

L.L.C.

The Marine Observer



The Review of the
Marine Division of the Meteorological
Office, in co-operation with Voluntary
Marine Observers

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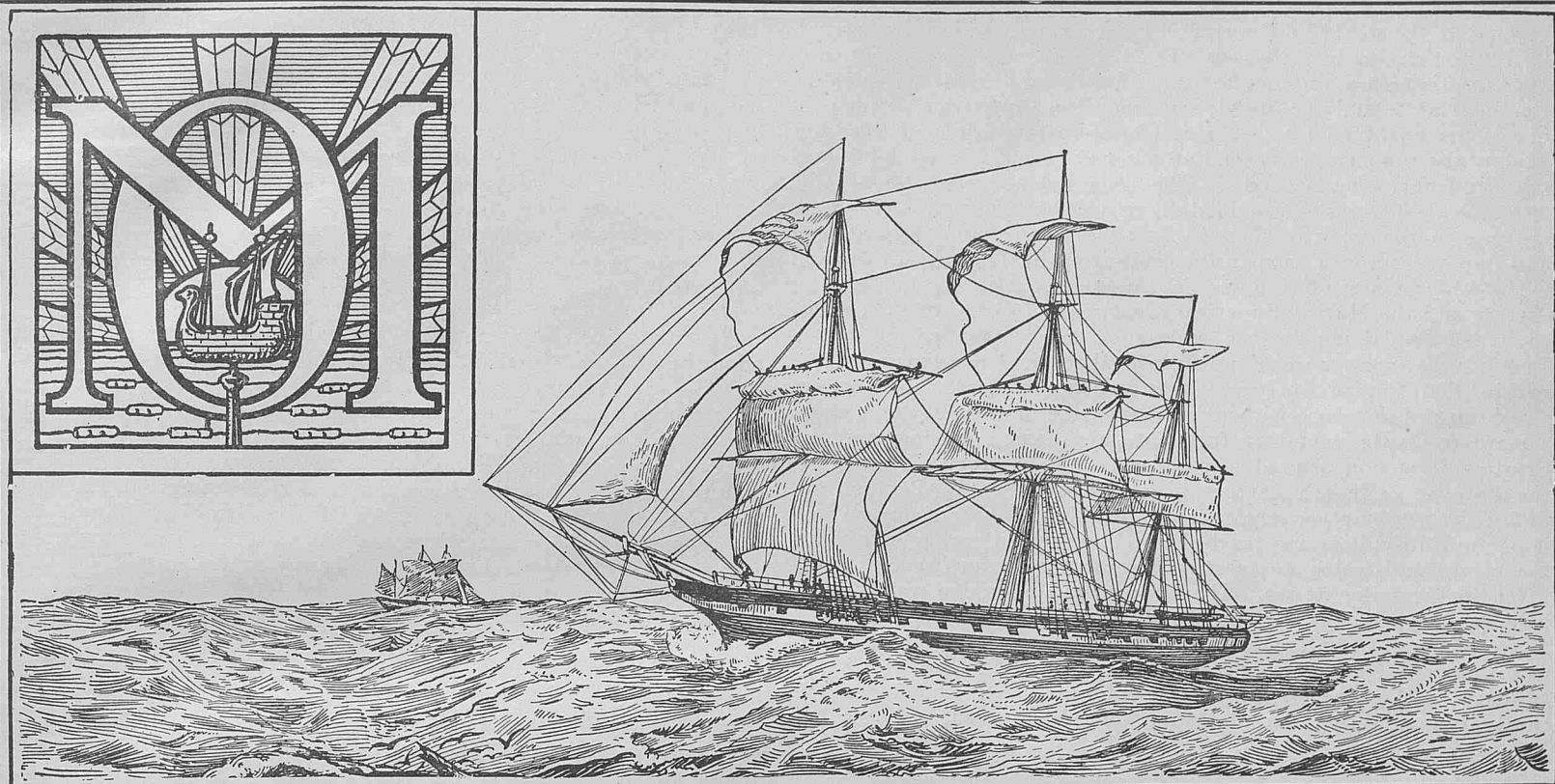
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FOREWORD TO VOLUME VII.

BY DR. G. C. SIMPSON, C.B., F.R.S.

In my foreword to THE MARINE OBSERVER last year I said that 1929 should be outstanding in the history of world-meteorology, especially of marine meteorology, and that anticipation has been fully realised. I doubt whether in any other year so many decisions have been taken which will affect meteorologists, professional or voluntary.

In relation to other important matters affecting our Merchant Navy, such as the change in the helm orders, the Articles in the Convention of Safety of Life at Sea dealing with meteorology may appear of small moment; but to meteorologists and all interested in meteorology they are epoch-making. For the first time in an International Convention, meteorological knowledge has been recognised to be of such importance as to warrant special mention. It is true that except in matters dealing with reporting tropical storms the Convention does not make meteorological service compulsory on the contracting governments, but it does pledge them to do all they possibly can to issue warnings and weather-bulletins and to give other meteorological aid in the interest of safety of

life at sea and of safe navigation. It also pledges them to organise observations at sea and to arrange for ships to transmit their observations to other ships and to the shore.

I do not think anyone will deny that the British Government is already doing a great deal in the direction required and that British seamen are second to none in their willingness to make observations for use of other ships and of the meteorological services on shore. I never felt that so far as this country is concerned such a Convention was necessary; but is a great encouragement to us all to make further efforts and to overhaul our arrangements so that we will be able to take pride in the way we carry out voluntarily the duties which the Convention asks us to undertake for the benefit of seamen of all nations.

The Meteorological Office has also been actively engaged during the year in another endeavour to ensure safety of life at sea. The rules and regulations regarding load lines have been under consideration of a Committee under the chairmanship of SIR CHARLES SANDERS and one of the problems they had to solve was the different

regions of the world and periods of the year in which the several load lines are to be enforced. The present rules are very vague and unsatisfactory, in fact they are hardly applicable outside the North Atlantic and the Mediterranean. The Committee decided to divide the world up into zones and to specify which load line—the winter, the summer or the Indian summer—should be used in each zone and for what period. The zones were chosen largely on meteorological records provided by the Meteorological Office and thus again the work of THE MARINE OBSERVER found a practical and important application to the comfort and safety of the seaman.

The Conference of Empire Meteorologists met in London in August and the Marine Superintendent made full use of the opportunity of explaining to our colleagues from other parts of the Empire, the importance of uniform methods and a common policy within the Empire to ensure that willing co-operation between the ships and the shore without which marine meteorology can make no progress. He went very fully into his plans and hopes and the ensuing discussion showed a readiness to help from all parts of the Empire. The Conference also showed to us in London the difficulties met by other services and an understanding of our several hopes and difficulties was reached which cannot but prove helpful in the future and which we trust will lead to still further aid being given to the sailor at sea. The Conference in London was a great help in preparing us all for the discussions at the International Meteorological Conference in Copenhagen where we met meteorologists from all countries.

Again in Copenhagen the Marine Superintendent had an opportunity of explaining his plans for the development of marine

meteorology and he has every reason to be proud that the Conference accepted almost unaltered his scheme based on the "Selected Ship." The scheme aims at the equipment of one thousand selected ships, the number of ships provided by each country to be in proportion to its share of the total ships' tonnage of the world. I have not space here to go into details but they will be explained fully in THE MARINE OBSERVER as occasion offers. The Conference also decided that arrangements for meteorological observations should be made only by the Meteorological Office of the country in which the ship is registered. This it is hoped will do away with a great deal of that overlapping of demands which has been a source of trouble in the past.

The great achievement of the Copenhagen Conference was the adoption of a real international code for use of ships at sea. This code is fully explained in this number of THE MARINE OBSERVER and its acceptance was so cordial in Copenhagen that there is no doubt that it will be used by ships of all nations.

Again I wish to express my thanks to all those who are working so unselfishly towards the development of meteorology at sea, both those on the ships and those in the Marine Division. Never has the co-operation been more close and the working more smooth and I have every confidence that the same happy condition will continue throughout the New Year.

DIRECTOR.

Meteorological Office,
Air Ministry.

7th November, 1929.

THE MARINE OBSERVER, 1930.

Hearty good wishes to the Corps of Voluntary Marine Observers and to all Seafarers.

May this year be both happy and prosperous to all who use the sea, and may it see much done to make the work of Marine Meteorology more congenial, more efficient, and more useful to the Sea Services.

With the prospect of ratification of the International Convention of Safety of Life at Sea, 1929, to come into force on July 1st, 1931, this year's work will necessarily be largely devoted to preparatory adjustments to comply with the Convention, extracts from which were published in the last October number of this JOURNAL.

This Convention contains an agreement whereby the Governments of the Countries party to it, undertake in the case of Marine Meteorology in aid of navigation, to perform certain services for all shipping and seamen, and to encourage shipping and seamen of their own Nation to perform certain services to further safety of life at sea. Every endeavour is to be made to obtain a uniform procedure, and to conform to the recommendations made by the International Meteorological Organization.

Since the Convention was signed, the International Maritime Meteorological Commission, that part of the International Meteorological Organization which deals with Marine Meteorology, have had under consideration certain recommendations, submitted with a view to uniformity of procedure, to facilitate the objects of the Convention of Safety of Life at Sea.

They have confirmed the recommendations for the "Selected Ship" International System of Routine Wireless Weather Reporting in all Oceans made after meetings at Paris in May, 1928, by a Sub-Commission composed of seven members of the International Marine and Synoptic Meteorological Commissions, and the latter Commission has recommended a code for use of "Selected Ships" in all parts of the World.

The subject of organization within the British Empire—conforming to International agreement—for the furtherance of Marine Meteorological work in aid of navigation, was reported upon to the British Empire Meteorological Conference, held in London in August, 1929, as fully and clearly as possible. In so reporting we summarised the experience and views of the Corps of Voluntary Marine Observers, thereby stressing the need for the maintenance of seamanlike practice, and uniformity and simplicity of method.

There are likely to be changes in Wireless Weather Signals on different coasts in different parts of the World. It may be some time before there is greater uniformity in Wireless Weather Shipping Bulletins, but as information of changes becomes available, it will be given as far as possible under the heading of

"Weather Signals" in THE MARINE OBSERVER. We intend as far as possible to maintain the plan of giving Weather Signals for the different coasts in geographical order through each year's numbers.

The only change to be made in the British Wireless Weather Shipping Bulletin, is the order of the elements in the two groups of code figures and the code table for present weather for coast station reports to conform to International agreements. This will be fully dealt with, as usual, in the February number.

May 1st, 1930, has been fixed by the British Service as the date upon which British "Selected Ships" should commence to use the International Wireless Weather Telegraphy code and times of observation for Synoptic Marine Meteorology.

As has so often been represented by British seamen, the present arrangement of observation times for "Selected Ships" Wireless Weather Reports, differing as they do in different parts of the World, are inconvenient and make communication difficult.

The new times of observation for synoptic work at sea will be welcome to those interested in Marine Meteorology. They are 0, 6, 12 and 18 hours G.M.T., and it is hoped that "Selected Ships" which have two officers in each watch will use all four of these times in different parts of the World, and that ships which have two officers in some watches, (as for example Chief and fourth in morning and dog watches) will use, when possible, three of these times. It is strongly advocated that ships which only have one officer in each watch, should, generally, only use the two observation times which fall in daylight so that lookout may never be neglected on account of Marine Meteorology. This only applies to routine work, any ship at any time encountering a dangerous tropical revolving storm should report to all ships, and the appropriate station, and any ship experiencing wind of Force 10 and above, should report to all ships.

A description with details of the present Ships' Wireless Weather Signals is repeated in Weather Signals in this number, as usual, and details and code of Ships' Wireless Weather Signals, new style, which should be used from after midnight, April 30th, 1930, is also given, so that all concerned may have ample time to become familiar with them, before the change is brought about on May 1st, 1930.

The Revised Meteorological Log and Meteorological Record, Form 911, with a new form for recording coded messages sent, will be supplied to all "Selected Ships" before April 30th, 1930, and revised Form 911 will also be sent to Regular observing ships which are not "Selected Ships" by that date, so that they can also better contribute to the work, by making more suitable written returns, the net result being, a reduction of clerical work in many ships.

The Meteorological Log is for a very special purpose, and the custom of logging weather at the end of each watch according to

ships time will be continued, but these revised Logs and Forms will be the subject of a special note in an early number, and space does not permit here to go into these details.

The code for "Selected Ships" W/T. weather reports is arranged so that the most essential information required in all parts of the World is contained in the first four groups, and these are followed by alternative sets of groups, in both cases, the first figure of the fifth group being a distinguishing number.

There are two alternative sets of Supplementary Groups, Numbers 3 and 6.

No. 6 gives information which is generally applicable to all parts of the World, and No. 3 gives information which is considered especially desirable by the European Meteorological Services from the North Atlantic, but which is also suitable for other parts of the World. The code does not provide for reporting current or ice or other navigational dangers, but in reporting to all ships, "Selected Ships" will do well to add in plain language, such information, as is desirable for ships at sea, taking care not to thus lengthen reports which are addressed to Weather Offices ashore.

The suggestions which have been so frequently made by British Seamen regarding the need of a universal meteorological code of general utility, to include information for exact navigational purposes as well as meteorology, have been represented; but the question of cost in the reception of messages ashore in many Countries, made it necessary to compress the information in the smallest possible compass, and, therefore, all five-figure groups are made to contain a maximum amount of information, and the number of groups is restricted to not more than seven.

The times of observation for Synoptic Marine Meteorology and the Code have both been agreed to Internationally. It may be well to point out here, that while the International Conference of Safety of Life at Sea was a diplomatic conference, the delegates formally representing the Governments of their respective Countries, the members of the International Meteorological Organization and its Commissions do not represent their Governments in the same way, and while the Convention of Safety of Life at Sea, when ratified, will become legally binding, the agreements of the International Meteorological Organization are moral and can only be maintained by the good faith of the parties concerned. The British Corps of Voluntary Marine Observers—with the knowledge that their interests have been represented—will, we feel sure, continue to set the splendid example, which has done so much to further the work in recent years.

Now that we have universal times of observation for routine Ships' Weather Telegraphy at sea, and a universal weather code, it is possible to introduce a special schedule for "Selected Ships" wireless communication with all ships and the shore. While the International Sub-commission for Ships' Wireless Weather Telegraphy and the International Commission for Marine Meteorology could not, at this stage, recommend a schedule for international use, the former invited the British Service to carry out trials in different parts of the world. Consequently, commencing also on May 1st, it is intended that the schedule for the communication of British "Selected Ships" reports to all ships and certain shore stations (which we have from time to time referred to) should be used in British "Selected Ships." This schedule has been worked out expressly to comply with the requests of the captains, officers, and W/T operators of "Selected Ships." Their nominated representatives have assisted us with the Wireless authorities in drawing up a scheme, which is thought will be found suitable, and which is given in this number. All concerned are asked to help to make this a success, so that if it proves suitable, it may be universally adopted. At first no doubt there may be difficulties, such as interruption, but with persistence, the wasted energy, confusion, and jamming, which occurred so often in the past in communication of ships' weather reports in the absence of a suitable schedule, may be overcome with satisfactory results.

May 1st, 1930, has been fixed to bring these changes into force for several reasons.

Firstly, Marine Observers have waited over long for uniformity in code and procedure. Secondly, it is desirable that Masters and Mates should not have to give thought to changes in Marine Meteorology when their minds will be fully occupied with other changes to be brought about on July 1st, 1931 by the Convention of Safety of Life at Sea. Thirdly, the present editions of MARINE OBSERVERS

HANDBOOK, the Meteorological Log, and Form 911 will all require to be reprinted so that this is an economical date, and fourthly, it is the earliest date upon which we can be ready in the Marine Division, for the change involves much work beforehand, and the keeping of a position chart for "Selected Ships" in the North Atlantic.

On January 1st, 1930, in the Marine Division, we shall make the change in the code used for the data cards with the Hollerith electric tabulating and printing machines, notified as long ago as the March 1929 number of THE MARINE OBSERVER. From that date Meteorological Logs will be of greater value than ever, for it is only observations recorded in these logs that are punched on cards. This revision of the Hollerith Code for Marine Meteorological data makes it possible to print the observations in code by machine, so that they may be made more readily available for their intended purposes.

This year, we are publishing each month Wind and Fog roses for the S.W. approaches to the British Isles and the approaches to Table Bay.

The former were originally published in THE MARINE OBSERVER in 1926, when we only had four years' observations on Hollerith Cards, these new roses are now compiled from eight years' observations, and their number is such, that they give averages, which give very fairly reliable information.

It will be noted that, though far more regular observing ships pass through the area at the mouths of the English, Bristol and St. George's Channels than in the region of the Cape of Good Hope, there are twice as many recorded observations near the Cape than in Home Waters. This is, of course, accounted for by the fact that many Observing Ships only start and finish recording meteorological observations on passing Ushant or the Fastnet, while in coastal waters abroad and even at anchor in open roadsteads such as Table Bay, the Meteorological Log is continued. There has always been this shortage of observations in Home Waters, and it accounts for lack of much needed information. At the commencement and end of a voyage in Home waters, there are duties which the officers must attend to, and the keeping of the Meteorological Log may be difficult, but we ask Commanders of observing ships, when possible, without interference of duties or inconvenience, to have the Meteorological Log continued in the Channel.

Fog and wind in these areas will be dealt with in an article in a later number, and during the year we hope to publish information of wind and fog at sea generally, following the series of articles on the winds of the Oceans.

Meanwhile, these roses themselves furnish information, which has long been sought for by navigators using these waters. They show the chances of getting fog and mist with the different directions of wind and in calms and variables, and therefore are useful especially when making a landfall, in connection with the reports given in Wireless Weather Shipping Bulletins. In each number will also appear charts giving the mean sea surface temperature in the Mediterranean. These are the first charts of sea temperature upon which we have been able to give the number of observations upon which the means are based, and these numbers indicate the reliability of the information contained in each two degree square. We hope always to give these numbers on Meteorological Ocean Charts in the future.

The maximum and minimum temperatures were specially asked for by the Meteorological Office at Malta, and they will be of general interest to navigators in the Mediterranean. The charts giving tracks of South Indian Ocean cyclones published in the 1924 numbers will be repeated this year.

As notified in my introductory remarks to THE MARINE OBSERVER 1929, this year the currents on the routes from the Leeuwin to Perim direct and via Colombo across the Indian Ocean and Arabian Sea are being charted. The first of these charts will appear in the February number accompanied by a note calling for the remarks of Commanders, who have experience of currents in navigating these routes. There can be little doubt that this investigation of the currents along these routes traversing the Indian Ocean as they do will be one of the most useful and interesting that we have undertaken during the last ten years; and we hope that it may do much to stimulate the interest of Marine Observers trading to Australia and the East via Suez. It will make up leeway in our work in this part of the World; for at present, our work in this connection in the North Atlantic and South Pacific is rather to windward of that in

the Indian Ocean. By the end of the year we hope that "the strain on all parts of the ropes may be equalised."

Articles will be written or revised upon subjects of Marine Meteorology in the Marine Division as necessary, and we hope that technical experts will contribute articles of special interest to seamen.

"The Marine Observer's Log" is our greatest asset, giving, as it does, first hand information, and we hope that Marine Observers will continue to improve and send in "additional remarks," Weather charts, photos, and sketches of the many wonderful and beautiful things which the Divine Creator sets in the sea and sky. Also accounts of their experiences in the practical application of Marine Meteorology to safe and economical navigation.

