4.29 ...	27.5.29
*† Matakana ...	Thurston, H. P.	E. Davies, B. Forbes-Moffatt, J. Dickson.	M.L.	Shaw, Savill & Albion	Met. Log. 29.9.28 to 11.2.29 ...	13.2.29
Mataram ...	Voy, W.	... ..	No. A.	Burns, Philp & Co. ...	Form 911 23.1.29 to 22.2.29 ...	2.4.29
†† Mataroa ...	Kershaw, W. A. R.	F. Eadon, J. J. Nicoll, C. Meyer.	M.L.	Shaw, Savill, & Albion	Met. Log. 1.2.29 to 15.5.29 ...	21.5.29
*† Matheran ...	Ison, W. A.	J. Richardson ...	No. M.	Brocklebank ...	Form 911 6.11.28 to 18.11.28 ...	23.11.28
*† Matiana ...	Green, F. V.	W. Mortimer ...	" M.	British India...	" 16.3.29 to 4.6.29 ...	10.6.29
*† Matra ...	Cornish, N. P.	W. Gibson ...	" M.	Brocklebank ...	" 28.11.28 to 23.3.29 ...	27.3.29
*† Maunganut...	Martin, W.	A. J. Herbert ...	" M.	Union S.S. Co. of N.Z	" 22.3.29 to 15.4.29 ...	3.6.29
*†32 Mauretania ...	McNeil, S. G.S., R.D., Capt., R.N.R.	R. H. C. Crawford, C. B. Osborne, B. J. P. Tuck.	W.T.	Cunard ...	W.T. Reg. 12.5.29 to 27.5.29 ... " 21.4.29 to 6.5.29... ..	30.5.29 9.5.29
††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 ...	" 6.5.29 to 23.5.29 ...	28.5.29
††22 Melita ...	Stewart, A.	J. Shearer ...	W.T.	Canadian Pacific ...	W.T. Reg. 5.5.29 to 24.5.29 ...	28.5.29
Mennon ...	Watson, C. J.	J. A. C. McGregor ...	No. A.	A. Holt... ..	Form 911 12.1.29 to 23.1.29 ...	28.1.29
††21 Metagama ...	McCombie, G. F., R.D., Commr. R.N.R.	C. L. de H. Bell, J. H. Tudor, A. Newsome.	W.T.	Canadian Pacific	W.T. Reg. 12.5.29 to 31.5.29 ...	5.6.29
*† Middlesex ...	Wilde, H.	D. J. Murray, ...	No. M.	Federal... ..	Form 911 8.2.29 to 18.5.29 ...	25.5.29
*† Minna ...	Mackenzie, G. G.	A. M. Campbell ...	" A.	Scottish Fishery Bnd.	" 26.3.29 to 14.5.29 ...	21.5.29
††23 Minnedosa ...	McQueen, D. S.	C. D. Watt, W. J. P. Roberts, H. M. Sanders.	W.T.	Canadian Pacific	W. T. Reg. 28.3.29 to 13.4.29 ... " 21.4.29 to 12.5.29 ... Form 911 27.3.29 to 13.5.29 ...	16.4.29 16.5.29 15.5.29
†† Minnesota ...	Finch, E., R. D., Commr. R.N.R.	L. C. Hill... ..	No. M.	Atlantic Transport...	Form 911 5.5.29 to 26.5.29 ...	30.5.29
†† Minnetonka ...	Gates, T. F., C.B.E.	H. E. D. McCartney ...	" M.	" ...	" 12.5.29 to 2.6.29 ...	6.6.29



LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Report Contributed. Received up to 14.6.29.	Date Received
<i>Polycarp</i> ...	Reynolds, W. H. B. ...	H. W. Taggart ...	No. A.	Booth ...	Form 911 23.4.29 to 8.5.29...	27.5.29
*† <i>Port Adelaide</i> ...	Swan, L. H. ...	R. B. Linklater, C. J. Gorley, F. J. Lavers.	M.L.	Commonwealth & Dominion.	Met. Log. 20.7.28 to 14.12.28	28.12.28
*† <i>Auckland</i> ...	Durham, R. S., D.S.O.	C. F. Post, E. R. Rowlands, W. Roberts, E. W. Dingle.	"	" " "	" 28.8.28 to 24.1.29	21.2.29
" <i>Bowen</i> ...	Hearn, G. W. ...	S. Ray ...	No. A.	" " "	Form 911 9.9.28 to 17.9.28...	26.10.28
*† <i>Campbell</i> ...	Needham, R. ...	J. G. Thom ...	M.L.	" " "	" 15.8.28 to 6.1.29...	14.1.29
*† <i>Caroline</i> ...	Brown, A. H. ...	J. B. Bradley, G. Langford, J. Stannard, L. J. Brice ...	"	" " "	Met. Log. 26.10.28 to 3.4.29	8.4.29
*† <i>Darwin</i> ...	Sawbridge, I. R. ...	H. Pinkney, E. M. Fenton, S. Moate.	"	" " "	" 2.9.28 to 3.1.29	7.1.29
*† <i>Denison</i> ...	Ferris, J. ...	L. W. Cady, A. A. Cooper, E. Beard, J. Rowland-Hill.	"	" " "	" 10.10.28 to 14.3.29	1.4.29
" <i>Dunedin, M.V.</i>	Farmar, F. ...	H. M. Post, V. G. Battle, W. Hopkins.	"	" " "	" 19.12.28 to 15.4.29	23.4.29
" <i>Fremantle, M.V.</i>	Gilling, W. ...	" " " " " " " "	No. A.	" " "	Form 911 29.3.29 to 16.4.29	21.5.29
" <i>Gisborne, M.V.</i>	Hayter, S. W. ...	H. Boys-Smith ...	" A.	" " "	" 2.1.29 to 1.5.29	11.5.29
*† <i>Hobart, M. V.</i>	Cottell, S. C. ...	L. Copeland, C. L. Webb, G. J. O. Jimman, W. B. Craig	M.L.	" " "	Met. Log. 21.11.28 to 23.3.29	3.4.29
*† <i>Hunter</i> ...	Robinson, C. A. ...	R. B. Stannard, A. McClounan, J. T. Weldin.	"	" " "	" 1.8.28 to 23.12.28	31.12.28
" <i>Huon</i> ...	Compton, J. E. ...	" " " " " " " "	No. A.	" " "	Form 911 6.3.29 to 3.4.29	10.4.29
*† <i>Melbourne</i> ...	Kippins, T. ...	W. G. Jones, F. W. Elgar, W. E. Simpson.	M.L.	" " "	Met. Log. 23.11.28 to 21.4.29	25.4.29
*† <i>Nicholson</i> ...	Jack, J. ...	J. H. Sloan, T. L. Kidwell, J. A. D. Fisher.	M.L.	" " "	Met. Log. 12.9.28 to 30.1.29	27.2.29
*† <i>Pirie</i> ...	Hudson, J. J. ...	E. H. Rogerson, A. Cooper, A. Brown.	"	" " "	" 26.11.28 to 22.4.29	3.5.29
*† <i>Sydney</i> ...	Higgs, W. G. ...	E. E. Roswell, F. R. Gorman, R. D. Chamberlain.	"	" " "	" 25.9.28 to 29.1.29	8.2.29
*† <i>Victor</i> ...	Williams, R. ...	W. Pickup, C. Hodson, C. E. Midwinter.	"	" " "	" 14.7.28 to 1.1.29...	23.1.29
" <i>Wellington</i> ...	Jones, C. N. ...	L. J. Skails ...	No. A.	" " "	Form 911 13.3.29 to 17.4.29	21.5.29
" <i>Protea, H.M.S.A.S.</i>	Dalglish, J., Lt.-Commr., S.A.N.S.	F. J. Dean ...	M.L.	South African Naval Service.	Met. Log. 16.10.28 to 20.2.29	21.3.29
*† <i>Protestlaus</i> ...	Quirk, T. W. ...	J. Milhench, A. E. Martin, E. A. H. Gepp.	"	A. Holt ...	" 20.11.28 to 24.4.29	14.5.29