In this work the aid which Marine Meteorology is to the airman, the meteorologist, and the general community ashore must never be forgotten. By carrying out this programme which is outlined for THE MARINE OBSERVER in 1930, we hope that we shall not only serve navigation, but also serve air navigation and meteorology generally to the best advantage with the resources at our disposal.

The Corps of Marine Observers, by their splendid voluntary work, have made THE MARINE OBSERVER what it is, and we thank them again for all they have done, and promise them all the help and encouragement we can give them in the future.

MARINE SUPERINTENDENT.

London,
21st October, 1929.

THE MARINE OBSERVER'S LOG.

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

CURRENT.

New Zealand Waters.

THE following is an extract from the Meteorological Log of S.S. *Ruapehu*, Captain A. W. McKELLAR, Auckland to Lyttelton, Observer Mr. L. F. MALCOURONNE.

"24th January, 1929, when bound from Auckland to Lyttelton, a S.W. gale was encountered after passing C. Palliser at 8.00 p.m. With the wind right ahead force 9 to 10 accompanied by a high sea, throughout the night a speed of three to four knots was maintained. The following day, soon after noon weather commenced to moderate, and a land fix obtained at 2.00 p.m. showed that an abnormal set to the N.W. at the rate of 1.5 knots had been experienced during the past 18 hours.

"Later in the day wind still from S.W. force 6 (a direction almost parallel to the trend of the coast line) a very strong set inshore was experienced between Kiakoura Peninsula and Godley Head, an allowance of 10° was found necessary in the course steered to counteract the current.

"The following evening (26th January) left Lyttelton for Wellington. Weather fine, light N.N.W. wind, slight sea and moderate S.E. swell. The current referred to above had entirely disappeared, although the prevailing N.E.'ly set was stronger than usual."

ABNORMAL CURRENT.

North Pacific Ocean.

THE following report has been received from S.S. *Narenta*, Commander R. G. CLAYTON, R.N.R.

"I have to report an unusually strong current experienced in the Pacific Ocean from Noon A.T.S. (1750 G.M.T.), 12th January, 1929, to 10.06 A.T.S. (1615 G.M.T.), 13th January, 1929, between positions Latitude 9° 00' N., Longitude 85° 09' W. and Latitude 11° 18' N., Longitude 90° 01' W.

Current Set 289° drift 55 miles, 2.45 knots.

Course and Distance made good 296°, 319'.

Course steered 297°.

Distance by revolutions (10 per cent. slip) 264'.

Distance by Patent Log 258'.

"The position at Noon, 12th January, was obtained by solar observations and bearings of the land and the ship's position was frequently checked by solar and stellar observations, taken by independent observers, during the following 24 hours. All these observations showed a steady current as above.

"Previous to Noon, 12th January, and after 10.0 a.m., 13th, the current was normal.

The weather was as follows—

12th, Noon to 6.0 p.m.

Light airs, smooth sea, slight Northerly swell.

6.0 p.m. to 13th, 6.0 a.m., N.E., force 4-5, moderate N.E.'ly sea.

13th, 6.0 a.m. to 10 a.m.

E., force 4. Moderate E'ly sea."

DRIFT OF A CANOE IN THE INDIAN OCEAN.

THE following note by Commander H. STRONG, R.N.R., late of the UNION CASTLE Line, was compiled from the description attached to a Dug-out Canoe exhibited in the Port Elizabeth Museum.

"This canoe was cast ashore on New Brighton Beach at Algoa Bay on February 15th, 1927. It has been hacked out of a large tree trunk. There are five pairs of blocks with a hole in each one along the inside of the gunwales, and a square socket has been formed in the bottom between the second pair of blocks from forward, for receiving the step of a mast pole. The three inner pairs of perforated blocks are for seats on which the occupants of the boat sat. The other two were used for lashing down the bamboo poles which were placed across the canoe, and formed part of the outriggers.

"It has been definitely ascertained that these canoes are still made and used in the Malay States, notably at Malacca and Sumatra. A sample of the wood of which the canoe has been made was submitted to Mr. B. J. RANDLE, the wood technologist of the Forest Products Research Laboratory, University of Oxford, who succeeded in identifying it with a Malayan wood known as Rengas.

"Botanically, the wood is probably one of two closely related species of Anacardiaceae, *Gluta tavoyana* or *Melanorrhæa glaba*.

"These trees do not occur outside the region of Indo-Malaya.

"The canoe was no doubt carried across the Indian Ocean by the Malabar Current and down the East African coast to the beach at Algoa Bay by the Mozambique Current at an average rate of 10 miles in the 24 hours over a distance of 5,000 miles.

Dimensions of canoe:—

Length 22 feet.

Width 21 inches.

Depth 24 inches."

LINE SQUALL.

North Atlantic Ocean.

THE following is an extract from the Meteorological Log of S.S. *Hertford*, Captain C. R. KETLEWELL, West Indies to London, Observer Mr. C. J. BREWER, 2nd Officer.

"22nd January, 1929, at 0242 G.M.T. in Latitude 33° 23' N., Longitude 39° 47' W., Barometer 998.9 mb., Wind W.S.W.6, a bank of heavy Nimbus cloud was observed to be working up from the Westward, which on approaching proved to be of distinct line squall formation, stretching in an almost straight line due East

and West from horizon to horizon, and having a heavy, solid appearance, with clear, well defined edges.

"At 0300 the wind veered to W.N.W. and increased to force 8, accompanied by vivid streaks of lightning, which were followed almost instantaneously by loud claps of thunder. When, at 0310, the centre of the squall appeared to be directly over the vessel, light rain commenced to fall, increasing steadily to a torrential down-pour, which lasted for ten minutes during which time the wind dropped to force 5 and backed to W.S.W.

"As the squall passed to the E.S.E. the rain gradually decreased and by 0335 the sky was again clear overhead and the squall observed low down on the Eastern horizon.

"During the passing of the squall no other clouds were visible above the horizon and the instrument readings were as follows:—0242 G.M.T., Barometer 998.9 mb., Dry Bulb 67°·6 F., Wet Bulb 63°·4 F., Sea 66°·2 F., 0310 G.M.T., Barometer 1000.2mb., Dry 60°·4 F., Wet 58°·0 F., 0330 G.M.T., Barometer 999.4mb., Dry 66°·4 F., Wet 63°·6 F., Sea 64°·0 F."

THUNDERSTORM.

South Pacific Ocean.

THE following is an extract from the Meteorological Report of S.S. *Hororata*, Captain H. BARNETT, Balboa to New Zealand, Observer Mr. E. A. QUICK, 3rd Officer.

"29th January, 1929, at 8 p.m. A.T.S. in Latitude 29° 22' S., Longitude 132° 33' W., weather, Barometer 30.08 in., Temperature 78°, Wind N. force 5, Sky overcast, heavy rain and vivid sheet lightning to N'ward. Conditions continued until 9 p.m., when barometer was 30.00 in. and lightning was more frequent and vivid, also thunder was heard in the distance to N'ward. At 9.25 p.m. a vivid flash broke right ahead of the ship and with the noise of big whips cracking, travelled aft through the aerial and masts and finally with a loud report and deafening roar of thunder fused all the lights in the quarters aft. No damage was done to ship's structure and the compasses were not affected. Lightning and thunder remained frequent until 9.35 p.m., when another brilliant and loud crack occurred right over the ship, after which conditions continued to improve. About 10 p.m. the wind was North force 6-7, and for about 20 seconds it blew hurricane force after a lull with torrential rain. By midnight conditions had improved, sky had cleared and lightning remained to S'ward, and getting fainter and less."

FOG FORMATION.

North Atlantic Ocean.

THE following is an extract from the Meteorological Report of S.S. *Hororata*, Captain H. BARNETT, London to Newport News, U.S.A., Observer Mr. E. A. QUICK, 3rd Officer.

"On the 8th January, 1929, on voyage from London to Newport News, U.S.A., in Latitude 37° 06' N., Longitude 73° 07' W. at 2 a.m. A.T. ship, the temperature of the air was 55° F. and the sea surface 65° F. At 4 a.m. the air temperature was falling fast, the sea surface remaining the same. At 6 a.m. the air was 40° F. and on day breaking it was observed that large areas of steam and vapour were rising from the sea surface. At 8 a.m. the temperature of the air was 35° F. and the sea surface temperature was 60° F. The barometer standing at 30.10 in. and rising slowly the sky being cloudy to three quarters, with heavy masses of Cumulus clouds laying low. Between 8.0 and 12.0 Noon frequent large clouds of vapour formed into spiral columns and ascended in almost a vertical direction often meeting the clouds, giving the appearance of well-defined waterspouts. Several waterspouts were observed all forming to the Southward of the ship and travelling in a S.E'ly direction. At Noon the temperatures were Air 35° F. and Sea 64° F., Barometer 30.21 inches. At 3 p.m. Latitude 36° 56' N., Longitude 73° 54' W., Barometer reading 30.24 inches, the temperature of the sea had fallen to 50° F. and at 4 p.m. had fallen to 46° F., remaining at that temperature. As the temperature fell so the steam and vapour rising from the surface dispersed and by 6 p.m. had completely disappeared. Weather remaining fine. Blue

sky and excellent visibility. A considerable amount of refraction was observed. At sunset one sun on another was observed to set, both being very distinct."

NOTE.—A depression had moved northward in the Western Atlantic during January 7th, 1929, and on the morning of January 8th had become very intense, centred near the entrance to Hudson Strait. At the rear of this depression and between it and a large anticyclone covering most of the United States, cold air was passing down from arctic North America nearly to Latitude 30° N. and the coldness of the air relative to the sea temperature observed by S.S. *Hororata* was due to this cause. The observed fog effects were caused by the temperature difference.

TRADE WINDS AND MONSOONS OVER THE BISMARK ARCHIPELAGO—EAST INDIES.

The following notes by the Harbour Master at Rabaul have been received through the HYDROGRAPHER OF THE NAVY.

"The South East Trade Winds prevail generally over the Bismark Archipelago during the months of May to October inclusive. They usually come in quietly during the latter part of May, blowing in force from light to moderate and freshening considerably towards the latter part of July and beginning of August. From then on through September and October they blow with considerable force and consistently, especially on the South Coast of New Britain and through the Dampier Straits. At this time they are very regular in direction and attain force varying from strong winds to moderate gales.

"On the North Coast of New Guinea and over the Western Islands (i.e., Manus Hermits, Ninigo, etc.), they are more inclined to be intermittent and especially so towards the Western portion of the Archipelago. The period during which the S.E. trades prevail is generally considered in the Northern portion to be the dry season. This does not hold good however on the N. Coast of New Britain, especially in the Huon Gulf and Dampier Straits, where at this time of the year heavy rain is experienced. In direction the wind is very steady from the S.E., especially off the S. Coast of New Britain, but in such places as St. George's Channel and Dampier or Vitiaz Straits, it is deflected considerably and appears to follow the trend of the land, this giving it a more southerly direction. During its earlier stages (May, June and July) it usually springs up about 9 or 10 in the morning, freshening as the day advances and dying down towards sunset, but later it blows with more steadiness and force and sometimes continues without cessation, day or night, for periods of up to ten days to a fortnight, and at such times it frequently attains moderate gale force. This condition, when it does prevail, does not appear to be localised, but extends practically over the entire archipelago, being, if anything, especially strong over New Britain, and not being any less violent on the Northern side until well up towards the Admiralty and Western Islands.

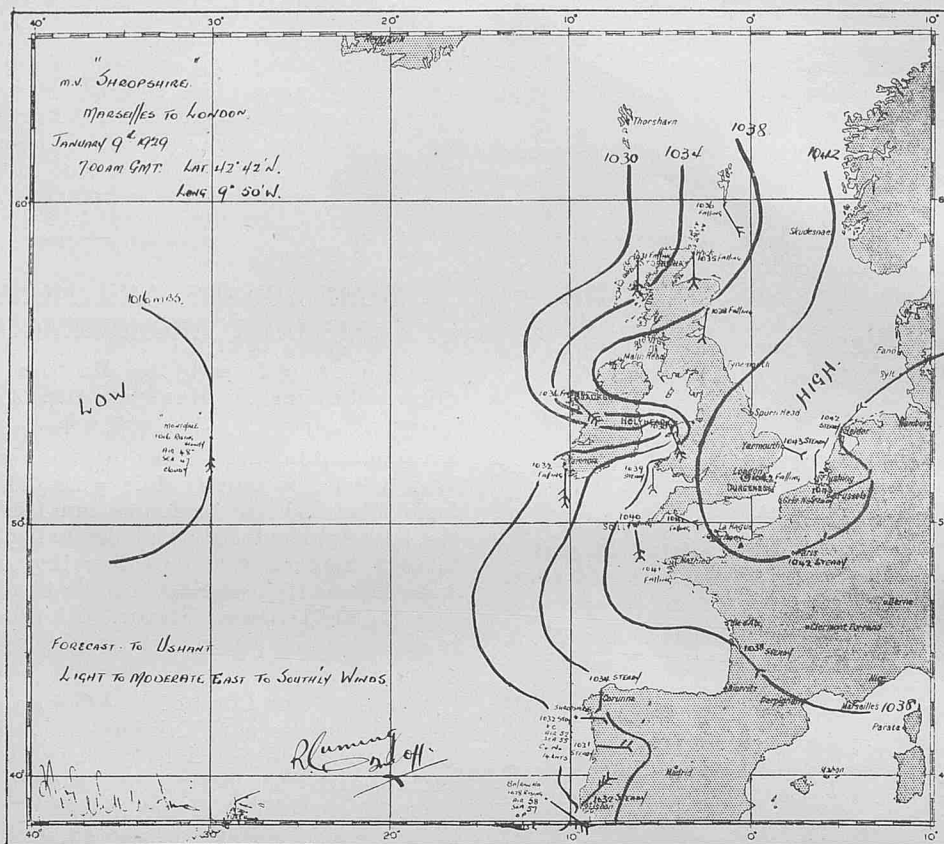
"The N.W. monsoon usually breaks over the Western Islands, the Admiralty Islands, and the western portion of the N. Coast of New Guinea, during the month of November, but rarely extends as far South as New Britain and the Southern part of New Ireland until the latter end of December. Its approach is usually indicated by the banking up of dark clouds to the N. and N.W. and this is sometimes noticeable for days before the monsoon actually makes itself felt. It is not so steady as the S.E. Trade Wind and generally commences with, and develops into, a series of violent squalls with very heavy rain. Sometimes these are of short duration, but they occasionally extend over periods of several days and in either case these alternate with intervals of comparatively fine and calm weather.

"The conditions generally, during the months of January, February and March, over New Britain and New Ireland, are most unsettled and consist of practically a continuation of heavy rain squalls which are almost invariably accompanied by very strong winds. This also applies to the N. Coast of New Guinea, but to the Southward and Eastward of Madang and the Finisterre Range, it is not generally felt with such violence, and comparatively little rain is experienced and in the Huon Gulf this is considered to be the drier of the two seasons, although occasionally very violent squalls with heavy rain come over the Rawlinson Range and down the Markham Valley."

WEATHER CHARTS MADE AT SEA.

Eastern North Atlantic.

Weather chart made at sea on board M.V. *Shropshire*, Captain B. W. ADAMSON, Rangoon to London, by Mr. R. CUMING, 2nd Officer.



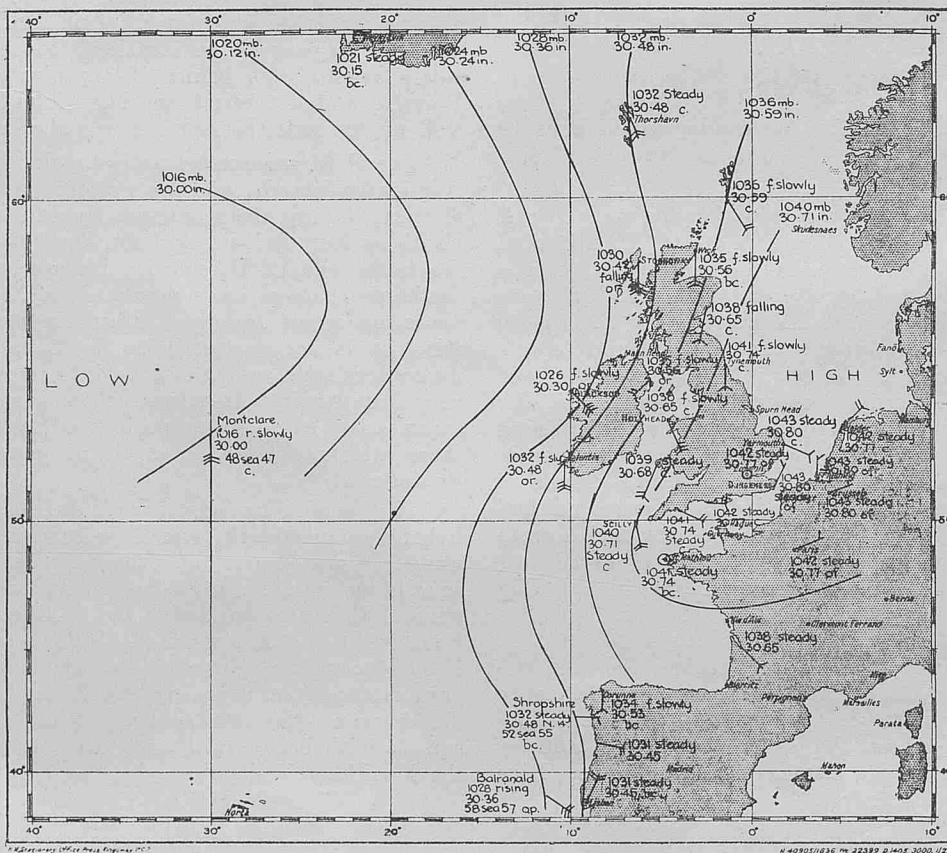
In this chart the isobars are thrown out by an incorrect reading of the barometer at Holyhead and therefore gave misleading information.

The chart below has been drawn in the Marine Division from the correct data. It should be noted that the observations for Holyhead were correctly transmitted in the Weather Shipping Bulletin for this day. On this occasion apparently *Shropshire* received the information through some other source as stations on the British Coast which are not given in the British Weather Shipping Bulletin are shown on her chart.

It is advisable for ships at sea to use Weather Shipping Bulletins which are specially designed for their purpose.

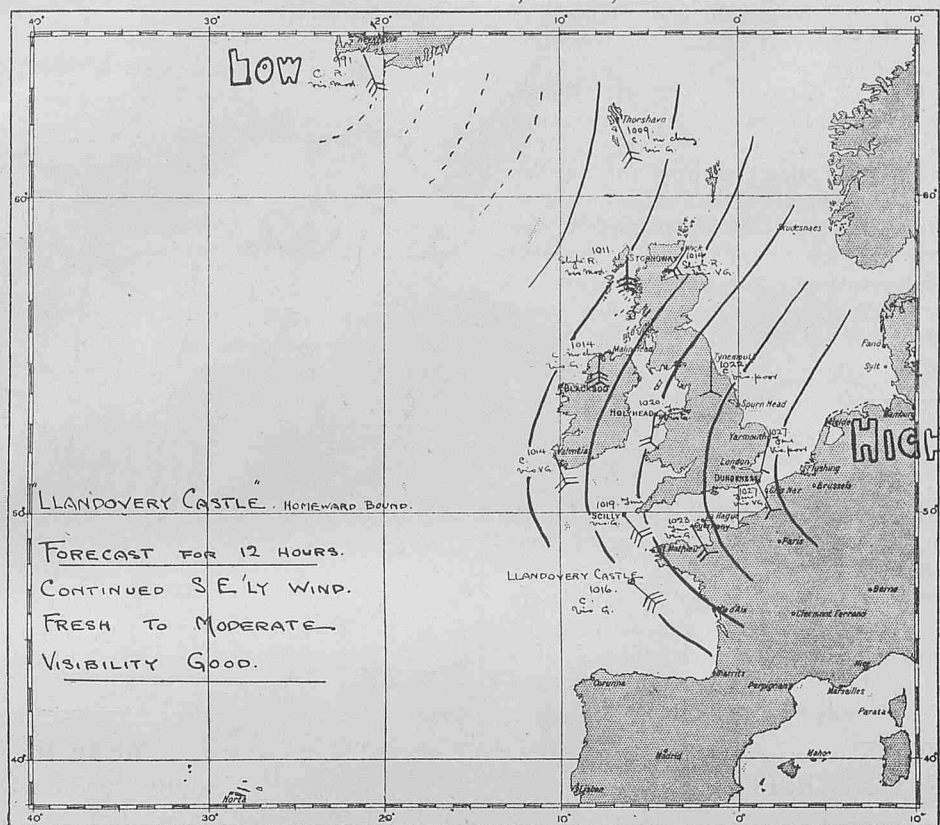
According to *Shropshire's* Meteorological Log the wind remained easterly increasing to force 4.

Weather Chart, morning of January 9th, 1929. Constructed from observations including those of the British Weather Shipping Bulletin.



Eastern North Atlantic—continued.

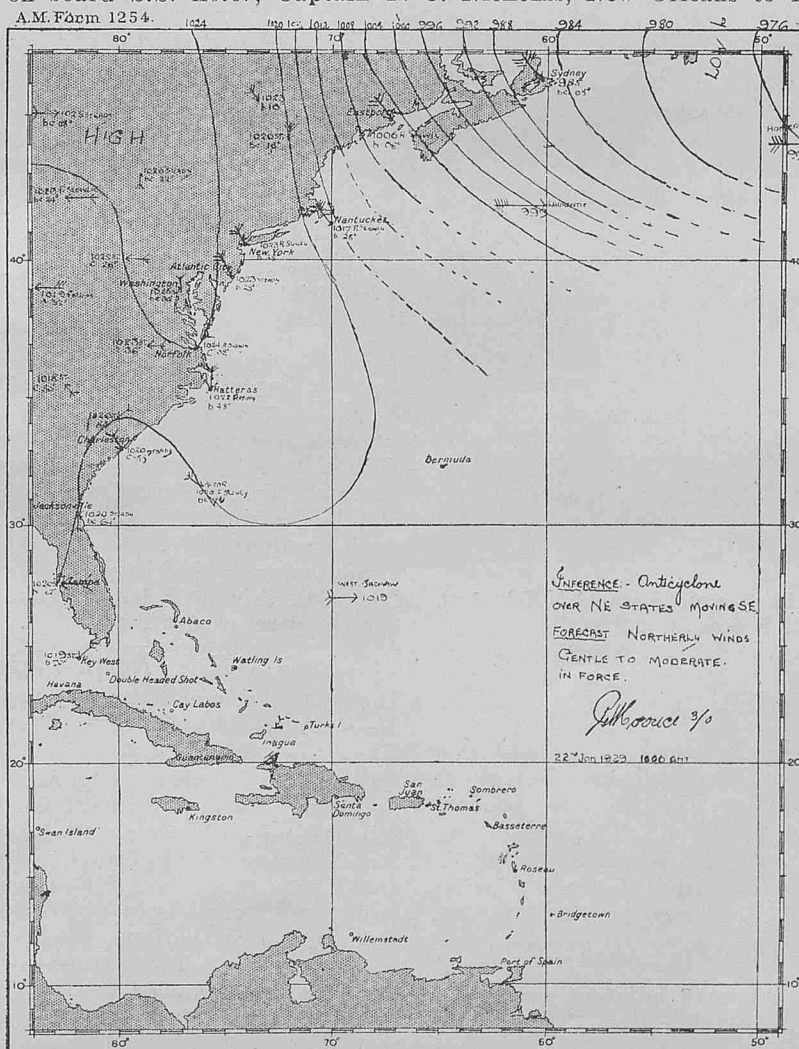
Weather Chart made at sea on board S.S. *Llandovery Castle*, Captain C. E. STUART, R.N.R., East Coast of Africa to London, by Lieutenant C. H. WILLIAMS, R.N.R., 2nd Officer.



According to *Llandovery Castle's* Meteorological Log the wind was from S.E. to E.S.E. force 5 with fine weather.

Western North Atlantic.

Weather Chart made at sea on board S.S. *Actor*, Captain P. O. NICHOLAS, New Orleans to Liverpool, by Mr. G. MORRICE, 3rd Officer.



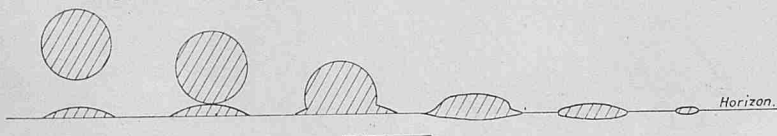
According to *Actor's* Meteorological Log the wind veered to E. and S.S.E. decreasing to force 2.

ABNORMAL REFRACTION.

Mediterranean Sea.

THE following is an extract from the Meteorological Report of S.S. *Nowshera*, Captain S. N. ROWE, Port Said to Dunkirk, Observer Mr. T. E. EARL, Chief Officer.

"January 13th, 1929, 1655 G.M.T. in Latitude $37^{\circ} 3\frac{1}{2}'$ N. Longitude $1^{\circ} 47'$ E. Wind W by S force 2, slight sea. Air Temperature 58° F. Barometer 30.405 in. Clouds Ci. and Ci-St. Amount 3. The sun was setting and when about its own diameter from the horizon another sun appeared from below the horizon, and after about a minute joined the sun (as per diagram 2) and the appearance of the sun setting was as diagram 2."



GREEN RAY AT SETTING OF VENUS.

North Atlantic Ocean.

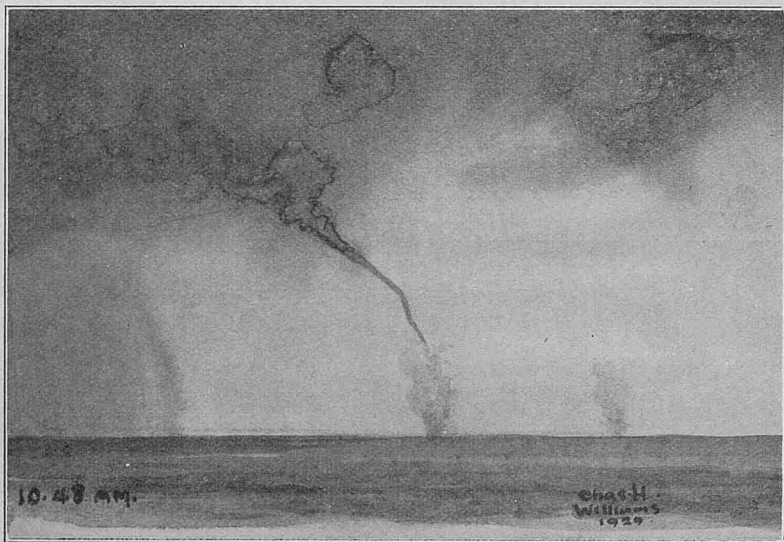
THE following is an extract from the Meteorological Log of S.S. *Culebra*, Commander C. J. GOBLE, R.D., R.N.R., London to West Indies, Observer Mr. W. S. THOMAS, 3rd Officer.

"24th January, 1929, 21.00 A.T.S. in Latitude $29^{\circ} 20'$ N. Longitude $69^{\circ} 19'$ W. Observed Venus setting. When at an altitude of about 10 minutes the planet appeared greatly enlarged and of a bright red colour, on the instant of her dipping the red changed quickly to a brilliant green. Sky cloudless."

SKETCH OF WATERSPOUT.

Mediterranean Sea.

THE accompanying sketch by Lieutenant C. H. WILLIAMS, R.N.R., has been received with the Meteorological Log of S.S. *Llandoverly Castle*, Captain C. E. STUART, R.N.R.



The waterspout was observed at 10.48 a.m. (0848 G.M.T.), 10th January, 1929, in Latitude $33^{\circ} 25'$ N. Longitude $27^{\circ} 24'$ E.

WATERSPOUT.

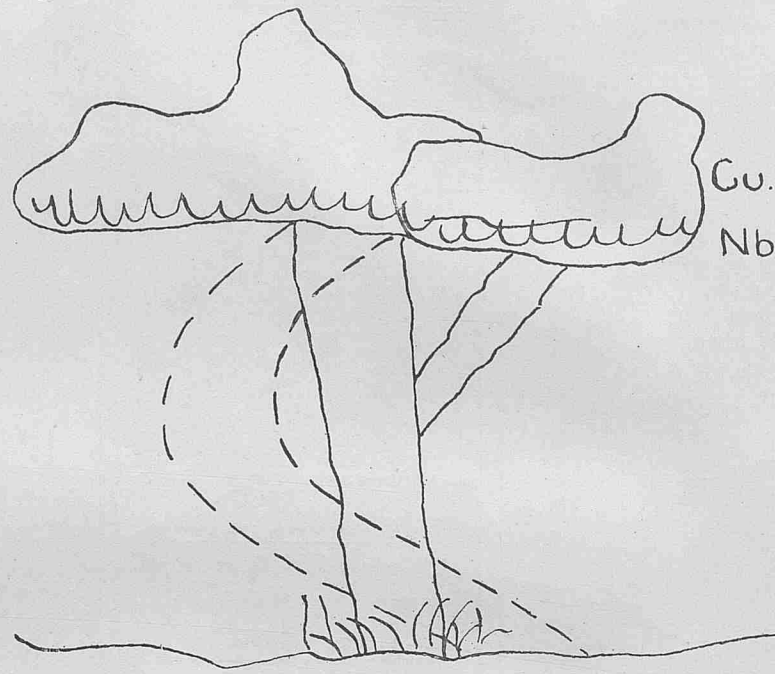
Red Sea.

THE following is an extract from the Meteorological Report of S.S. *Kaisar-i-Hind*, Captain G. MANLEY, Bombay to London, Observer Mr. R. H. HAND, 2nd Officer.

"January 4th, 1929, in Latitude $19^{\circ} 36'$ N. Longitude $39^{\circ} 10'$ E. Observed two successive waterspouts on starboard beam, 5 miles approximately. The first lasted from 7.12 a.m. to 7.30 a.m. the second 7.28 a.m. to 7.32 a.m. Barometer 30.034 in. Clouds Cu.Cu.-Nb. 1 N.

Air Temperature 78° F. Sea 81° F. The small adjacent spout soon emerged into the larger one which straightened as it got more

powerful and then assumed the bent shape (dotted line) before drying up. The cloud was Cu-Nb., the rather remarkable thing being that it was practically Cumulus, the lower straight edge only being slightly Nimbus."



METEOR.

South Pacific Ocean.

THE following is an extract from the Meteorological Log of S.S. *Matakana*, Captain H. P. THURSTON, Wellington to Balboa, Observer Mr. B. FORBES MOFFATT, 2nd Officer.

"19th January, 1929, 3.00 a.m. ship's time (G.M.T. 19d. 9 h. 29 m.) Latitude $9^{\circ} 46'$ S, Longitude $95^{\circ} 59'$ W. Brilliant meteor observed. First seen between Castor and Pollux, passing thence to the zenith, and disappeared close to Spica. Passage occupying about 20 seconds. First appearance as a bright bluish white light gradually increasing in brilliance to the zenith, where it gave sufficient light to read a wrist watch (estimated to be similar to the light given by full moon). At the zenith it burst with a bright bluish flare: the edges of this flare showed a distinct pink. Passing on towards Spica it broke into two and died to a reddish glow and finally disappeared. It left a trail stretching 20° across the sky in its wake and lasting about 10 seconds after its passage. Sky Cirro-Stratus, but all major stars visible."

Caribbean Sea.

THE following is an extract from the Meteorological Report of S.S. *Norfolk*, Captain G. F. MEAD, Wellington to Balboa, Observer Mr. A. M. DOWMAN, 4th Officer.

"At 5.06 A.T.S. 1026 G.M.T. on 21st January, 1929, in Latitude $9^{\circ} 59'$ N., Longitude $78^{\circ} 48'$ W. Observed exceptionally brilliant meteor, yellowish blue in colour, lighting whole western sky and vessel plainly, bearing 225° and falling from an altitude of 50° in a southerly direction, subtending an angle of 45° with horizon, and disappearing behind bank of Cumulus cloud 10° above horizon. Course of ship 071° weather, strong N.E. trades, good visibility. Air Temperature 78° F."

North Pacific Ocean.

THE following is an extract from the Meteorological Report of S.S. *Sheaf Mount*, Captain C. V. GROVES, Galveston to Japan, Observer Mr. A. MACARTHUR, 2nd Officer.

January 15th, 1929, 2.52 a.m. A.T.S. in Latitude $23^{\circ} 01'$ N., Longitude $168^{\circ} 30'$ W. Observed brilliant meteor of bluish light, emitting short yellowish-red tail of separate balls of fire. Rose bearing N. 20° E. (true) close eastward of stars δ Megrez and γ Phecda, at an altitude of 54° and travelling E.S.E. (true), disappeared bearing N. 52° E. (true) at an altitude of $46^{\circ} 30'$, lasting 1.5 secs. Weather fine and clear with light variable winds and slight N.W.'ly swell. Barometer 30.04 in. Temperature 73° F. Altitudes determined with sextant as near as possible after passage of meteor, relative to stars in the vicinity.

THE DECK LOG.

When damage happens to ship or cargo, when there is a collision, stranding or loss, or abnormal expenditure of fuel, or delay, the

NAMES OF MEN ON LOOK-OUT.		A.M.		REMARKS.			
				<p><i>Ship rolling heavily</i></p> <p><i>4.45 am. Wind backed to SW, d. commenced.</i></p> <p><i>Ship rolling heavily</i></p> <p><i>Ship rolling heavily</i></p>			
REVOLUTIONS.		WORK.		PRESSURE.		COAL.	
Per Day.		Speed.		Steam.		By Engine.	Remaining.
Per Min.		Slip.		Vacuum.		By Deck.	Received.

(pages 40-41 and 53 of MARINE OBSERVERS' HANDBOOK, 4TH EDITION) both of which are international, are generally known to seamen, and with them the wind and weather can be exactly described. The visibility can be clearly defined by use of the international scale, (page 55, MARINE OBSERVERS' HANDBOOK), and the state of the sea can be adequately indicated by use of the DOUGLAS Scale, (page 44, MARINE OBSERVERS' HANDBOOK) which has recently been adopted for international use.

The barometer reading if not reduced to the standard datum may be misleading, the method of reduction is given on pages 16-20 of the MARINE OBSERVERS' HANDBOOK, and in Chapter I of WIRELESS AND WEATHER: AN AID TO NAVIGATION.

Each Shipping Company has its own form of Deck Log. A uniform Deck Log throughout the British Merchant Navy may not be possible, because different ships in different trades have different requirements, but the weather may be entered similarly throughout the Merchant Navy if suitable weather columns are provided.

Taking the example of the Ship's Deck Log above, if five columns are inserted between the column for the Thermometer (which should indicate if attached to the Barometer or exposed for obtaining the Temperature of the free air) and the columns for the sounding of the wells, these same observations may be entered with equal or greater precision, brevity, and on an international and uniform method and by the arrangement given below all the weather observations, except necessary remarks, are kept together.

Thus entered the observations are more readily copied or extracted for meteorological investigation; they show the navigator at a glance

the weather experienced: are more convenient to the shipowner; and can be more easily compared by lawyers when casualties are subject to enquiry by the Courts.

The practice of entering the set and drift of current when it can be reliably obtained by difference between D.R. and observed positions is of inestimable value, and should be encouraged; for it not only helps to increase knowledge of ocean currents, but acts as an incentive to accurate navigation and good steering. This is purely a navigational problem and the entry of set and drift is best made in the Deck Log in the space for Remarks, together with the times covered by the observation, also the observed positions when other than Noon so that the interval is clearly shown and the calculation of set and drift may be checked, if necessary, also the D.R. from the Course and Distance columns of the Log.

The MARINE OBSERVERS' HANDBOOK is written for the guidance of the Corps of Voluntary Marine Observers to keep Meteorological Logs and records for the Meteorological Office, but the methods of observation advocated therein will be found suitable for general sea service, and if in time shipowners see their way to adopt such an arrangement it would be for the general benefit and convenience of the Merchant Navy and Meteorological Services.

We shall be glad to receive remarks upon this suggestion from Marine Superintendents, and especially from Commanders and Officers who are not members of the Voluntary Corps of Marine Observers, also from others concerned with the Deck Logs of ships of the British Merchant Navy.

SQUALLS AT SEA.—I.

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

General.—The following remarks on the meaning of the word "squall" are quoted from a paper on "Line-Squalls" by M. A. GIBLETT, M.Sc., published in the Journal of the Royal Aeronautical Society, Volume XXXI, 1927, page 509.

"It is not a word coined by meteorologists, but is of ancient origin, probably nautical, and is described in the New English Dictionary as meaning 'a sudden and violent gust, a blast or short sharp storm of wind,' thus:—1725 De Foe, Voyage Round World—'It blew . . . not only by squalls and sudden flaws, but a settled terrible tempest.' It was also applicable to other meteorological elements than wind, thus:—1748 Anson's Voy.—'We had frequent squalls of rain and snow.' Squalls were of several kinds, thus:—1823 Crabb. Technol. Dict.—'A black squall is attended with a dark cloud, in distinction from a white squall when there are no clouds, and a thick squall accompanied with hail, sleet, etc. A straight squall has been spoken of, meaning one in which there is no change of wind direction. Then again we have:—1846 A. Young, Naut. Diet.—'The arched squall . . . is usually distinguished by the arched form of the clouds near the horizon.' This is merely a perspective effect when looking at the forward edge of a long straight cloud bank."

In "The Sailor's Word-Book," published in 1867, Admiral SMYTH defined a squall as "A sudden gust of wind, frequently occasioned by the interruption and reverberation of the wind from high mountains. These are very frequent in the Mediterranean, particularly in the Levant." Admiral SMYTH's definitions of varieties of squall will be given later in the present article. Up to comparatively recent times the words "gust" and "squall" appear to have been used more or less indiscriminately, though it is possible that the former was sometimes used to imply a rise of wind of shorter duration. Since the advent of the pressure-tube anemometer, with its exact tracing of the fluctuations of wind, meteorologists make a distinction between the two terms. Gusts are the comparatively rapid fluctuations in the strength of the wind normally experienced near the surface of the earth. In the records of the pressure-tube

anemometer they are shown by the more or less extensive departures of the pen trace from the mean position which represents the average wind strength being experienced at the time. A squall is a burst of wind which occurs suddenly, lasts usually for at least several minutes and then dies away suddenly. The distinction as regards duration is thus stated by Sir NAPIER SHAW:—"A squall is a rapid increase of wind velocity that remains over half a minute at least; it may include a number of gusts of different force. . . A gust is an increase of wind velocity followed by a lull in less than half a minute; gusts are incidental to all winds." Figure 1 is a copy of a portion of the

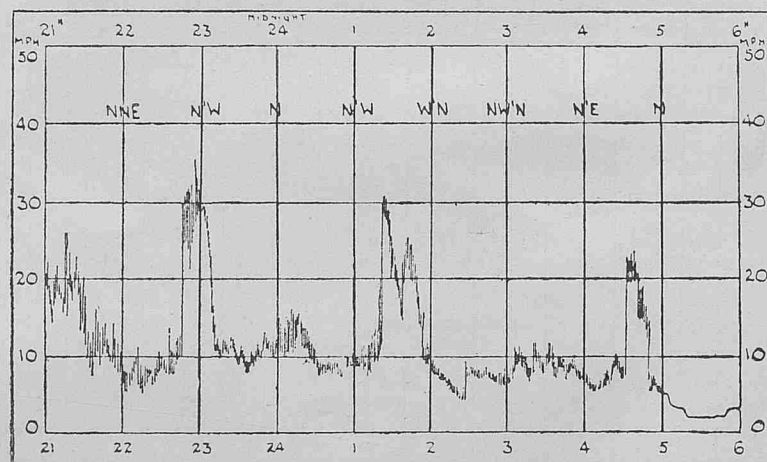


Fig. 1.—Squalls and Gusts, Scilly, March 3rd to 4th, 1908.