" <i>Pyrrhus</i> ...	Elford, W. J. ...	C. W. Copelin ...	No. A.	" " "	Form 911 27.3.29 to 2.6.29...	12.6.29
*† <i>Quiloa</i> ...	Cave, S. G. ...	E. M. B. Heath, W. Welch ...	" M.	British India...	" 31.7.28 to 21.1.29	20.2.29
†† <i>Rajputana</i> ...	Cadiz, F. G., D.S.O. ...	R. E. Tucker ...	" M.	P. & O. ...	" 16.2.29 to 11.4.29	17.4.29
†† <i>Ranchi</i> ...	Brooks, C., D.S.O., R.D., Commr., R.N.R.	B. P. Skinner ...	" M.	P. & O. ...	" 3.5.29 to 22.5.29...	28.5.29
†† <i>Ranpura</i> ...	King, A. M., D.S.O. ...	E. J. Spurling ...	" M.	P. & O. ...	" 13.4.29 to 1.5.29...	3.5.29
†† <i>Razmak</i> ...	Harrison, R., D.S.O., R.D., Capt. R.N.R.	" " " " " " " "	" M.	P. & O. ...	" " " " " " " "	"
††60 <i>Regina</i> ...	Davies, E. ...	R. S. Walker, E. A. A. Crowley, C. W. R. Campbell	W.T.	White Star - Dominion	" 19.5.29 to 9.6.29...	13.6.29
*† <i>Remuera</i> ...	Cameron, J. J. ...	H. Harwood, C. R. Pilcher, T. S. Marchington, R. C. Aldridge.	M.L.	New Zealand S.S. Co.	W.T. Reg. 19.5.29 to 9.6.29... Met. Log. 24.11.28 to 15.3.28	11.6.29 17.4.28
" <i>Rhexenor</i> ...	Stout, G. L. ...	W. E. Barrett ...	No. A.	A. Holt...	Form 911 14.3.29 to 21.4.29	10.5.29
" <i>Rhodesian Transport.</i>	Bullock, F. W. H. ...	J. G. Freeman ...	" A.	Houlder Bros. ...	" 6.9.28 to 24.12.28	28.12.28
*† <i>Rimutaka</i> ...	Holland, E. ...	F. Pretty, H. S. Cashmore, F. Cooke, E. Foster.	M.L.	New Zealand S.S. Co.	Met. Log. 31.8.28 to 3.1.29...	7.1.29
" <i>Ripley Castle</i> ...	Aylen, C. E. H. ...	A. C. J. Hatt ...	No. A.	Union Castle ...	Form 911 8.1.29 to 9.4.29	15.4.29
" <i>Rother</i> ...	Woodhead, T. H. ...	N. Thompson ...	"	Goole Steam Shipping	" 15.3.29 to 3.6.29...	13.6.29
*† <i>Rotorua</i> ...	Hunter, J. L. B. ...	L. Griffiths, T. M. Devitt, H. Cockerill.	M.L.	New Zealand S.S. Co.	Met. Log. 26.10.28 to 16.2.29	26.2.29
" <i>Royal Transport</i> ...	Oliver, R. C. ...	R. Hughes ...	No. A.	Houlder Bros. ...	Form 911 17.6.28 to 15.9.28	21.9.28
*† <i>Ruapehu</i> ...	McKellar, A. W., R.D., Capt., R.N.R.	H. N. Lawson, E. H. Hopkins, L. F. Malcouronne.	M.L.	New Zealand S.S. Co.	Met. Log. 2.11.28 to 11.3.29...	15.3.29
*† <i>St. Albans</i> ...	Diamond, S. L. ...	R. L. Harry, J. D. Kavanagh, F. O. Colvin.	"	Eastern and Australian.	" 4.12.28 to 27.3.29	9.5.29
" <i>St. Helier</i> ...	Richardson, L. ...	C. Bell ...	C.C.	G.W. Railway ...	Telegraphic Report 14.5.29	14.5.29
" <i>St. Julien</i> ...	Pitman, R. ...	C. W. Sanderson ...	"	" " "	" 11.4.29	11.4.29
" <i>St. Andrew</i> ...	Bearpark, E. W. ...	J. Meade ...	No. A.	Rankin Gilmour ...	Form 911 6.4.29 to 24.5.29...	12.6.29
††38 <i>Samaria</i> ...	Malin, R. G., Lieut.-Commr., R.N.R.	F. D. Thomas, D. McMillan, P. G. Britten.	W.T.	Cunard ...	W.T. Reg. 11.5.29 to 31.5.29	5.6.29
" <i>Sardinian Prince</i> ...	Pearson, F. T. ...	G. A. Davies ...	No. A.	Prince ...	Form 911 16.4.29 to 20.5.29	29.5.29
" <i>Saxon</i> ...	Shilton, P. G., R.D., Capt. R.N.R.	C. H. Williams ...	" A.	Union Castle ...	" 5.4.29 to 26.5.29...	28.5.29
*† <i>Scholar</i> ...	Peterkin, A. G. ...	G. Baker ...	" M.	Harrison ...	" 20.1.29 to 16.4.29	24.4.29
" <i>Scotia</i> ...	Pritchard, S. D., M.B.E.	W. L. Hughes ...	C.C.	L.M. & S. Railway ...	Telegraphic Report 3.5.29...	3.5.29
††33 <i>Scythia</i> ...	Irving, R. B., O.B.E., R.D., Capt. R.N.R.	R. Sell, G. H. Morris, J. G. Bradley.	W.T.	Cunard ...	W.T. Reg. 6.5.29 to 25.5.29 Form 911 4.5.29 to 27.5.29...	5.6.29 31.5.29
" <i>Sheaf Mount</i> ...	Groves, C. V. ...	A. Macarthur ...	No. A.	W. A. Souter ...	" 25.4.29 to 14.5.29	21.5.29
*† <i>Sheaf Spear</i> ...	Whitfield, G. A., O.B.E.	P. L. Hay ...	M.L.	" " "	Met. Log. 2.9.28 to 17.1.29	1.2.29
*† <i>Shropshire, M.V.</i>	Adamson, B. W. ...	W. L. Whiteside, R. Cuming, W. H. Brittain.	"	Bibby ...	" 8.2.29 to 19.4.29...	22.4.29
*† <i>Sinkiang</i> ...	Stringer, C. B. L. ...	" " " " " " " "	"	China Navigation Co.	" " " " " " " "	"
" <i>Somerset</i> ...	Howell Price, J. ...	W. Redwood ...	"	Federal ...	Form 911 26.1.29 to 12.3.29	18.3.29
*† <i>Spero</i> ...	Montgomery, H. ...	H. W. Vickers ...	"	Ellerman Wilson ...	Met. Log. 6.7.28 to 12.1.29...	22.1.29
*† <i>Statesman</i> ...	Mowat, J. ...	C. V. Watts ...	No. M.	Harrison ...	Form 911 31.1.29 to 12.4.29	10.5.29
" <i>Stephen</i> ...	Evans, L. G. ...	L. McMillan ...	" A.	Booth ...	" 27.3.29 to 9.4.29...	18.4.29
" <i>Stockwell</i> ...	Smith, W. ...	F. Moore ...	" A.	Brocklebank ...	" 26.10.28 to 22.11.28	28.12.28
" <i>Surrey</i> ...	Mac Rae, A. B. ...	A. V. Pearce ...	M.L.	Federal ...	" 12.4.29 to 12.5.29	7.6.29
" <i>Sutton Hall</i> ...	Walmsey, R. J. ...	" " " " " " " "	No. A.	Ellerman ...	" 26.4.29 to 9.5.29...	3.6.29
" <i>Sylvanfield, M.V.</i>	King, J. F. ...	A. A. Tully ...	" A.	Hunting & Son ...	" 11.4.29 to 14.5.29	27.5.29
" <i>Tainui</i> ...	Elford, H. E. ...	L. J. Hopkins ...	" A.	Shaw, Savill & Albion	" 2.3.29 to 7.4.29	23.5.29
" <i>Tahiti</i> ...	Aldwell, B. M. ...	F. W. Bales ...	" A.	Union S.S. Co. of N.Z.	" 14.3.29 to 11.4.29	3.5.29
*† <i>Taiying</i> ...	Frame, A. M. ...	F. Stratford, A. C. Kennedy, E. S. Birrell ...	M.L.	Yuill & Co. ...	Met. Log. 14.9.28 to 5.1.29	13.2.29
*† <i>Takada</i> ...	Lindon, J. ...	" " " " " " " "	No. M.	British India ...	" " " " " " " "	"
*† <i>Talma</i> ...	Hocking, R. W., R.D., Lieut.-Commr., R.N.R.	A. R. Andrew ...	" M.	" " "	Form 911 24.2.29 to 6.4.29...	6.5.29
" <i>Talthybius</i> ...	Wilson, R. J. ...	" " " " " " " "	M.L.	A. Holt ...	" 12.12.28 to 29.12.28	17.1.29