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of the Royal Aeronautical Society.

anemometer record at Scilly on March 3-4, 1908. The minor fluctuations here shown are gusts while there are three squalls during the

period, upon each of which gusts are superimposed. There is, however, a more fundamental distinction than that of duration between a gust and a squall. Gusts are due to the turbulent or eddy motion of the air arising from the friction offered by the ground to the flow of the general air current passing over the locality. In other words, they are the result of mechanical interference with the steady flow of air. A squall, on the other hand, is the result of some definite meteorological cause which affects the general air current flowing over the observer. Owing to the presence and diversity of the land surface, gusts are in general more frequent and more intense over land than over the sea. They are nevertheless experienced at sea and are very pronounced during heavy gales. In their most intense form they come with a boom like the discharge of a piece of heavy ordnance. Hence has arisen the sailor's expression "blowing in great guns."

The terms "rain," "hail" or "snow squall" are frequently used, but these should mean a wind squall accompanied by rain, hail or snow. Wind is the characteristic feature of a squall and sudden bursts of rain, hail or snow unaccompanied by wind changes other than those of normal gustiness are not strictly squalls. The purpose of the present article is to give an account of wind squalls at sea. The subject is a wide one and can only be discussed here with comparative brevity. Squalls have always meant much to seamen, especially in sailing ships, where sudden changes of wind might mean damage to spars, loss of sails or even disaster if the necessary action was not taken in time. From the scientific point of view our knowledge of squalls is far from perfect or complete. Natural phenomena are very complex and wind squalls constitute no exception to this rule. Of recent years the line-squall has been extensively studied, but even in the case of such a well-defined phenomenon there are varieties which occur with greater or less frequency. An attempt has been made below to classify squalls at sea into distinct classes, but there may be other types of rarer occurrence, and it is probable also that with increasing knowledge we shall be able to distinguish minor variations in each class. In the Marine Observer's Log accounts of squalls are given, selected for their special interest, but there has not yet been opportunity to review the descriptions contained in the accumulated logs of the past. Statistics of squall distribution and frequency have also, in the main, not yet been worked up. The monthly frequencies of squalls in parts of the equatorial and N.E. Trade Wind region of the Atlantic Ocean are, however, summarised in Table I from the data in Captain TOYNBEE's "Remarks to accompany Monthly Charts of Meteorological Data for Nine Ten-Degree Squares."

TABLE I.—Monthly Frequencies of Occurrence of Squalls.

The figures are percentages of the number of Wind Observations (for example, the figure 10 means 10 squalls observed in every 100 wind observations).

	Jan.	Feb.	March.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Square 3 { 0°–10°N. 20°–30°W. }	10	6	8	8	10	10	10	9	11	14	15	9
" 302 { 0°–10°S. 20°–30°W. }	4	5	9	9	11	8	7	7	7	5	4	4
" 39 { 10°–20°N. 20°–30°W. }	3	2.5	1	1	2	2	4	6	8	8	3	2

Except for some types of squall experienced in coastal and narrow waters the formation of squalls depends either upon the juxtaposition of masses of relatively cold and warm air, mainly by the process of the upraising of the warm air by the influx of cold air below it, or by the rising of warm heated air from the surface by the process of convection. The main type of squall produced by the first method is the line-squall and that produced by the second method is the convectional squall of the equatorial regions.

It should be noted that the sudden onsets of local or general winds which thereafter blow more or less persistently are not regarded as squalls in the ordinary sense of the word. The chief example of such a sudden onset is the blast of wind associated with the burst of the Indian S.W. Monsoon.

The "black squall," defined by Admiral SMYTH as "one attended with a dark cloud and generally heavy rain," is not a distinct type of squall. It is merely a descriptive term which might be applied to any squall showing the characteristics mentioned.

Simple Squalls.—The following account of a simple squall is taken from ABERCROMBY'S "Weather":—"In a true simple squall . . . the blast comes on suddenly with a burst, and rain or hail . . . while the whole rarely lasts more than five or ten minutes. At sea one often sees two or three squalls flying about at a time. Then we readily observe that over the squall there is firm, hard, cumulus cloud; that the disturbance only reaches a short distance above the earth's surface; that the squall moves nearly in the same direction as the wind; and that there is little or no shift of the wind before or during the squall. We also see that the shape of the squall is merely that of an irregular patch, with a tendency rather to be longer in the direction of the wind than in any other quarter; and that the motion of the squall as a whole is much slower than that of the wind which accompanies the first blasts. If, at the same time, we watch our barometer closely, we find that if the squall is sufficiently strong the mercury invariably rises—sometimes as much as one-tenth of an inch—and returns to its former level after the squall is over. No difference is observed in this sudden rise, whether the squall is accompanied by rain, hail, or thunder and lightning."

It is probable that these squalls occur chiefly in the rear of depressions in temperate latitudes, that is, in the relatively cool N.W. wind (in the northern hemisphere) or in the S.W. wind (southern hemisphere), with a clear sky and detached clouds of St-Cu. or Cu. type. They are more frequent and more severe in the Southern Ocean south of Latitude 40° S. than in the North Atlantic, owing to the more continuous succession of depressions in the southern hemisphere, and hence were much encountered in the days of the sailing ship, "while running the easting down." Heavy hailstorms are a frequent accompaniment of the squall, particularly in the southern hemisphere, and in the days referred to it was often necessary for the boy on the poop to sweep up with a broom after each hailstorm.

Simple squalls may at times present points of special interest, and two squalls recorded in THE MARINE OBSERVER will be referred to here. On 5th October, 1923, in the Mediterranean, S.S. *Clan Ross*, Captain W. G. M. CHRISTIAN, observed a squall in which there were two distinct layers of St-Cu. cloud, one moving from N.N.W. and the other from S.S.W. (See VOLUME I, 1924, p. 132). On 7th November, 1927, also in the Mediterranean, S.S. *Osterley*, Commander I. J. HAYES, R.D., R.N.R., observed a squall with heavy Nb. cloud which came from the N.W. and remained for 1½ hours in the same position with regard to the ship, the cloud slowly rotating in an anticlockwise direction. The sea was confused beneath the cloud but smooth outside it. The following examples of ships being struck flat aback by a squall are taken from ALLINGHAM'S "Nautical Meteorology," 3rd edition:—"The ship *Four Winds*, on 24th August, 1887, in Latitude 26° S., Longitude 60° E., had a fresh S.E. breeze. Suddenly a very sharp gust caught her flat aback, and she stopped as suddenly as though she had run up against something solid." "The ship *Castle Rock*, on 1st April, 1893, in Latitude 40° S., Longitude 92° E., was struck flat aback with great force. In a second the wind was right aft, with such strength that it brought the lower mizen topsail yard down in halves. In another two seconds it burst out on her starboard beam, threw her lee top-gallant rail under and tore off several of the sails."

In the open Trade Wind and Monsoon regions simple squalls also occur, of less intensity than those described above. They are not associated with heavy cloud, and there is only a moderate increase in wind force, with comparatively small changes of direction. Slight showers or moderate rain may be experienced with these squalls, but hail does not occur, or very rarely.

An example of a Trade Wind squall in the South Atlantic will be found in THE MARINE OBSERVER, Volume V, 1928, p. 179, observed by S.S. *Rimutaka*, Captain F. A. HEMMING, on 23rd September, 1927.

The Line-Squall.—We shall describe first the typical line-squall associated with the trough or squall line, or, as it is now generally referred to by meteorologists, the cold front of a cyclonic depression of temperate latitudes. A brief description of line-squall phenomena is all that the limits of this article will allow. The reader who would like to study the subject in greater detail is referred to the paper by Mr. GIBLETT mentioned above. The typical line-squall is the one originally studied by meteorologists and the one for which the name was coined; it is, however, now recognised that the characteristic features of the line-squall may be produced in circumstances other than those associated with the passage of the cold front of a depression. Examples of squalls of various types coming within this category will be given later; there is as yet, little reference to them in meteorological literature, but it is probable that they will continue to be called line-squalls, equally with the typical line-squall. The sequence of phenomena in a typical line-squall is definite and easily recognisable. There is a sudden rise of the mercury in the barometer by about 2 mb. (less than 0.1 in.), a veer of wind through about 8 points (a back in the Southern

Hemisphere), a simultaneous fall of temperature which may be as much as 10° to 20° F. and a sudden squall of wind, sometimes of great violence, lasting for a few minutes. The phenomena are represented in Figure 2, but it should be noted that the average wind speed after the squall has passed is sometimes greater than that before the squall. In the figure it is less. In the northern hemisphere the typical wind change is from S.W. to N.W.

For diagrams and explanation of Prof. BJERKNES' theory of the structure of depressions reference may be made to Chapter XI of *WIRELESS AND WEATHER, AN AID TO NAVIGATION*. Referring to the northern hemisphere the cold front is the edge of the current of relatively cold air coming from a north-westerly direction and impinging on the central core of relatively warm and humid air. The cold air undercuts the warm air and forces it upward giving the heavy rainfall. The onset of the cold air, which is of greater density than the warm air, gives the sudden rise of pressure and fall of temperature. The line-squall cloud is a kind of Cu-Nb, the arch cloud, the lower edge of which is often very ragged and indented, these irregularities being due to vertical eddies. It should be noted that this cloud is not necessarily observed, sometimes being obscured by the general cloud masses.

Practically every depression has line-squalls associated with it, but they are of minor intensity in many cases. The length of the whole line-squall front may be several hundreds of miles on occasion. The really severe line-squalls are in a small minority. It is very common for more or less severe thunderstorms to be associated with line-squalls but conditions are not always equally favourable to their production, depending on the rate of fall of temperature with height in the warm air adjacent to the cold front.

It is probable that the storm which inflicted so much damage to the Spanish Armada on 30th May, 1588, was a line-squall. It was of very brief duration. A great line-squall disaster of more recent times was the sinking of the full-rigged corvette H.M.S. *Eurydice*, homeward bound from the West Indies, on 24th March, 1878. She was off Ventnor, in the Isle of Wight, running free with a nearly westerly wind with all sail set. It was a beautiful sunny afternoon and all the ports were open. At 3.45 p.m. she was struck by a squall heralded by a bank of black clouds from the N.W. and before sail could be shortened she went on her beam-ends and foundered with all hands. The squall, accompanied by a violent snowstorm, raged with great violence for a few minutes after which fair weather again set in. Synoptic charts for 43 minutes past noon and 3 p.m. are shown in Figure 3.

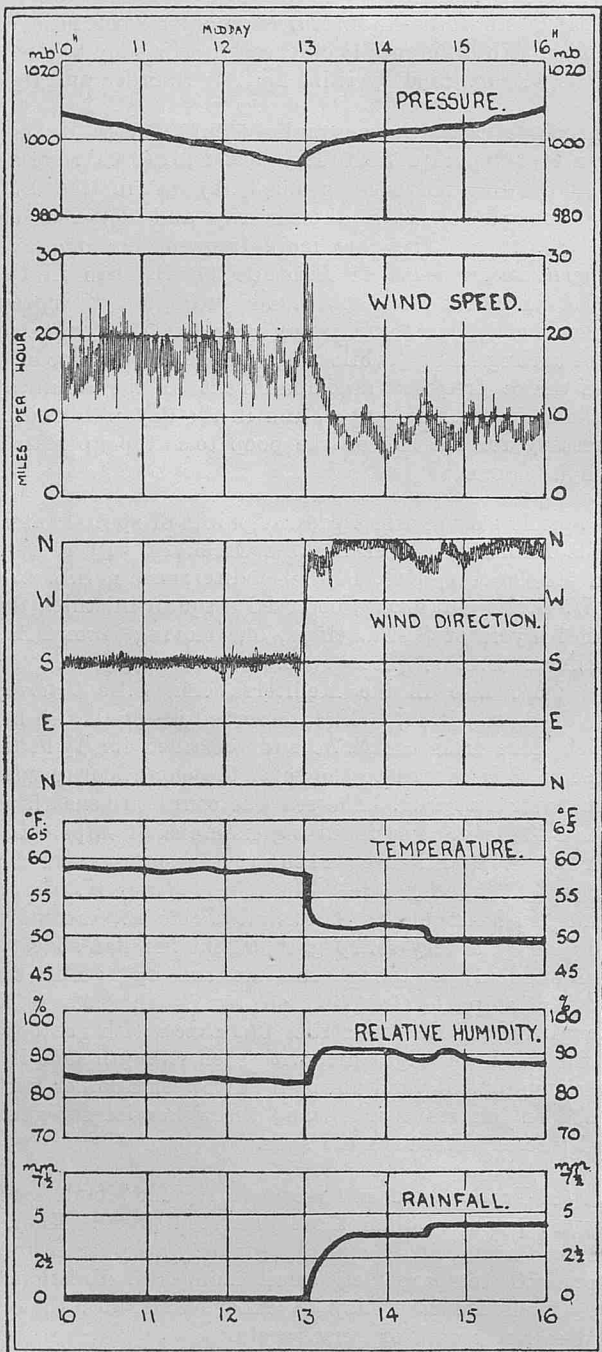


Fig. 2.—Changes during passage of a typical cold front.

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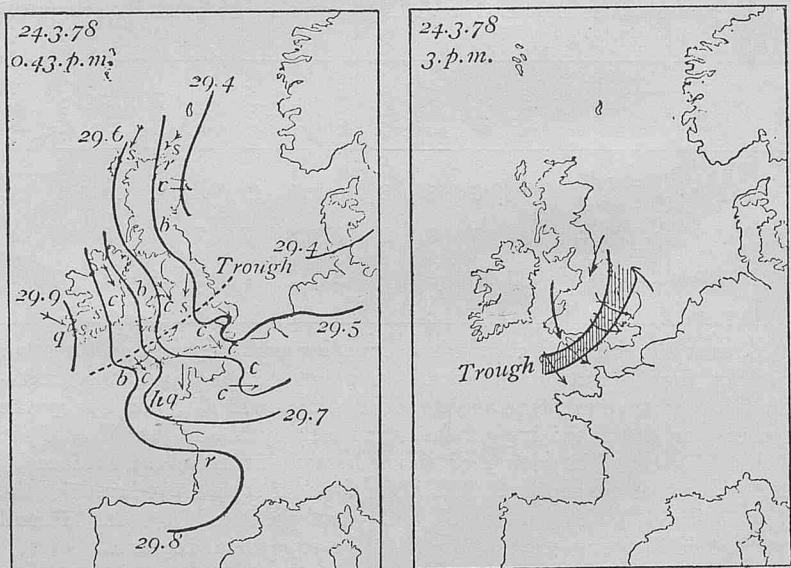


Fig. 3.—The Eurydice Squall, Isobars and Wind at 0.43 p.m. and area covered by squall at 3 p.m.

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A number of accounts of line-squalls have appeared in The Marine Observer's Log. A fine photograph of a line-squall cloud taken on board S.S. *Arracan*, Captain W. T. HAMILTON, in the Mediterranean on 10th May, 1922, was reproduced in MARINE OBSERVER, VOLUME I, 1924, page 21.

Modifications of the Typical Line-Squall.—Space does not permit of the enumeration of all the minor varieties of wind change possible with the line-squall, but mention may be made of certain known types. The wind before the squall may be so strong as to mask it entirely, the wind after the passage of the squall merely declining rapidly from its previous strength. There is thus no squall in the strict sense of a wind squall though all the other characteristics of the line-squall may be present. A rarer type is for the wind to rise suddenly at the time of the squall and maintain its strength thereafter for perhaps several hours. The other two variations that will be mentioned here both give added emphasis to the squall itself. The wind both before and after the squall may be nearly calm, the change to squall conditions being very marked, or, as happened at Luce Bay, Scotland, on 29th October, 1917, a gust of very great strength may be superimposed on the added wind strength of the squall; in this case the gust reached a speed of 86 miles per hour. It is also possible for the barometric rise to be delayed, the mercury perhaps falling for a short while before the rise occurs. A line-squall of this type was experienced by S.S. *Benalla*, Captain J. S. SHEEPWASH, on 3rd November, 1928, the account being published on page 241 of VOLUME VI of THE MARINE OBSERVER.

Distribution of the Line-Squall.—The true line-squall associated with a depression may occur in any part of the temperate latitudes and even in as low latitude as 30° N. or S., but as stated above, the severer line-squalls are comparatively rare. Line-squalls are thus especially frequent in the Southern Ocean along the parallels of the forties and the fifties. In two cases the phenomenon is known under definite local names, the Southerly Burster of summer in Southern Australia and the true Pampero of South America. The former of these has been described, with synoptic charts, in Chapter VI of "WIRELESS AND WEATHER AN AID TO NAVIGATION," so that the account need not be repeated here. The fall of temperature is very marked, usually 15°-20° F. but in an extreme case a fall of 37° F. was noted. Similar storms are experienced in the neighbourhood of Durban. The Pampero occurs in Argentinian and Uruguayan waters chiefly during the months July to September, and is followed by a cold south-westerly breeze. The account of a Pampero quoted in ABERCROMBY'S "Weather" is reproduced here because of its vivid description of the cloud arch accompanying the squall. In many Pamperos, however, the actual squall of wind and rain is much greater than in this description while the accompanying thunderstorms are sometimes among the most violent known anywhere on land or sea.

"In the early morning of a day in November the wind blew rather strongly from the north-east. The sky was cloudy, but not overcast, save in the south-west horizon. The clouds were moving very slowly from the west, or a little south of it, throwing out long streamers eastwards. About 8 a.m. the threatening masses in the south-west had advanced near enough to show that their head marked two dense and perfectly regular battalions of cloud, one behind the other, in close contact, yet not intermingling, and completely distinguished by their striking difference of colour, the first being of a uniform leaden grey, while the second was as black as the smoke of a steamer. On arriving overhead it was seen that the front, although slightly sinuous, was perfectly straight in its general direction and that the bands were of uniform breadth. As they rushed at a great speed under the other clouds without uniting with them, preserving their own formation unbroken, their force seemed irresistible, as if they were formed of some solid material rather than vapour. The length of these wonderful clouds could not be conjectured, as they disappeared beneath the horizon at both ends, but probably at least fifty miles of them must have been visible, as the 'Cerro' commands a view of twenty miles of country. Their

breadth was not great, as they only took a few minutes to pass overhead, and appeared to diminish from the effects of perspective to mere lines on the horizon. At the instant when the first band arrived, the wind—which was still blowing, and something more than gently, from the north-east—went round by north to south-west; at the same time a strong cold blast fell from the leaden cloud, and continued to blow till both bands had passed. From neither of them, however, came lightning or rain, but, filling up the sky in rear of the regular army, followed a confused rabble of clouds, with a constant rumbling of thunder, and from which evidently rain was falling. It was not, however, till fifteen minutes after the passage of the two regular bands that rain fell where the observations were taken. The storm, passing on, obscured the whole sky, wind, rain, and thunder continuing for some hours, but only to a moderate degree."