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 14.6.29.	Date Received.
†† <i>Tamaroa</i> ... ..	Hartman, W. H. ...	A. J. Galvin ... ..	No. M.	Shaw, Savill & Albion	Form 911 10.11.28 to 21.2.29	11.3.29
** <i>Tanda</i> ... ..	Pilcher, E. T., Lieut.-Commr., R.N.R.	G. C. Smith, H. Murday, H. Nuzum.	M.L.	E. & A. S.S. Co. ...	Met. Log 16.10.28 to 19.2.29	6.4.29
*† <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>Tarantia</i> ... ..	Henderson, F. M. ...	N. H. King ... ..	No. A.	Anchor ... ..	Form 911 29.12.28 to 5.2.29	1.3.29
<i>Tetrestas</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 ... ..	" 12.2.29 to 27.3.29	13.5.29
<i>Tetela</i> ... ..	Brice, E. H. ... ..	F. E. Holmes ... ..	" A.	Elders & Fyffes ...	" 3.5.29 to 31.5.29...	3.6.29
<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. ... ..	E. F. Bayes ... ..	" A.	A. Holt ... ..	" 17.11.28 to 26.3.29	20.4.29
*† <i>Tilawa</i> ... ..	Rowe, P. W. ... ..	E. A. Rabey ... ..	" M.	British India... ..	" 31.3.29 to 11.5.29	3.6.29
*† <i>Tinhow</i> ... ..	Andoe, G. ... ..	J. S. King... ..	" M.	A. Weir & Co. ... ..	" ... ..	"
*† <i>Titan</i> ... ..	Powder, J. J. ... ..	P. Cross, R. A. Shennan, C. F. Bailey.	M.L.	A. Holt... ..	Met. Log. 19.8.28 to 3.1.29...	14.1.29
*† <i>Tongariro</i> ... ..	Burton Davies, J. ...	E. A. Burton, A. E. Williams, H. Wilkinson, D. Baldwin.	"	New Zealand S.S. Co.	Met. Log. 12.8.28 to 7.1.29...	18.1.29
<i>Transylvania</i> ...	Erskine, R. ... ..	P. Middleton ... ..	No. A.	Anchor ... ..	Form 911 23.9.28 to 10.11.28	20.11.28
<i>Trefusis</i> ... ..	Hunt, D. ... ..	R. H. Silley ... ..	" A.	Hain S.S. Co. ... ..	" 7.2.29 to 13.2.29...	23.4.29
*† <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. 5.5.29 to 23.5.29...	30.5.29
*† <i>Tyndareus</i> ... ..	Hughes, R. T. ... ..	A. F. Barclay, F. V. Smith, D. S. Bruce.	M.L.	A. Holt ... ..	Form 911 5.5.29 to 23.5.29...	29.5.29
					Met. Log. 30.10.28 to 31.3.29	14.5.29
** <i>Ulimaroa</i> ... ..	Wylie, W. J. ... ..	S. B. Komall ... ..	No. M.	Huddart Parker, Ltd.	Form 911 15.3.29 to 9.4.29...	27.5.29
<i>Ulysses</i> ... ..	Owen, R. D., O.B.E....	A. McDonald ... ..	" A.	A. Holt ... ..	" 2.3.29 to 22.3.29...	16.4.29
<i>Umvolosi</i> ... ..	Barnes, E. W. ... ..	R. Dyns ... ..	" A.	Bullard King ... ..	" 27.4.29 to 15.5.29	3.6.29
*† <i>Upwey Grange</i> ...	Goodrick, H. P. ... ..	G. T. Hurst ... ..	" M.	Houlder ... ..	" 18.5.29 to 4.6.29...	12.6.29
<i>Varadulla</i> ... ..	Fear, E. T. C. ... ..	W. H. Barker ... ..	" A.	Cunard... ..	Form 911 1.12.28 to 11.1.29	15.1.29
†† <i>Viceroy of India</i> ...	Ohlson, B. J., D.S.O., R.D., Commr. R.N.R.	A. G. Stansfield... ..	" M.	P. & O. ... ..	" ... ..	"
<i>Vigilant</i> ... ..	Simpson, E. S. S. ...	J. H. Hennessey ... ..	" A.	Scottish Fishery Board.	Form 911 1.5.29 to 29.5.29...	12.6.29
** <i>Waioapu</i> ... ..	Todd, D. ... ..	L. Leeder ... ..	" M.	Canadian - Australasian.	" 4.4.29 to 28.4.29...	7.6.29
** <i>Wairuna</i> ... ..	Ryan J. ... ..	H. W. Jones, E. A. Stein, E. R. Pate.	M.L.	Union S.S. Co. of N.Z.	Met. Log. 19.10.28 to 21.1.29	15.3.29
†† <i>Walmer Castle</i> ...	Morton Betts, W. ...	G. H. Pickering... ..	"	Union Castle ... ..	Form 911 20.5.29 to 9.6.29...	13.6.29
<i>Warfield</i> ... ..	Steel, R. ... ..	" ... ..	No. A.	" ... ..	Form 911 2.2.29 to 21.3.29...	2.4.29
*† <i>War Nizam</i> ... ..	Moncrieff, T. ... ..	F. J. Marshall ... ..	" M.	British Tankers ... ..	" 5.5.28 to 11.6.28	26.6.28
*† <i>Westmoreland</i> ...	Hamilton, F. S. ... ..	A. W. Marshall, W. Timberlake, K. S. Phillips.	M.L.	Federal... ..	Met. Log. 3.8.28 to 22.11.28	29.11.28
†† <i>William Scoresby, R.S.S.</i> ... ..	Shannon, R. L. V., Lieut.-Commr. R.N.	M. C. Lester ... ..	"	Falkland Islands Government.	" 22.9.28 to 19.1.29	11.5.29
†† <i>Windsor Castle</i> ...	Chave, Sir B., K.B.E.	A. J. Tweddell, C. Gorringe, R. Tyser.	"	Union Castle ... ..	" 25.8.28 to 17.2.29	21.2.29
** <i>Wonganella</i> ... ..	Suffern, H. ... ..	G. F. Phillips ... ..	No. M.	W. Crossby & Sons... ..	Form 911 14.3.29 to 15.4.29	27.5.29
*† <i>Woodarra</i> ... ..	Reilly, J. V. ... ..	H. Goater, L. J. C. Simpson, G. F. Alexander J. McPhail.	M.L.	British India... ..	Met. Log. 15.7.28 to 31.12.28	4.1.29
<i>Zent</i> ... ..	Roberts, H. ... ..	" ... ..	No. A.	Elders & Fyffes ...	Form 911 30.4.29 to 2.6.29...	5.6.29
<i>Conway, H.M.S.</i> ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ... ..	Cadets' M.L.	" ... ..	Cadets' Met. Log. 23.9.28 to 15.12.28	19.12.28
<i>Pangbourne Nautical College Worcester, H.M.S.</i>	Tracy, A. F. G., Commr., R.N.	" ... ..	"	" ... ..	Cadets' Met. Log. 16.1.29 to 23.3.29	10.4.29
					Cadets' Met. Log. 25.1.29 to 17.4.29	19.4.29
<i>Abaco</i> ... ..	" ... ..	The Keepers ... ..	Lighthouse Register.	" ... ..	Lighthouse Register 1.7.28 to 31.12.28	28.5.29
<i>Cay Lobos</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 9.2.28 to 18.8.28	28.5.29
<i>Double Headed Shot</i>	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.3.28 to 31.8.28 } 28.5.29 10.10.28 to 31.3.29	
<i>Inagua</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 20.7.28 to 31.12.28	28.5.29
<i>Sombrero</i> ... ..	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.7.28 to 31.12.28	5.2.29
<i>Watling Island</i> ...	" ... ..	" ... ..	"	" ... ..	Lighthouse Register 1.7.28 to 31.12.28	28.5.29
<i>Cape Pembroke (Falkland Is.)</i>	" ... ..	" ... ..	"	" ... ..	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 31.5.29.	Date Received
<i>Antillian</i> ... ..	Hannaford, W. ... ..	J. L. Crighton ... ..	Leyland ... ..	Water Samples ... ..	14.3.29
<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> ... ..	" ... ..	E. Jones ... ..	Booth ... ..	" ... ..	3.5.29
<i>Oranian</i> ... ..	Bolton, W. ... ..	T. J. Jones ... ..	Leyland ... ..	" ... ..	19.3.29