Line-Squalls not associated with Travelling Depressions.—We now come to the type of squall referred to previously, not associated with travelling depressions, but showing the same characteristic features as the true line-squall. Severe line-squalls are often experienced in the Mediterranean, especially in winter, with the pouring of cold air through the breaks in the mountain chains of Southern Europe. When established these cold currents form the Mistral of the Gulf of Lyons and the Bora of the Adriatic. Similar line-squalls may occur in the Persian Gulf in winter. Still further removed from the depression line-squall are those due to the influx of the cool sea breeze in tropical regions. This relatively cool air meets the warm land air and produces a line-squall in coastal regions. Such squalls have been studied in Lower Egypt where they occur practically every afternoon during the hot season, but in view of the extreme dryness of the air they are usually "white squalls," unaccompanied by cloud, and the whole squall is normally a very slight affair. The changes of wind, pressure and temperature, however, are indistinguishable in character from those of a severe line-squall occurring at the trough of a depression. The so-called north-westerners at Calcutta during the hot season belong to the same category and show a well defined black arch of cloud. A well-known example of a line-squall due to a different cause is the Sumatra of the Malacca Strait. These squalls occur chiefly from April to October and usually at night. It is often stated that they are never experienced in the daytime. This is erroneous as they occasionally occur at any rate in the forenoon. A heavy bank of Cu-Nb. of arch form spreads over the sky and the wind may reach a strength of Beaufort 8 or 9, with a thunderstorm and heavy rain. The duration of the whole storm is usually less than two hours and it hardly penetrates inland at all. The Sumatra is believed to be caused by the flow of cold air, due to nocturnal radiation, down the slopes of the mountainous interior of the Malay Peninsula. This air meets the warm air over the Strait.

ABERCROMBY states that he observed a very striking instance of a line-squall due to the meeting of the S.E. Trade and the N.W. Monsoon in the Indian Ocean. "There was no doldrum, but the two currents met along a line whose position was marked by a long, dark, black cloud, with heavy rain and squall." The following is an extract from the Meteorological Log of M.V. *Adda*, Captain J. T. TOFT, Liverpool to West Coast of Africa, Observer G. BOSWELL:—"At about 7.20 p.m. on the 11th June, 1929, vessel in Latitude 21° 30' N., Longitude 17° 33' W., encountered a clearly defined line-squall travelling from S.E. to N.W. and extending from horizon to horizon. On contact thermometer fell 40° F. and barometer rose .04 inch. The wind for a few minutes was of terrific force, but conditions became normal again as squall passed over. No rain." Apparently observations of changes of wind direction during the squall were not made, but the log shows the vessel to have been in the N.E. Trade Wind before the squall and in the African S.W. Monsoon the following day. This is an instance of a line-squall between these two great air-currents. The possible occurrence of line-squalls within the Doldrums is referred to in the second part of this Article.

(To be continued.)

WEATHER SIGNALS.

UNDER Weather Signals it is intended to publish particulars and concise descriptions of Signals and Codes used for reporting Weather, Ice, and Time in four sections.

- I. Ships' Wireless Weather Signals.
- II. Wireless Weather Signals made from the shore to ships.
(Bulletins, Wireless storm, and ice warnings.)
- III. Wireless Time Signals.
- IV. Visual Weather Signals made at the Coast. (Gale and hurricane warnings.)

Sections II, III, and IV will be published as far as possible in geographical order, so that the most used of these signals for all parts of the world may be as complete as possible in each year's Numbers of THE MARINE OBSERVER.

The decode tables of the Old International Weather Code are printed altogether on pp. 19-21.

The Universal International Ships' Wireless Weather Telegraphy Code which comes into force on May 1st, 1930, is also given on pp. 26-30.

Request for Information to Meteorological Services of Maritime Countries.

Invitation is hereby given to send concise descriptions of Weather Signals made for the information of shipping and seamen in all parts of the World, in accord with the International Convention of Safety of Life at Sea, 1929, with a view to publication in the appropriate number of "The Marine Observer." Only limited space is available.

Request for Information to the Weather Services desiring British Selected Ships' Routine Wireless Weather Reports from May 1st, 1930.

Meteorological Services desiring to receive coded weather reports made by "A selected ships" in the Fleet List in this Journal, are invited to forward the following information in order that it may be made more generally known:—

- (1) The name of the receiving W/T Station, (C.W.), with call sign, latitude, and longitude and particulars on similar lines to that given on page 25 for Portishead, as far as applicable and

with a view to covering the largest area as possible, see Chart II (lithographic).

- (2) The Telegraphic address of the service desiring to receive these ships' reports, and the groups of the Universal International Ships' Wireless Weather Telegraphy Code desired.

After May 1st, 1930, reports from "B selected ships" may be intercepted by shore stations as required.—see pp. 22-24.

FOR USE UP TO APRIL 30TH, 1930, BUT NOT AFTER THAT DATE.

(For System to come into force on May 1st, 1930. see pages 22 to 24.)

I. SHIPS' WIRELESS WEATHER SIGNALS.

WEATHER Reports between ships at sea and from ships to Weather offices are of three kinds:—

- (1) Those which give information of conditions experienced during a passage or part of a passage with conditions prevailing at the time the message was drafted, no attempt being made to synchronise with other observations.

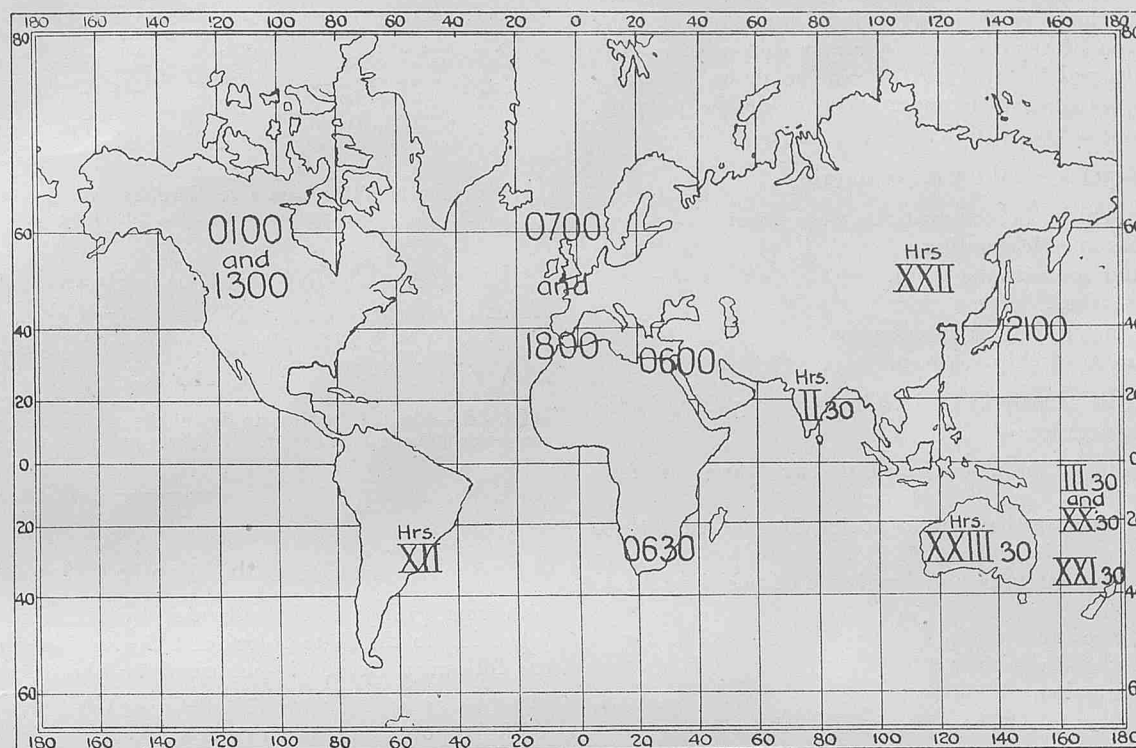
- (2) Those which are based upon observations made at arranged times so that they provide synchronised data in a standard form but *not* in code.

- (3) Those which are based upon observations made at arranged times so that they provide synchronised data *in code*.

(2) and (3) are essential for the system which is explained in this book.

In order that synchronised data may be available over ocean areas, observations made for the purpose of Wireless Weather Reports should be taken at the same time as those of the nearest land weather service. These times are given upon the accompanying Chart and in the Table below it.

Chart showing Greenwich Mean Times of Shore Observations.



The Arabic figures represent Greenwich mean time at which observations are taken for Daily Weather Reports. Where observations for these reports are timed by local time, the approximate Greenwich mean time is given in Roman figures.

The Greenwich Times at which Weather observations are taken in the different countries, of which reports for coast stations may be transmitted for the information of seamen are as follows, and observing ships are advised to take their observations for sending reports to all ships at the same time within the approximate limits suggested:—

G.M.T. of Shore Observations.	Suggested approximate limits for observation times by regular voluntary observers making reports to "All Ships."
British Isles and Europe. 0700 and 1800	From Longitude 40° W. in the Atlantic Ocean to the west and north coasts of Europe to the Equator including the Mediterranean to Longitude 20° E.
Egypt ... 0600	In the Mediterranean Eastward of Longitude 20° E. and in the Red Sea.
India ... 0230	Arabian Sea, Persian Gulf, Bay of Bengal and Indian Ocean north of the Equator.
China ... 2200	China Sea.
Japan ... 2100	From the east coast of Japan in the Pacific Ocean to Longitude 180° E., north of the Equator.
North America 0100 and 1300	From Longitude 40° W. in the Atlantic to the east coast of North America north of the Equator. From Longitude 180° W. in the Pacific to the West Coast of America north of the Equator.
South Africa ... 0630	From Longitude 20° W. to the African Coast in the Atlantic Ocean south of the Equator. From Longitude 80° E. to the African Coast in the Indian Ocean south of the Equator.

G.M.T. of Shore Observations.	Suggested approximate limits for observation times by regular voluntary observers making reports to "All Ships."
Australia ... 2330	From Longitude 80° E. to the Australian Coast in the Indian Ocean south of the Equator. From Longitude 160° E. to the Australian Coast in the Pacific south of the Equator.
New Zealand ... 2130	From Longitude 160° E. to Longitude 130° W. south of Latitude 30° S.
Fiji ... 0330 and 2030	From Longitude 160° E. to Longitude 130° W. between the Equator and Latitude 30° S.
South America 1200	From Longitude 130° W. to the American Coast in the Pacific south of the Equator. From Longitude 20° W. to the American Coast in the Atlantic south of the Equator.

In order to ensure a regular service of reports which all ships may receive, each of the ships whose names appear in the list of Regular Observing Ships as "Selected Ships" given at the end of each Number of this Journal is invited to make the report described in (2) below daily and to enter it in her Meteorological Log or Meteorological Report, Form 911.

Thus ships on the list with numbers before their names are "Selected Ships" and upon them the efficiency of this voluntary service mainly depends.

(2) Standard Form not in Code.

TIMES of observation must not be confused with times of transmission of reports. So long as the observations are taken at these fixed times transmission of reports may follow as convenient. The reports should be addressed to "All Ships," and made on the wavelength which the Captain considers most efficient for the purpose, usually 600 m. spark or 2,100 m. C.W.

Wireless Weather Reports should always contain—

- The position at which the observations were taken,
- The corrected barometric reading,
- The direction and force of the wind,
- The present weather,*
- The Greenwich mean time of observation,
- The date and name of ship sending.

Other information will usually be desired by receiving ships in the following order of importance:—

- Course and speed of ship during last two, three or four hours,
- Tendency or change of the barometer in the last two, three or four hours,
- Current found with latitude and longitude of positions From and To,
- Temperature of the air,
- Temperature of the sea surface,
- Swell and its direction,
- Past weather.

Without using a code, messages may be conveniently framed giving these elements briefly and concisely with sufficient standardisation to enable them to be easily read.

For this purpose the following scales are recommended:—

The Beaufort Scale of Wind Force.

Admiral Beaufort's numbers.	Seamen's description of wind.	Admiral Beaufort's numbers.	Seamen's description of wind.
0	Calm.	7	Moderate gale.
1	Light air.	8	Fresh gale.
2	Light breeze.	9	Strong gale.
3	Gentle breeze.	10	Whole gale.
4	Moderate breeze.	11	Storm.
5	Fresh breeze.	12	Hurricane.
6	Strong breeze.		

The Beaufort Notation of Weather.

(It is best to write words in the Message.)

b Blue sky.	p Passing showers.
c Cloudy.	q Squalls.
d Drizzle.	r Rain.
e Wet air.	rs Sleet.
f Fog.	s Snow.
fe Wet fog.	t Thunder.
g Gloomy.	tl Thunderstorm.
h Hail.	u Ugly.
kq Line squall.	v Unusual visibility.
l Lightning.	w Dew.
m Mist.	z Dust haze.
o Overcast sky.	

* For the purpose of Aircraft it is important that exact information of cloud types and amount should be given.

The direction of movement of the Upper Clouds is of great importance.

The International Weather Telegraphy Barometric Tendency Table.

Barometer steady. (The barometer has not fallen or risen more than $\frac{1}{4}$ millibar in 3 hours).	
Do. rising slowly. (The barometer has risen 1 to $1\frac{1}{2}$ mb. ('03- '04 in.) in last 3 hours).	Do. do. 2 to $3\frac{1}{2}$ " ('06- '10 in.) do.
Do. rising. Do.	Do. do. 4 to 6 " ('12- '18 in.) do.
Do. rising quickly. Do.	Do. do. over 6 " ('18 in.) do.
Do. rising very rapidly. Do.	Do. fallen 1 to $1\frac{1}{2}$ " ('03- '04 in.) do.
Do. falling slowly. Do.	Do. do. 2 to $3\frac{1}{2}$ " ('06- '10 in.) do.
Do. falling. Do.	Do. do. 4 to 6 " ('12- '18 in.) do.
Do. falling quickly. Do.	Do. do. over 6 " ('18 in.) do.
Do. falling very rapidly. Do.	

Example of Plain Language Wireless Weather Report in standard form, not in code, recommended.

To CQ.

Weather 3045N 6146W Barometer corrected 3009
ENE3 Cloudy CiStr 8 1300 GMT Twenty Eight May
Course N49E 13 Steady Current WSW $\frac{3}{4}$ Knot From
28N 65W to 30N 61W Air 73 Sea 74 Cristales.

NOTE—The date appears in the middle of this message, the most important elements appearing before it. If abbreviation is desired omit all after date.

(3) North Atlantic "Decode."

THE main groups of the code used by a limited number of ships for reporting to the Meteorological Office having been internationalised, the following Decode is published for the information of ships who are able to intercept these reports.

The reports are addressed to *Weather London* (Meteorological Office, London) and to *Government Observer, Washington, D.C.* (United States Weather Bureau). Those addressed to *Weather London* are made to Portishead W/T Station, call sig. **GKU**, the ship reporting first calling Portishead on the wavelength of 2,013 metres (C.W.), unless otherwise instructed by Portishead, and passing her report on the wave length designated by Portishead. Those addressed to *Government Observer, Washington, D.C.*, are made to any of the following U.S. Navy radio stations at Bar Harbour, Me., call sig. **NBD**. New York, N.Y., call sign **NAH**, Norfolk, Va, call sign **NAM**, or Charleston, S.C., call sign **NAO**, on a wavelength of 2,100 metres (C.W.). The respective transmissions take place as soon as possible after observation time.

Observations made between the 100-fathom line, British Isles, and 40° W. Longitude are reported to *Weather London*.

Observations made between Longitude 40° W. and a line, Belle Isle—Virgin Rocks—Sable Island—Cape Hatteras are reported to *Government Observer, Washington, D.C.*

The times of observation are:—

European land 0100, 0700, 1300 and 1800, G.M.T.

American land 0100, G.M.T. = 8 p.m. 75th Meridian Time.

and 1300, G.M.T. = 8 a.m. 75th Meridian Time.

Ships at Sea from the 100-Fathom Line British Isles to 40° W. Longitude.

0700 and 1800, G.M.T.

Ships at Sea from Longitude 40° W. to a Line Belle Isle—Virgin Rocks—Sable Island—Cape Hatteras.

0100 and 1300, G.M.T.

ADDITIONAL reports may be made to *Weather London* eastward of Longitude 40° W., containing observations made at 0100 and 1300 G.M.T.

A message consisting of figures addressed to *Weather London* or *Government Observer, Washington D.C.*, may be decoded as follows:—

As the first four groups are international, these groups, in weather reports transmitted by wireless telegraphy to weather offices of maritime countries by ships of all nations, may usually be decoded in the same manner.

Rule up a form, a sample of which is given on opposite page, and write the groups of figures and words, in the order received, in the spaces.

DECODE FORM.

Code.	Code Figures.					Distinguishing Letter.	Number of Group.	Name of Element and how to decode the Figures.	Message decoded.	
	Column Numbers.									
	1	2	3	4	5					
								Addressed to “	”.	
International Weather.	4	*	*	*	*	P	1	Day of Week, Table I.*	Wednesday.	
	*	1	*	*	*	Q		Name of Latitude and Longitude, Table II.	North and West.	
	*	*	4	5	*	LL		Latitude, degrees.	45°.	
	*	*	*	*	8	L		Latitude, approx. minutes (multiply code fig. by 6).	48'	
	3	0	*	*	*	ll	2	Longitude, degrees.	33°.	
	*	3	8	*	*	l		Longitude, approx. minutes (multiply code fig. by 6).	48'	
	*	*	*	0	7	GG		Greenwich Mean Time to nearest hour.	07.	
	2	4	*	*	*	BB	3	Barometer, prefix 9 or 10 to code figures and, if desired, convert to inches. (See Special Table XXIII, p. 21.)	1024mb.	
	*	*	1	6	*	DD		Wind direction true, Table III.	South.	
	*	*	*	*	2	F		Wind force, Table IV.	2.	
	1	1	*	*	*	ww	4	Present weather, Table V.	No change, Cloudy.	
	*	*	4	*	*	v		Visibility. Table VI.	Very good.	
	*	*	8	0	*	K		Swell. Table VII.	Slight.	
	*	*	*	*	4	d		Swell—direction from, Table VIII.	South.	
	Check.	0	*	*	*	*	x	5	Sum of Column 1, less tens.	
		*	9	*	*	*	x		Sum of Column 2, less tens.	
*		+3	1	*	*	x	Sum of Column 3, less tens.		Check corrected.	
*		*	+4	1	*	x	Sum of Column 4, less tens.			
*		*	*	*	1	x	Sum of Column 5, less tens.			
2		*	*	*	*	y	6	Sum of Group 1, less tens.		
*		1	*	*	*	y		Sum of Group 2, less tens.		
*		+3	5	*	*	y		Sum of Group 3, less tens.	Check corrected.	
*		*	*	4	*	y		Sum of Group 4, less tens.		
*		*	*	+4	2	y		Sum of Group 5, less tens.		
British M.O. Weather.		6	*	*	*	*	C	7	Cloud predominating, Table IX.	Strato-Cumulus.
		*	7	*	*	*	N		Cloud amount, Table X.	Seven-tenths.
	*	*	1	*	*	W	Past weather, Table XI.		Cloudy.	
	*	*	*	0	*	U	Unusual phenomena. (See Special Table XXII, p. 21.)		None.	
	*	*	*	*	4	y	Sum of Group 7, less tens.		Group correct by check.	
	6	8	*	*	*	TT	8	Air temperature, degrees.	68° F.	
	*	*	6	9	*	tt		Sea temperature, degrees.	69° F.	
	*	*	*	*	1	y		Sum of Group 8, less tens.	An error in this group.	
	Space for word if wind force greater than 9.									