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

MARINE METEOROLOGY, ATLASES, BOOKS AND MEMOIRS.

CHARTS:—

ATLANTIC:—

Monthly Current Charts for the Atlantic Ocean, from information collated and prepared in the Meteorological Office. (No. 132, 1897) (22½ × 18 in.) (Published by the Admiralty.)

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

ATLANTIC (NORTH):—

Meteorological Charts of the North Atlantic for each month of the year, giving normals of Pressure, Air and Sea Surface Temperature and Ocean Currents, with Frequencies of Winds, also Ice Limits. (No. 149A, 1923) 1s. each (35 × 22½ in.). Sold by J. D. Potter, 145, Minories, E.1.

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

Charts of Meteorological Data for Square 3, Lat. 0°-10° N., Long. 20°-30° W. (20 × 13½ in.) and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. (17 × 16½ in.) (No. 20, 1874). 20s.

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

ATLANTIC (SOUTH):—

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. (No. 159, 1902.) (27 × 20½ in.) (Published by the Admiralty.)

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

BAFFIN BAY AND DAVIS STRAIT:—

Monthly Meteorological Charts of Baffin Bay and Davis Strait. (No. 221, 1917.) 8s. (30 × 25½ in.)

INDIAN OCEAN:—

Meteorological Charts of the East Indian Seas for each month of the year, giving Normals of Pressure, Air and Sea Temperatures and Ocean Currents, with Frequencies of Winds. (No. 181A, 1923.) 1s each. (35 × 22½ in.) Sold by J. D. Potter, 145, Minories, E.1.

CHARTS:—*continued.*

INDIAN OCEAN:—*continued.*

Monthly Current Charts for the Indian Ocean, from information collated and prepared in the Meteorological Office. (No. 124, 1896.) (20 × 24½ in.) (Published by the Admiralty.)

MEDITERRANEAN SEA:—

Atlas of Normal Monthly Values of the Meteorological Elements for the Mediterranean Sea and adjacent Lands. (No. 224, 1917.) 6s. (22½ × 17 in.)

PACIFIC OCEAN:—

Quarterly Current Charts for the Pacific Ocean, from information collated and prepared in the Meteorological Office. (No. 134, 1897.) (26½ × 28½ in.) (Published by the Admiralty.)

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. (No. 159, 1902.) (27 × 20½ in.) (Published by the Admiralty.)

RED SEA:—

Meteorological Charts of the Red Sea. (No. 106, 1895.) 21s. (22 × 13½ in.)

SOUTHERN OCEAN:—

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