The message now reads—Wednesday, Latitude 45° 48' N., Longitude 33° 48' W., G.M.T. 07 hours, Barometer 1024mb, Wind south force 2, Cloudy weather, Visibility very good, slight swell from south (column check corrected) (Group check corrected), Cloud St.-Cu, amount 7-tenths; past weather, cloudy; No unusual phenomena; (Group correct by check) Air temperature 68° F., Sea temperature 69° F. (An error in group).

* Tables I—XXI (International Code) will be found on pp. 19-21.

To save space, the groups of figures and their meanings have been inserted in the sample decode form, in *italics*.

Example:—The following message intercepted:—*Weather London* 41458 30807 24162 11404 09111 21542 67104 68691.

These figures having been written in the appropriate spaces, errors made in transmission may be checked by adding together the figures in each *column* of the first four groups, *neglecting the tens*. If the message has been correctly transmitted, the sums of the columns will agree with the corresponding figures of Group 5. If the sums differ, write down (under the original figures in Group 5) the numbers which must be *added* to make them agree.

NOTE.—In all adjustments of check figures, tens and carrying figures must be disregarded entirely; thus for purposes of the check system $9 + 4 = 3$, not 13.

Next add together the figures in each group 1 to 5, separately (neglecting tens). These sums should agree with the figures from

left to right in Group 6. If they differ, write down (under the original figures in Group 6) the numbers which must be *added* to make them agree.

Group 5 now indicates the *columns* in which there are errors with the numbers to be added to the figures which are in error.

Group 6 indicates the *groups* in which these errors occur.

In the example given we find that 0 in the second column of Group 2 should be 3, and that 4 in the third column of Group 4 should be 8.

In the remaining groups of the message a *double* check is not provided, but the fifth figure in each group will represent the sum of the first four figures, neglecting tens, and if it does not agree it will be known that one or more figures are in error.

The message is next decoded by means of the Tables and Instructions given on the Decode Form.

In publishing "Weather Signals" in the Numbers which follow throughout the year for the Maritime countries of the world every endeavour will be made to make the information accurate and up to date, at the same time giving it as tersely and conveniently as possible for mariners from the many available sources.

Following the International Conference of Safety of Life at Sea, London, 1929, and the British Empire and International Meteorological Conferences at London and Copenhagen, 1929, changes may be expected with a view to producing uniformity as far as possible.

Every effort will be made to guard against error, and Marine Observers are asked to write in and point out any errors which may appear to them.

For general guidance in the use of Wireless Weather Signals at sea "Wireless and Weather, an Aid to Navigation," may be obtained from H.M. Stationery Office, price 5s.

ABRIDGED KEY TO THE OLD INTERNATIONAL WEATHER CODE.

THE KEY LETTERS AND THEIR MEANINGS.

- A = Form of *predominating cloud lowest* in the Table of cloud forms.
- a = Form of *predominating cloud highest* in the Table of cloud forms when more than one type of cloud exists.
- BBB = Pressure in millibars and tenths (initial 9 or 10 omitted), or millimetres and tenths (initial 7 omitted). The values refer to sea level and include all corrections for index error, temperature and gravity.
- BB = Pressure in whole millibars or whole millimetres (initial 9, 10 or 7 omitted).
- b = Amount of barometric tendency during the three hours preceding the time of observation expressed in half-millibars or half-millimetres. For tendencies 10–19 the *second* figure only is reported and 33 is added to the wind direction number (DD). For tendencies 20–29 the *second* figure only is reported and 67 is added to the wind direction number. Tendencies greater than 29 are reported as 29.
- bb = Amount of barometric tendency during the three hours preceding the time of observation expressed in half-millibars or half-millimetres.
- C = Form of *predominating cloud*, according to the Table of cloud forms, when only one form is reported, as from ships at sea. (See Table IX.)
- c = Characteristic of barometric tendency during the period of three hours preceding the time of observation. (See Table XIII.)
- DD = Direction of the wind (True) near the surface. (See Table III.)
- d = Direction (True) from which swell comes. (See Table VIII.)
- d_s = Direction of Ship's movement on scale (0–8) in which 2 = E, 4 = S, &c.
- F = Force of the wind on the Beaufort Scale. (Forces above 9 are reported as 9, with the actual force in a word at the end. (See Table IV.)
- GG = Greenwich Mean Time of observation (01=1 a.m., 12=noon, 13=1 p.m., &c.)
- H = Relative humidity of the air. (See Table XIX.)
- h = Height of base of lower predominating cloud present. (See Table XXI.)
- I_{II} I_{II} = Index number of station.
- jj = Meaning varies according to time of observation and between inland and coastal stations, as follows:—

- | | Inland Stations. | Coastal Stations. |
|--------------------|------------------|----------------------|
| At 0700 G.M.T. ... | jj = mm | jj = SV _s |
| At 1800 G.M.T. ... | jj = MM | jj = SV _s |
- K = The characteristic of the swell *in the open sea*. (See Table VII.)
- K' = Amount and characteristic of barometric tendency expressed by a single figure. (See Table XII.)
- L = Amount of sky (scale 0–10) covered by cloud form A and all forms of the same layer (*i.e.*, low, medium or high) as A, if "a" refers to a different layer.
- LLL = Latitude in degrees and tenths, the tenths being obtained by dividing the number of minutes by 6 and *neglecting the remainder*.
- lll = Longitude in degrees and tenths, the tenths being obtained as for latitude LLL.
- MM = Maximum temperature in the interval of 11 hours ending at 18 h. G.M.T. (or at one of the hours 1 h., 7 h., 13 h., 18 h. G.M.T., following not less than 4 hours after noon, local time).
- mm = Minimum temperature in the interval of 13 hours ending at 7 h. G.M.T. (or at the hour 13 hours after the time of reporting the maximum temperature).
- N = *Total amount of sky covered with cloud*. (See Table X.)
- P = Day of the week. (See Table I.)
- Q = Quarter of globe in which ship is situated. (See Table II.)
- RR = Rainfall (at 7 a.m. for preceding 13 hours and at 6 p.m. for preceding 11 hours). (See Table XVII.)
- R = Amount of rainfall for the preceding 24 hours. (See Table XVI.)
- r = Time of commencement of precipitation. (See Table XVIII.)
- S = State of the sea and swell (coast stations). (See Table XX.)
- TT = Temperature of the air in whole degrees Fahrenheit or Centigrade (50 added to negative values).
- tt = Temperature of the sea (surface water) in whole degrees.
- TTT = Temperature of air in degrees and tenths Fahrenheit or Centigrade (500 added to negative values).
- ttt = Temperature of the sea (surface water) in degrees and tenths.
- V = Visibility or distance at which objects can be seen in daylight (or at which lights can be seen at night). (See Table XIV.)

v = Visibility at sea from ships at sea. (*See* Table VI.)
 V_s = Visibility towards the sea (from coast stations). (*See* Table XIV.)
 W = Past weather—the weather in the interval preceding the time of observation. This interval is 5, 6, or 7 hours for reports at 1h., 7h., 13h., and 18h., G.M.T. (*See* Table XI.)

ww = The actual weather at the time of observation with which is combined, whenever possible, the general character of the weather. (*See* Table V.)

w₁ = The initial figure of the code ww, thus indicating the general state of the weather. (*See* Table XV.)

YY = Day of month.

OLD INTERNATIONAL WEATHER TELEGRAPHY CODE TABLES.

Table I.

P.—Day of the Week.

Code Figure.	Code Figure.
1 = Sunday.	5 = Thursday.
2 = Monday.	6 = Friday.
3 = Tuesday.	7 = Saturday.
4 = Wednesday.	

Table II.

Q.—Quarter of the Globe.

Code Figure.	Lat.	Long.	
1	N.	W.	} Barometer in millibars.
2	N.	E.	
3	S.	W.	
4	S.	E.	
5	N.	W.	} Barometer in millimetres.
6	N.	E.	
7	S.	W.	
8	S.	E.	

Table III.

DD.—Two Figure Compass. True (to nearest point).

Code Figures.	Code Figures.	Code Figures.
00 Calm.	11 S.E. by E.	22 W.S.W.
01 N. by E.	12 S.E.	23 W. by S.
02 N.N.E.	13 S.E. by S.	24 W.
03 N.E. by N.	14 S.S.E.	25 W. by N.
04 N.E.	15 S. by E.	26 W.N.W.
05 N.E. by E.	16 S.	27 N.W. by W.
06 E.N.E.	17 S. by W.	28 N.W.
07 E. by N.	18 S.S.W.	29 N.W. by N.
08 E.	19 S.W. by S.	30 N.N.W.
09 E. by S.	20 S.W.	31 N. by W.
10 E.S.E.	21 S.W. by W.	32 N.

Table IV.

F.—Wind Force.

Code Figure.	Beaufort Number.	Code Figure.	Beaufort Number.
0 = Calm ...	... Nought.	7 = Moderate gale ...	Seven.
1 = Light air ...	... One.	8 = Fresh gale ...	Eight.
2 = Light breeze ...	... Two.	9 = Strong gale ...	Nine.
3 = Gentle breeze ...	... Three.	9 = Whole gale ...	Ten.
4 = Moderate breeze ...	... Four.	9 = Storm ...	Eleven.
5 = Fresh breeze ...	... Five.	9 = Hurricane ...	Twelve.
6 = Strong breeze ...	... Six.		

When force 10, 11 or 12, figure 9 transmitted, words "gale," "storm" or "hurricane" respectively, added at end of the message.

Table V.

ww.—Present Weather Scale.

THE figures are grouped to refer to particular phenomena, for example 20 to 29, Fog or mist. In making these observations the following instruction is given to the observer:—

In selecting the appropriate number for reporting the general character of the weather, no account should be taken of phenomena which occurred more than one hour before the time of observation, but only of phenomena which occurred during the interval of one hour preceding the fixed time of observation.

In deciding on the appropriate term, observers should not be restricted to the difference between the conditions at the instant and

the conditions one hour before, but should choose the term to give the best information of the changes taking place.

Code Figures.

Table V—continued.

00	Blue sky or some cloud (Cloud 0-5)	Cloud has decreased.
01		No apparent change.
02		Cloud has increased.
03		Precipitation within sight.
04		With solar or lunar halo.
05		After fog or mist or dust storm.
06		After rain or drizzle.
07		After snow, sleet or hail.
08		With or after thunder and lightning in [neighbourhood.
09		After thunderstorm.
10	Cloudy or overcast (Cloud 6-10)	Cloud has decreased.
11		No apparent change.
12		Cloud has increased.
13		Precipitation within sight.
14		With solar or lunar halo.
15		After fog or mist or dust storm.
16		After rain or drizzle.
17		After snow, sleet or hail.
18		With or after thunder and lightning in [neighbourhood.
19		After thunderstorm.
20	Fog or mist	But clear in zenith - } Just begun.
21		And apparently overcast - }
22		But clear in zenith - } Intermittent.
23		And apparently overcast - }
24		But clear in zenith - } For some time.
25		And apparently overcast - } Has become thinner.
26		But clear in zenith - } For some time.
27		And apparently overcast - }
28		But clear in zenith - } For some time.
29		And apparently overcast - } Has become thicker.
30	Passing showers	Slight, of rain.
31		" " hail or rain and hail.
32		" " sleet.
33		" " snow.
34		Heavy, of rain; has become better.
35		" " rain.
36		" " rain; has become worse.
37		" " hail or rain and hail.
38		" " sleet.
39		" " snow.
40	Drizzle	Slight occasional.
41		" continuous.
42		" but has increased.
43		Moderate but has decreased.
44		" occasional.
45		" continuous.
46		" but has increased.
47		Thick but has decreased.
48		" occasional.
49		" continuous.
50	Rain	Slight occasional.
51		" continuous.
52		" but has increased.
53		Moderate but has decreased.
54		Moderate occasional.
55		" continuous.
56		" but has increased.
57		Heavy but has decreased.
58		" occasional.
59		" continuous.

Code figures.

Table V.—*continued.*

60	Snow or snow and hail	{	Slight occasional.	
61			„ continuous.	
62			„ but has increased.	
63			Moderate but has decreased.	
64			„ occasional.	
65			„ continuous.	
66			„ but has increased.	
67			Heavy but has decreased.	
68			„ occasional.	
69			„ continuous.	
70	Sleet or rain and snow	{	Slight occasional.	
71			„ continuous.	
72			„ but has increased.	
73			Moderate but has decreased.	
74			„ occasional.	
75			„ continuous.	
76			„ but has increased.	
77			Heavy but has decreased.	
78			„ occasional.	
79			„ continuous.	
80	Hail or rain and hail	{	Slight occasional.	
81			„ continuous.	
82			„ but has increased.	
83			Moderate but has decreased.	
84			„ occasional.	
85			„ continuous.	
86			„ but has increased.	
87			Heavy but has decreased.	
88			„ occasional.	
89			„ continuous.	
90	Thunder- storm (or Line Squall)	{	Slight thunderstorm without hail.	
91			„ „ with hail.	
92			Moderate thunderstorm without hail.	
93			„ „ with hail.	
94			Heavy thunderstorm without hail	without
95			„ „ with hail	gale.
96			„ „ without hail	} with gale.
97			„ „ with hail	
98			Line squall without hail.	
99			„ „ with hail.	

Table VI.

v.—Visibility from Ships at Sea.

Code Figure.		
0	Dense fog	Objects not visible at 50 yards.
1	Thick fog	„ „ „ 1 cable.
2	Fog	„ „ „ 2 cables.
3	Moderate fog	„ „ „ ½ mile (nautical).
4	Mist or haze, or very poor visibility.	„ „ „ 1 mile (nautical).
5	Poor visibility	„ „ „ 2 miles (nautical).
	Moderate visibility	„ „ „ 5 miles (nautical).
6	Good visibility	„ „ „ 10 miles (nautical).
8	Very good visibility	„ „ „ 30 miles (nautical).
9	Excellent visibility	Objects visible at more than 30 miles (nautical).

Table VII.

K.—Swell.

Code Figure.	
0	No, or slight swell
1	Moderate swell
2	Heavy swell
3	Long low swell
4	Confused swell
} and sea smooth to moderate.	
5	No, or slight swell
6	Moderate swell
7	Heavy swell
8	Long low swell
9	Confused swell
} and sea rough or above.	

Table VIII.

d.—One figure compass. (True.)

Code Figure.	Code Figure.	Code Figure.
0 = No Swell.	3 = S.E.	6 = W.
1 = N.E.	4 = S.	7 = N.W.
2 = E.	5 = S.W.	8 = N.

Table IX.

C.—Cloud Predominating.

Code Figure.							
1—Cirrus ...	...	...	...	...	...	Ci.	
2—Cirro-Stratus ...	...	...	...	...	...	Ci.-St.	
3—Cirro-Cumulus ...	...	...	...	...	...	Ci.-Cu.	
4—Alto-Cumulus ...	...	...	...	...	...	A.-Cu.	
5—Alto-Stratus ...	...	...	...	...	...	A.-St.	
6—Strato-Cumulus ...	...	...	...	...	...	St.-Cu.	
7—Nimbus ...	...	...	...	...	...	Nb.	
8—Cumulus or Fracto-Cumulus ...	...	...	...	...	...	Cu. or Fr.-Cu.	
9—Cumulo-Nimbus ...	...	...	...	...	...	Cu.-Nb.	
0—Stratus or Fracto-Stratus ...	...	...	...	...	...	St. or Fr.-St.	

Table X.

N.—Cloud Amount.

Code Figure.	Code Figure.
0 = No cloud.	6 = Sky 6/10ths covered.
1 = Sky 1/10th covered.	7 = „ 7/10ths „
2 = „ 2/10ths „	8 = „ 8/10ths „
3 = „ 3/10ths „	9 = „ 9/10ths „
4 = „ 4/10ths „	0 = „ overcast.
5 = „ half „	

The weather reported by Table V, will indicate which 0 applies here.

Table XI.

W.—Past Weather.

Code Figure.	
0 = Blue sky or blue sky and part cloudy (b or bc).	
1 = Cloudy.	
2 = Overcast continuously.	
3 = Fog or mist.	
4 = Thick fog.	
5 = Passing showers.	
6 = Rain or drizzle.	
7 = Snow or sleet.	
8 = Hail or rain and hail.	
9 = Thunderstorm.	

Table XII.

K'.—Barometric Tendency.

Code Figure.	
0	Barometer steady. (The barometer has not fallen or risen more than ¼ millibar in 3 hours.)
1	Do. rising slowly. (The barometer has risen 1 to 1½ mb. ('03-'04 in.) in last 3 hours.)
2	Do. rising. Do. do. 2 to 3½ ('06-'10 in.) do.
3	Do. rising quickly. Do. do. 4 to 6 ('12-'18 in.) do.
4	Do. rising very rapidly. Do. do. over 6 ('18 in.) do.
5	Do. falling slowly. Do. do. fallen 1 to 1½ ('03-'04 in.) do.
6	Do. falling. Do. do. 2 to 3½ ('06-'10 in.) do.
7	Do. falling quickly. Do. do. 4 to 6 ('12-'18 in.) do.
8	Do. falling very rapidly. Do. do. over 6 ('18 in.) do.

Table XIII.

c.—Characteristic of Barometric tendency during last 3 hours.

Code Figure.		
0 = 0 or +	Steady or rising	The barometer is now higher than, or the same as, 3 hours ago.
1 = + 0	Rising then steady	
2 = + -	Rising then falling	
3 = - + or 0 +	Falling or steady then rising	
4 = Unsteady +	Unsteady but rising	The barometer is now lower than 3 hours ago.
5 = -	Falling	
6 = - 0	Falling then steady	
7 = - +	Falling then rising	
8 = 0 - or + -	Steady or rising then falling.	
9 = Unsteady -	Unsteady but falling	

Table XIV.

V and V_s—Visibility.

Code Figure.

0	=	Objects not visible at	50 metres (55 yards).
1	=	" " "	200 metres (220 yards).
2	=	" " "	500 metres (550 yards).
3	=	" " "	1,000 metres (1,100 yards).
4	=	" " "	2,000 metres (1½ miles).
5	=	" " "	4,000 metres (2½ miles).
6	=	" " "	10,000 metres (6¼ miles).
7	=	" " "	20,000 metres (12½ miles).
8	=	" " "	50,000 metres (31¼ miles).
9	=	Objects visible at	50,000 metres or more.

Table XV.

w₁—General state of the weather (abridged).

Code Figure.

0	—	Cloud amount 0–5.	5	—	Rain.
1	—	Cloud amount 6–10.	6	—	Snow or Hail and Snow.
2	—	Fog or mist.	7	—	Sleet or Rain and Snow.
3	—	Passing showers.	8	—	Hail or Rain and Hail.
4	—	Drizzle.	9	—	Thunderstorm.

Table XVI.

R.—Rainfall during preceding 24 hours.

Code Figure.

0	=	No rain.	5	=	11–15 mm.
1	=	Trace or 0.1 mm.	6	=	16–20 mm.
2	=	0.2–2 mm.	7	=	21–30 mm.
3	=	3–5 mm.	8	=	31–50 mm.
4	=	6–10 mm.	9	=	above 50 mm.

Table XVII.

RR.—Amount of Rainfall.

Code Figures.

Code Figures.	Meaning.
91	0.1 mm.
92	0.2 "
93	0.3 "
94	0.4 "
95	0.5 "
96	0.6 "
97	Some rain, but not measurable.
98	More than 90 millimetres.
99	Measurement impossible or unreliable.

Amounts of 0.7 mm. or more are coded as whole millimetres, *e.g.*, 17.2 mm. coded as 17.

Table XVIII.

r.—Time of commencement of precipitation.

Code Figure.

0	...	No rain.
1	...	0 to 1 hour before time of observation.
2	...	1 to 2 hours before time of observation.
3	...	2 to 3 " " "
4	...	3 to 4 " " "
5	...	4 to 5 " " "
6	...	5 to 6 " " "
7	...	6 to 8 " " "
8	...	8 to 10 " " "
9	...	Above 10 hours before time of observation.
—	...	No observation.

Table XIX.

H.—Relative humidity.

Code Figure.

0	...	...	...	95 to 100 per cent.
9	...	...	...	90 " 94 "
8	...	...	...	80 " 89 "
7	...	...	...	70 " 79 "
6	...	...	...	60 " 69 "
5	...	...	...	50 " 59 "
4	...	...	...	40 " 49 "
3	...	...	...	30 " 39 "
2	...	...	...	20 " 29 "
1	...	...	...	10 " 19 "

Table XX.

S.—State of Sea and Swell (Coast Stations).

Code Figure.

0	...	No swell	} Calm or slight sea.
1	...	Moderate swell	
2	...	Heavy swell	
3	...	No swell	} Moderate sea.
4	...	Moderate swell	
5	...	Heavy swell	
6	...	Rather rough sea.	
7	...	Rough sea.	
8	...	Very rough sea.	
9	...	Mountainous sea.	

Table XXI.

h.—Height of base of lower predominating cloud present.

Code Figure.

	Metres.	Feet.
0	0 to 50	0 to 150
1	50 " 100	150 " 300
2	100 " 200	300 " 600
3	200 " 300	600 " 1,000
4	300 " 600	1,000 " 2,000
5	600 " 1,000	2,000 " 3,000
6	1,000 " 1,500	3,000 " 5,000
7	1,500 " 2,000	5,000 " 6,500
8	2,000 " 2,500	6,500 " 8,000
9	No low cloud.	No low cloud

SPECIAL WEATHER TELEGRAPHY TABLES, NOT OLD INTERNATIONAL WEATHER CODE.

Table XXII.

U.—Unusual Phenomena.

Code Figure.

0	=	None of the following remarks appropriate.
1	=	Appearances indicate that a tropical storm has formed.
2	=	Appearances indicate that a tropical storm is forming.
3	=	Heavy squalls during last three hours.
4	=	Squally weather.
5	=	Barometer <i>falling</i> very rapidly (more than 2 millibars an hour).
6	=	Barometer <i>rising</i> very rapidly (more than 2 millibars an hour).
7	=	Wind has <i>increased</i> decidedly during the last hour.
8	=	Wind has <i>decreased</i> decidedly during the last hour.
9	=	Unusually red sunset (or sunrise).

Table XXIII.

Conversion of Millibars to Inches.

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

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

VOLUNTARY.

SCHEME OF COMMUNICATION FOR BRITISH SELECTED SHIPS' ROUTINE WIRELESS WEATHER TELEGRAPHY.

Trial to commence May 1st, 1930.

Based on the experience of British "Selected Ships" in making Meteorological reports by Wireless to all ships and certain shore stations and in view of the difficulties experienced through not having a world-wide system including definite times for reporting by W/T, following Art. 35 of the International Convention of Safety of Life at Sea, 1929, a scheme was submitted for the consideration of the International Meteorological Organisation at Copenhagen in September, 1929.

This recommendation could not be adopted until a trial had been made, and the British Meteorological Office was invited to carry out a trial as soon as possible.

This scheme provides on a voluntary basis for a system by which "Selected Ships," when at sea, make meteorological observations at fixed times G.M.T., and subsequently report these observations at fixed times G.M.T., to certain coast stations and to all ships; the main principles being that:—

"Selected Ships" fitted for long range transmission to address their reports to the appropriate shore station and use the wave length allotted to that station; Berne and all concerned being notified that the information may be intercepted and used by all ships.

"Selected Ships" not fitted for long-range transmission to address their reports to **C.Q.** (all ships) using wave length 600 metres spark, shore stations within range intercepting them as required.

"Selected Ships" be limited to a certain total, the complement to be maintained by each maritime country party to the Convention of Safety of Life at Sea to be according to their proportion of the world's tonnage, steam and motor, of vessels of over 100 tons.

The following table gives the world's tonnage and the number of selected ships at present desired for each maritime country of the world, including those that are not yet party to the Convention of Safety of Life at Sea.

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage.	Number of Selected Ships required.	Number of Ships fitted for C.W. transmission.
	Number.	Gross Tons.			
Argentina	252	264,898	0.4	4	—
Belgium	230	488,219	0.8	8	6
Brazil	344	542,092	0.9	9	5
Chili	116	159,568	0.3	3	—
Danzig	33	127,568	0.2	2	—
Denmark	627	1,042,209	1.7	17	6
Finland	239	213,991	0.3	3	—
France	1,482	3,255,832	5.2	52	12
Germany	2,053	3,738,067	6.0	60	32
Greece	515	1,187,508	1.9	19	—
Holland	1,270	2,809,375	4.5	45	24
Italy	1,142	3,348,732	5.4	54	23
Japan	2,048	4,139,815	6.6	66	—
Norway	1,765	2,953,944	4.7	47	6
Portugal	169	219,337	0.3	3	10
Russia (Soviet Union)	349	373,836	0.6	6	—
Spain... ..	789	1,137,813	1.8	18	17
Sweden	1,239	1,411,730	2.3	23	4
Turkey	179	159,836	0.3	3	—
United States of America (excluding Lakes).	3,104	11,249,288	18.0	180	88
Yugo Slavia... ..	145	260,912	0.4	4	—
Other Countries ...	908	1,117,130	1.8	18	3
					Not classified 5
Total... ..	28,724	62,389,750	100.0	1,000	423

* Including Dominion of Newfoundland.

† The British Empire number of "Selected Ships" to be allotted amongst Great Britain and the Dominions by arrangement.

The main points are as follows:—

(1) The number of messages required for this service is comparatively small, if efficiently organized.

(2) If not efficiently organized and limited the result has proved to be congestion of communication, wasted energy, expense and consequent loss of efficiency.

(3) The Marine Meteorological code or form of message used must be universal throughout this Marine Meteorological service, simple and concise, giving only essential information.

(4) There are two main classes of "Selected Ships" to be considered:—

(a) Ships fitted with long range, Type A1 apparatus, mostly mail liners, sailing and arriving at dates fixed by mail contract; termed "**A Selected Ships.**"

(b) Ships fitted with short range A2 or Type B apparatus including many passenger and cargo liners sailing according to an advertised programme; also a number of cargo vessels whose movements are irregular, termed "**B Selected Ships.**"

**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.	Gross Tons.			
Great Britain and Ireland.	7,810	19,754,001	31.7		
Australia and New Zealand.	613	709,030	1.1		
Canada (excluding Lakes).	579	871,985	1.4		
Hong Kong	124	309,376	0.5		
India and Ceylon ...	138	175,400	0.3		
South Africa... ..	122	69,922	0.1		
Other Colonies* ...	340	298,336	0.5		
Total	9,726	22,188,050	35.6	356†	182

(5) "A Selected Ships" should work a definite **schedule** under the control of specified coast wireless stations in parts of the world where there is congestion.

(6) The movements of a number of "B Selected Ships" are uncertain, and in some areas there may be more than are required to report, when the full number of "Selected Ships" of all nations has been reached. Control from coast wireless stations is impracticable; moreover, in some areas where there is not a great deal of shipping, and in certain seasons, it will be necessary for **other ships as well as "Selected Ships"** to make reports, and this applies particularly to Hurricane, Cyclone and Typhoon regions.

All that can be said is that at present, on the most frequented mail liner routes, notably the Trans-North Atlantic, no routine wireless meteorological reports are necessary from "B Selected Ships," at certain shore stations, except in cases of urgency.

In all parts of the world which cannot be adequately served by "A Selected Ships," "B Selected Ships" should broadcast their reports to C.Q. (all ships) on 600 metres spark **at schedule times**.

This may result in interference, but at least ships and stations which are anxious to obtain information at no great range will be able to receive it, for obviously those on the spot will arrange matters of communication within the schedule times laid down, and when reports are not received, repetition will be asked for as necessary.

This broadcasting by "B Selected Ships" on 600 metres spark, of routine meteorological reports has its weak points, but at present there is no alternative; and it is of the utmost importance that reports from "Selected Ships" should be available to all ships and meteorological centres through certain stations in all parts of the world, particularly in the hurricane regions, and in the regions of heavy weather on the less frequented trade routes of the Southern Ocean.

The following schedule gives times (Greenwich Mean Time) of observation agreed to internationally and times (G.M.T.) of the commencement of periods for transmission of these reports, based upon these observation times and the established periods of wireless operator watches. It should be noted that they follow immediately after the S.O.S. three-minute period of silence.

Chart I below gives the W/T operator zones and times of observation, those being starred which are usually during daylight.

Schedule.

All times are G.M.T.

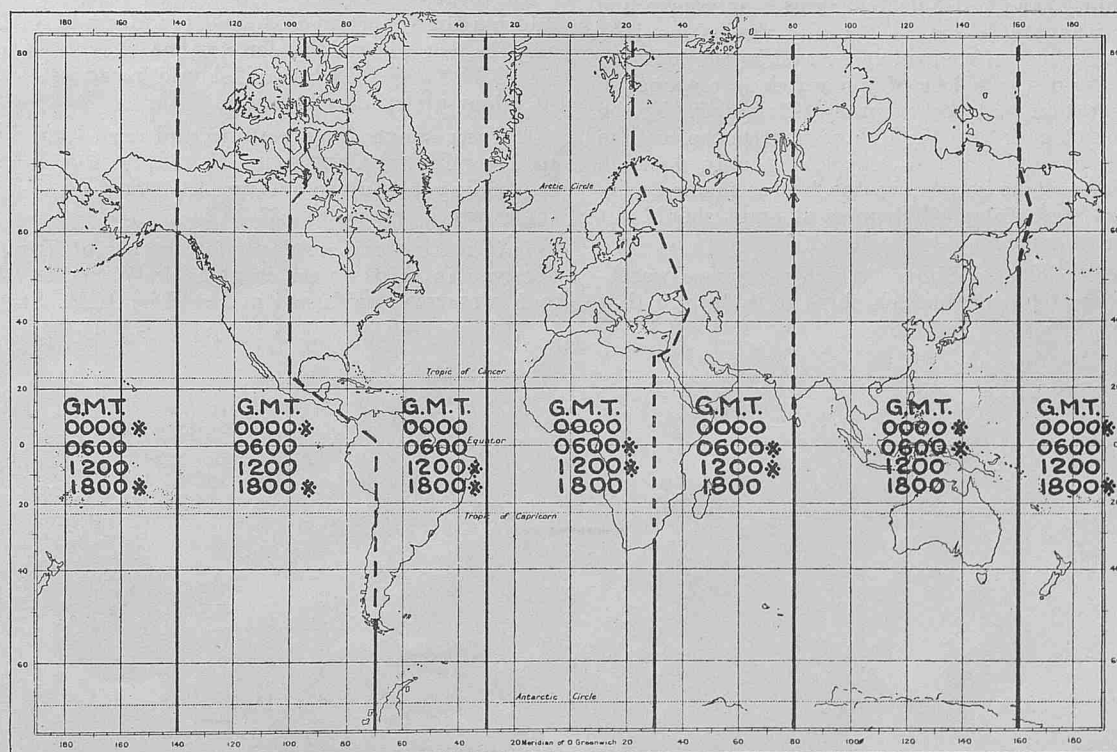
Zones between Greenwich Meridians.	FIRST WEATHER REPORT.			SECOND WEATHER REPORT.		
	Times of observations.	Times of reporting by Type A1 (C.W.) Ships.	Times of broadcasting by Type A2 (I.C.W.) and Type B (Spark) Ships.	Times of observations.	Times of reporting by type A1 (C.W.) Ships.	Times of broadcasting by Type A2 (I.C.W.) and Type B (Spark) Ships.
30° W.-30° E.	0600	{ 0618 0818 }	0830	1200	1218	1230
30° E.-80° E.	0600	{ 0618 0818 }	{ 0630 0830 }	1200	1218	1230
80° E.-160° E.	0000	0018	0030	0600	{ 0618 0818 }	0830
160° E.-140° W.	0000	0018	0030	1800	{ 1818 2018 }	2030
140° W.-70° W.	0000	0018	0030	1800	{ 1818 2018 }	{ 1830 2030 }
70° W.-30° W.	1200	1218	1230	1800	{ 1818 2018 }	2030

It will be noted that against some of the observation times there are two times of commencement of periods for transmitting. The second of these times, where two occur, are for single operator ships to report, in cases where they would not be keeping wireless watch following the observation hour. It should be remembered that a large proportion of "Selected Ships" carry two or three operators, and they should use the earlier periods for transmission, also repeating for the benefit of ships with one operator during the second period.

Relaying on the wave lengths given in this Schedule should not be resorted to; but every endeavour should be made for the reports in areas in which the *Jacques Cartier* type of ships are working, to reach those ships, who will relay them to special shore stations for the information of Meteorological Offices on a special short wave for long range.

CHART I.—SHIPS' WIRELESS WEATHER SIGNALS. International Observation Times for Weather Telegraphy at Sea.

* Indicates usually daylight hours.



In further explanation of this scheme.

In the case of British Ships the proportion fitted with Type A1 apparatus is 1 to every 20 fitted with Type A2 or Type B apparatus.

"Selected Ships" are selected from those whose commanders have volunteered to carry out regular Meteorological work at sea, according to their sailing schedule and trade to provide distribution; according to their wireless apparatus to ensure efficient communication; and according to the capacity and keenness of their officers to ensure the most accurate information.

At present about 1 in every 3 British "Selected Ships" has Type A1 apparatus, that is, there is one "A Selected Ship" to every two "B Selected Ships."

It is obvious that "A Selected Ships" whose approximate position on certain dates can be foreseen, can be informed in what order to report, when in areas where there are more "Selected Ships" than are necessary to supply the number and distribution of reports required.

It is equally obvious that a number of "B Selected Ships" cannot be so treated.

With regard to (5), in the case of "A Selected Ships" in the Eastern North Atlantic the Meteorological Office, London, will furnish Portishead Wireless Station (at 1230 G.M.T.) with the names of chosen "Selected Ships" every day; and Portishead will call up those ships at 0430 and 1030 G.M.T. daily and indicate the order in which they should make their reports, thus ensuring a minimum of signalling and the best distribution of reported observations.

It may not be found necessary for "A Selected Ships" to be controlled in the same way by stations in parts of the world where there are not likely to be many "A Selected Ships" within range.

Chart II, to be found at the end of this number (lithographic), is intended only to illustrate the principle of the scheme. It gives coast wireless stations in all parts of the world, which might in future be used for the reception of these reports.

At present only Portishead in England is detailed in this way.

Information of other stations in different parts of the world detailed to work in this scheme will be given in THE MARINE OBSERVER as they become available.

Until such information is available "A Selected Ships" should broadcast their reports in parts of the world not covered by such long range stations, at schedule times on 2,100 metres wave length.

Chart I on page 23 gives the International times of observation and the wireless watch zones, those observation times in each wireless watch zone which generally fall during daylight being starred.

Many "A Selected Ships" and "B Selected Ships" only have one officer in each watch. The first essential for safe navigation is a good look-out kept by the officer of the watch, as well as the look-out men. In the Merchant Navy the officer of the watch is responsible for meteorological observation and the accuracy of reports. If the officer of the watch at night goes into the lighted charthouse to take meteorological observations and draft a report, not only does he leave his post of look-out, but he returns to the bridge momentarily blinded. Hence Wireless Meteorological Reports at night should not be required as a matter of routine.

There are a number of "Selected Ships" which carry two watch-keeping officers for each watch, and in such ships it is desired that

observations should be made and reported at all four times. Those made at the times not starred being reported as soon as convenient.

The schedule has been worked out in consultation with wireless experts to overcome the present confusion, jamming and waste, which disheartens all concerned. It is not necessary that reporting ships only should know when to signal meteorological reports, but that all ships should know when to listen and when to refrain from communication which jams them, and all are asked to help in making this trial a success.

Urgent meteorological reports should be made at any time. Any ship at any time encountering a tropical revolving storm should report to all ships and the appropriate station, continuing to report at intervals of three hours so long as the ship remains under the influence of the storm.

Ships experiencing gales in which the wind reaches Force 10 or above on the Beaufort Scale should inform all ships within range.

Ships encountering Ice or other navigational dangers should report immediately to all ships and the appropriate station. See instructions for Danger to Navigation Signals for all ships, page 27.

No charges are made for "Selected Ships" Routine Wireless Meteorological Reports broadcast to all ships or addressed in accordance with these instructions to the Meteorological Centres given in the list of Wireless Stations detailed to receive routine coded Weather Reports from British Selected Ships published monthly in THE MARINE OBSERVER.

Ships' Wireless Weather reports addressed to Meteorological Centres not conforming to these instructions may be liable to charges.

Brief Instructions for convenience and guidance of Marine Observers and W.T. Operators.

1. At 0, 6, 12 and 18 hours G.M.T. record observations on Form 911 or in Form 915. When there are not two officers in the watch omit these observations during darkness.

2. In "Selected Ships" immediately code these observations on Form 138 and write out message on Form 139. In the case of "Selected Ships" fitted for C.W. long range transmission address the report to the appropriate Meteorological Centre. The report should be sent through the appropriate W./T. station indicated in the list on page 25, which will be repeated monthly in THE MARINE OBSERVER until further notice, on the wave length indicated for that station, in the order of ships indicated for the day by the station and according to the schedule above which is also given on Code Card Form 138A.

In the case of "Selected Ships" fitted for spark transmission, address the report to C.Q. and broadcast according to schedule. In regions not covered by long range C.W. stations indicated in the list C.W. "Selected Ships" should broadcast to all ships on 2100 m. at times given in schedule.

3. Instructions for observing and recording observations are given in THE MARINE OBSERVERS' HANDBOOK, 5th Edition. Instructions for coding are given on pp. 26-7 and on Form 138. The decode tables are given on pp. 32-35.

Information and guidance for the use of Wireless Weather reports received in ships at sea is given in WIRELESS AND WEATHER, AN AID TO NAVIGATION, published and sold by H.M. Stationery Office.

Request for Information.

THE ATTENTION OF METEOROLOGICAL SERVICES IS INVITED TO THE INVITATION GIVEN ON PAGE 14 OF THIS NUMBER.

[illegible]

TO COME INTO FORCE FOR BRITISH SELECTED SHIPS ON MAY 1st, 1930.

INTERNATIONAL SHIPS' WIRELESS WEATHER TELEGRAPHY CODE

formulated by the International Commission for Synoptic Meteorology and adopted by the International Meteorological Organization at Copenhagen, September, 1929.

Code and Instructions for Coding Messages.

The International Ships' Wireless Weather Code is a figure code, arranged in groups of five figures.

The first four groups are universal and the remaining groups are in two alternative or supplementary sets of groups. The first figure in the fifth group of message (or first supplementary group) indicates which set of supplementary groups is used.

The first four universal groups should always be used, and the supplementary sets of groups may be omitted, or abbreviated by omitting the last group or groups of the set; that is, the code figure message may be shortened as necessary, but the order of the figures and groups must always be strictly maintained, otherwise the message is not decodable.

If an observation or element is not available, an X (or the appropriate number of Xs) (— • • —) should take its place in order to maintain the sequence of figures in the groups.

Having entered synchronized weather observations and particulars of set and drift of current and ice in the Ship's Meteorological Record, Form 911, or the Meteorological Log, Form 915 (specially ruled pages at end of book), the observations should be coded, thus—

First. From the list of wireless stations detailed to receive routine coded weather reports from "Selected Ships," ascertain the number of groups and the supplementary groups desired by the shore meteorological services from ships in the part of the world that the ship is in, remembering that the seventh group can only be given completely by ships having a special barograph; and decide on the information to be sent, not forgetting the desirability of information of the set and drift of current, ice, and navigational obstructions being included in reports intended for "all ships," but not through C.W. stations for certain meteorological centres.

Thus ensuring the necessary brevity and information for the meteorological centre, and the necessary information for ships at sea. Do not include information in C.W. reports addressed to meteorological centres which they do not require.

Second. On Form 138, the register for coded "Selected Ships" wireless meteorological reports, in No. 1 column write the address of the Meteorological Centre if your ship is fitted for C.W. transmission, but "All Ships' Weather" if Spark.

Universal Groups.

With the Code Card, Form 138A, from synchronized weather observations entered on Form 911 or 915, code as follows:—

	KEY LETTERS.
Column 2.—Code the Day of the Week. Table I ...	P
„ 3.—Code the Octant of the Globe. Table II ...	Q
„ 4.—Code the Latitude by entering the whole degrees (prefixing 0 if necessary to make up two figures); and dividing the minutes by six, neglecting the remainder. Enter the result ...	LLL
„ 5.—Code the Longitude by entering the whole degrees (prefixing 0 if necessary the make up two figures, or omitting the initial 1 if Longitude is 100° or over). Divide the minutes by six, neglecting the remainder. Enter the result ...	lll
„ 6.—Enter the hours of the Greenwich Mean Time of Observation ...	GG

From the Code Card Form 138A.

„ 7.—Code the Direction of the Wind. Table III...	DD
„ 8.—Code the Force of the Wind, forces 9 and above are entered as 9 but if 10, 11 or 12, add the words Gale, Storm, or Hurricane at the end of the message. Table V. ...	F

KEY
LETTERS.

„ 9.—Code the Present Weather. Table VI ...	ww
„ 10.—Code the corrected barometer reading by entering the two last whole figures if a millibar barometer, or coding, if inches, by Table VIII ...	BB
„ 11.—Enter the Visibility by Scale. Table XII ...	V
„ 12.—Enter the Air Temperature in whole degrees Fahrenheit, omitting the initial 1, if over 100° ...	TT

No. 3 Supplementary Groups.

If these groups have been decided upon, in Column 13 enter "3" as distinguishing number for the remainder of the coded message.

KEY
LETTERS.

Column 14.—Code type of Lower Cloud. Table XIII ...	CL
„ 15.—Code type of Middle Cloud. Table XIV ...	CM
„ 16.—Code type of Upper Cloud. Table XV ...	CH
„ 17.—Code the total amount of sky covered. Table XVII ...	N
„ 18.—Subtract the lesser from the greater of the Air and Sea Temperatures and code the result with Table XVIII ...	ta
„ 19.—Enter the Swell by Scale. Table XIX ...	K
„ 20.—Code the True Direction of Swell. Table IV ...	d
„ 21.—Code the Past Weather. Table VII ...	W
„ 22.—Code the proportion of sky covered with Lower Cloud. Table XVII ...	N _L
„ 23.—Code the course of ship. Table IV ...	d _s
„ 24.—Code the speed of the ship. Table XX ...	f
„ 25.—Code the characteristic of the Tendency of the Barometer, as shown by barograph. Table X ...	a
„ 26.—Code the Amount of rise or fall of the Barometer in the last 3 hours. Table XI ...	bb

No. 6 Supplementary Groups.

If these groups have been decided upon, in Column 27 enter "6" as distinguishing number for the remainder of the coded message.

KEY
LETTERS.

Column 28.—Enter the Swell by Scale. Table XIX ...	K
„ 29.—Code the True Direction of the Swell. Table IV ...	d
„ 30.—Code the Predominating type of Cloud. Table XVI ...	C
„ 31.—Code the total amount of sky covered. Table XVII ...	N
„ 32.—Subtract the lesser from the greater of the Air and Sea Temperatures and code the result. Table XVIII ...	ta
„ 33.—Code the Course of the Ship. Table IV ...	d _s
„ 34.—Code the recorded change of the barometer in the last two, three, or four hours. Table IX ...	A
„ 35.—Code the Past Weather. Table VII ...	W
„ 36.—Code type of Upper Cloud. Table XV ...	CH

For messages which are to be broadcast to C.Q. or made to shore services indicated in the list of W.T. stations in THE MARINE OBSERVER as requiring such information, in Column 37, enter briefly in plain language the set and drift of current experienced, with position **from** and **to**, Ice or other navigational obstructions.

On no account should such information be entered in messages for shore services that do not require it.

The ship's call sign should be given in the usual way in sending the report.

In Column 38.—After the message has been despatched enter the call sign of the station through which it was sent, with wave length, or **C.Q.**, as the case may be.

In Column 39.—After the message is sent enter the exact time (G.M.T.) of despatch.

Be sure that your message is correctly coded, and that you have not duplicated the Supplementary Groups.

Write out the message on the signal pad (Form 139) provided and send to the wireless operator for despatch in accordance with instructions given in Scheme of Communication for British Selected Ships' Routine Wireless Weather Telegraphy, pages 22 to 24, schedule for which is also given on Code Card Form 138A.

DANGER TO NAVIGATION SIGNALS FOR ALL SHIPS.

The following are extracts from the International Convention for Safety of Life at Sea, to come into force, July 1st, 1931, when ratified:—

Article 34.

The master of every ship which meets with dangerous ice, a dangerous derelict, a dangerous tropical storm or any other direct danger to navigation is bound to communicate the information, by all the means of communication at his disposal, to the ships in the vicinity, and also to the competent authorities at the first point of the coast with which he can communicate. It is desirable that the said information be sent in the manner set out in Regulation XLVI.

Each Administration will take all steps which it thinks necessary to ensure that when intelligence of any of the dangers specified in the previous paragraph is received it will be promptly brought to the knowledge of those concerned and communicated to other Administrations interested.

The transmission of messages respecting the dangers specified is free of cost to the ships concerned.

ANNEXE 1.

REGULATION XLVI.

TRANSMISSION OF INFORMATION.

The transmission of information regarding ice, derelicts, tropical storms or any other direct danger to navigation is obligatory. The form in which the information is sent is not obligatory. It may be transmitted either in plain language (preferably English) or by means of the International Code of Signals (Wireless Telegraphy Section). It should be issued **CQ** to all ships, and should also be sent to the first point of the coast to which communication can be made, with a request that it be transmitted to the appropriate authority.

All messages issued under Article 34 of the present Convention will be preceded by the safety signal **TTT**, followed by an indication of the nature of the danger, thus:—**TTT** Ice; **TTT** Derelict; **TTT** Storm; **TTT** Navigation.

INFORMATION REQUIRED.

The following information is desired, the time in all cases being Greenwich Mean Time:—

(a) ICE, DERELICTS AND OTHER DIRECT DANGERS TO NAVIGATION.

- (1) the kind of ice, derelict or danger observed;
- (2) the position of the ice, derelict or danger when last observed;
- (3) the time and date when the observation was made.

(b) TROPICAL STORMS.—(Hurricanes in the West Indies, Typhoons in the China Seas, Cyclones in Indian Waters, and storms of a similar nature in other regions.)

(1) A STATEMENT THAT A TROPICAL STORM HAS BEEN ENCOUNTERED.—This obligation should be interpreted in a broad spirit, and information transmitted whenever the master has good reason to believe that a tropical storm exists in his neighbourhood.

(2) METEOROLOGICAL INFORMATION.—In view of the great assistance given by accurate meteorological data in fixing the position and movement of storm centres, each shipmaster should add to his warning message as much of the following meteorological information as he finds practicable:—

- (a) barometric pressure (millibars, inches or millimetres);
- (b) change in barometric pressure (the change during the previous two to four hours);
- (c) wind direction (true, not magnetic);
- (d) wind force (Beaufort or decimal scale);
- (e) state of the sea (smooth, moderate, rough, high);
- (f) swell (slight, medium, heavy), and the direction from which it comes.

When barometric pressure is given, the word "millibars," "inches" or "millimetres," as the case may be, should be added to the reading, and it should always be stated whether the reading is corrected or uncorrected.

When changes of the barometer are reported the course and speed of the ship should also be given.

All directions should be true, not magnetic.

(3) TIME AND DATE AND POSITION OF THE SHIP.—These should be for the time and position when the meteorological observations reported were made, and not when the message was prepared or despatched. The time used in all cases should be Greenwich Mean Time.

(4) SUBSEQUENT OBSERVATIONS.—When a master has reported a tropical storm it is desirable, but not obligatory, that other observations be made and transmitted at intervals of three hours, so long as the ship remains under the influence of the storm.

EXAMPLES.

ICE.

TTT Ice. Large berg sighted in 4605 N., 4410 W., at 0800 G.M.T. May 15th.

DERELICT.

TTT Derelict. Observed derelict almost submerged in 4006 N., 1243 W., at 1630 G.M.T. April 21st.

DANGER TO NAVIGATION.

TTT Navigation. Alpha lightship not on station. 1800 G.M.T. January 3rd.

TROPICAL STORM.

TTT Storm. Experiencing tropical storm. Barometer, corrected, 994 millibars, falling rapidly. Wind N.W., force 9, heavy squalls. Swell E. Course E.N.E., 5 knots. 2204 N., 11354 E. 0030 G.M.T. August 18th.

TTT Storm. Appearances indicate approach of hurricane. Barometer, corrected, 2964 inches, falling. Wind N.E., force 8. Swell medium from N.E. Frequent rain squalls. Course 035, 9 knots. 2200 N., 7236 W. 1300 G.M.T. September 14th.

TTT Storm. Conditions indicate intense cyclone has formed. Wind S. by W., force 5. Barometer, uncorrected, 753 millimetres, fell 5 millimetres last three hours. Course N., 60 W., 8 knots. 1620 N., 9302 E. 0200 G.M.T. May 4th.

TTT Storm. Typhoon to south-east. Wind increasing from N. and barometer falling rapidly. Position 1812 N., 12605 E. 0300 G.M.T. June 12th.

CODE TABLES FOR W.T. WEATHER REPORTS FROM SHIPS AT SEA TO ALL SHIPS AND SHORE STATIONS.

Day and Position.

Table I.

P.—Day of the Week.

	Code Figure.		Code Figure.
Sunday	1	Thursday	5
Monday	2	Friday	6
Tuesday	3	Saturday	7
Wednesday	4		

Table II.

Q.—Octant of the Globe.

	Longitude.	Code Figure.
North Latitude.	0° W. — 90° W.	0
	90° W. — 180° W.	1
	180° E. — 90° E.	2
	90° E. — 0° E.	3
South Latitude.	0° W. — 90° W.	5
	90° W. — 180° W.	6
	180° E. — 90° E.	7
	90° E. — 0° E.	8

Compass.

Table III.

DD.—Compass Table for Wind Direction to points.

True Direction.	Code Figures.	True Direction.	Code Figures.
Calm	00	S. by W.	17
N. by E.	01	S.S.W.	18
N.N.E.	02	S.W. by S.	19
N.E. by N.	03	S.W.	20
N.E.	04	S.W. by W.	21
N.E. by E.	05	W.S.W.	22
E.N.E.	06	W. by S.	23
E. by N.	07	W.	24
E.	08	W. by N.	25
E. by S.	09	W.N.W.	26
E.S.E.	10	N.W. by W.	27
S.E. by E.	11	N.W.	28
S.E.	12	N.W. by N.	29
S.E. by S.	13	N.N.W.	30
S.S.E.	14	N. by W.	31
S. by E.	15	N.	32
S.	16		

Table IV.

d and d_s.—Compass Table to Half Cardinal Points.

True Direction.	Code Figure.
No Sea or Swell; or Ship hove to	0
N.E.	1
E.	2
S.E.	3
S.	4
S.W.	5
W.	6
N.W.	7
N.	8
No observation or no information	9

Wind.

Table V.

F.—Wind Force, Beaufort Scale.

Beaufort Number.		Code Figure.
Nought.	Calm	0
One.	Light airs	1
Two.	Light breeze	2
Three.	Gentle breeze	3
Four.	Moderate breeze	4
Five.	Fresh breeze	5
Six.	Strong breeze	6
Seven.	Moderate gale	7
Eight.	Fresh gale	8
Nine.	Strong gale	9
Ten.	Whole gale	9 Gale*
Eleven.	Storm	9 Storm*
Twelve.	Hurricane	9 Hurricane*

* These words to be written at end of weather message.

Weather.

Table VI.

ww.—Present Weather. (Abridged for British Ships.)

	Code Figures.
Cloudless	00
Partly cloudy	01
Cloudy	02
Overcast	03
Haze (but visibility greater than one mile)	05
Distant Lightning	07
Mist	08
Precipitation within sight	10
Thunder, without precipitation at the ship or station	11
Ugly threatening appearance of sky	13
Squally weather	14
Heavy Squalls in last three hours	15
Waterspout seen in last three hours	16
Signs of a tropical storm forming	18
Signs that a tropical storm has formed	19
Precipitation (rain, drizzle, hail, snow or sleet) in last hour, but not at time of observation	20
Dust or Sand storm	30
Fog	40
Moderate fog in last hour	41
Thick fog in last hour	42
Fog in patches	49
Drizzle	50
Drizzle and Fog	57
Slight or moderate drizzle and rain	58
Thick drizzle and rain	59
Rain	60
Rain and fog	67
Slight or moderate rain and snow	68
Heavy rain and snow	69
Snow or Sleet	70
Shower or showers	80
Showers of slight or moderate hail, or rain and hail	88
Showers of heavy hail, or rain and hail	89
Thunderstorm	90

Preference should be given to 18 and 19 when they apply, otherwise to the largest number of this code which applies to the weather at the position of the ship at the time of observation.

Table VII.

W.—Past Weather.						Code Figure.
Fair (clear or slightly clouded)	...	...	...	...	...	0
Variable sky	...	...	...	...	...	1
Mainly overcast	...	...	...	...	...	2
Fog or thick dust haze (visibility less than five cables)	...	...	...	...	...	3
Drizzle	...	...	...	...	...	4
Rain	...	...	...	...	...	5
Snow or sleet	...	...	...	...	...	6
Showers	...	...	...	...	...	7
Sandstorm or duststorm	...	...	...	...	...	8
Thunderstorm	...	...	...	...	...	9

Barometer.

Table VIII.

BB.—Code Table for corrected barometer readings in millibars and inches.

(Adapted for British Ships.)

Mb.	In.	Code Figs.	Mb.	In.	Code Figs.	Mb.	In.	Code Figs.	Mb.	In.	Code Figs.
925	27.32	25	960	28.35	60	995	29.38	95	1025	30.27	25
926	27.35	26	961	28.38	61	996	29.41	96	1026	30.30	26
927	27.38	27	962	28.41	62	997	29.44	97	1027	30.33	27
928	27.41	28	963	28.44	63	998	29.47	98	1028	30.36	28
929	27.44	29	964	28.47	64	999	29.50	99	1029	30.39	29
930	27.46	30	965	28.50	65	1000	29.53	00	1030	30.42	30
931	27.49	31	966	28.53	66	1001	29.56	01	1031	30.45	31
932	27.52	32	967	28.56	67	1002	29.59	02	1032	30.48	32
933	27.55	33	968	28.59	68	1003	29.62	03	1033	30.51	33
934	27.58	34	969	28.62	69	1004	29.65	04	1034	30.53	34
935	27.61	35	970	28.65	70	1005	29.68	05	1035	30.56	35
936	27.64	36	971	28.67	71	1006	29.71	06	1036	30.59	36
937	27.67	37	972	28.70	72	1007	29.74	07	1037	30.62	37
938	27.70	38	973	28.73	73	1008	29.77	08	1038	30.65	38
939	27.73	39	974	28.76	74	1009	29.80	09	1039	30.68	39
940	27.76	40	975	28.79	75	1010	29.83	10	1040	30.71	40
941	27.79	41	976	28.82	76	1011	29.86	11	1041	30.74	41
942	27.82	42	977	28.85	77	1012	29.89	12	1042	30.77	42
943	27.85	43	978	28.88	78	1013	29.92	13	1043	30.80	43
944	27.88	44	979	28.91	79	1014	29.94	14	1044	30.83	44
945	27.91	45	980	28.94	80	1015	29.97	15	1045	30.86	45
946	27.94	46	981	28.97	81	1016	30.00	16	1046	30.89	46
947	27.97	47	982	29.00	82	1017	30.03	17	1047	30.92	47
948	28.00	48	983	29.03	83	1018	30.06	18	1048	30.95	48
949	28.03	49	984	29.06	84	1019	30.09	19	1049	30.98	49
950	28.05	50	985	29.09	85	1020	30.12	20	1050	31.01	50
951	28.08	51	986	29.12	86	1021	30.15	21	1051	31.04	51
952	28.11	52	987	29.15	87	1022	30.18	22	1052	31.07	52
953	28.14	53	988	29.18	88	1023	30.21	23	1053	31.10	53
954	28.17	54	989	29.21	89	1024	30.24	24	1054	31.13	54
955	28.20	55	990	29.24	90						
956	28.23	56	991	29.26	91						
957	28.26	57	992	29.29	92						
958	28.29	58	993	29.32	93						
959	28.32	59	994	29.35	94						

NOTE.—It will be seen that the code figures may represent two values of barometric pressure, but this only takes place with a very high or a very low barometer, so that recipients of a message will be able to decide which value is intended.

Table IX.

A—Change of Barometer in last 2, 3 or 4 hours.

(Adapted for British Ships.)

(The change in 3 hours should be given if possible.)

	In 2 hours.	In 3 hours.	In 4 hours.	Code Figure.
Barometer steady—Has not risen or fallen more than	0.3 mb.	0.5 mb.	0.7 mb.	0
Barometer rising slowly—Has risen.	(.01 in.)	(.01 in.)	(.02 in.)	1
Barometer rising—Has risen	0.7–1.0 mb.	1.0–1.5 mb.	1.3–2.0 mb.	2
	(.02–.03 in.)	(.03–.05 in.)	(.04–.06 in.)	
Barometer rising quickly—Has risen.	1.4–2.4 mb.	2.0–3.5 mb.	2.8–4.8 mb.	3
	(.05–.07 in.)	(.06–.10 in.)	(.08–.14 in.)	
Barometer rising very rapidly—Has risen.	2.6–4.0 mb.	4.0–6.0 mb.	5.2–8.0 mb.	4
	(.08–.12 in.)	(.12–.18 in.)	(.15–.24 in.)	
Barometer falling slowly—Has fallen.	over 4.0 mb.	over 6.0 mb.	over 8.0 mb.	5
	(.12 in.)	(.18 in.)	(.24 in.)	
Barometer falling — Has fallen	0.7–1.0 mb.	1.0–1.5 mb.	1.3–2.0 mb.	6
	(.02–.03 in.)	(.03–.05 in.)	(.04–.06 in.)	
Barometer falling quickly — Has fallen.	1.4–2.4 mb.	2.0–3.5 mb.	2.8–4.8 mb.	7
	(.05–.07 in.)	(.06–.10 in.)	(.08–.14 in.)	
Barometer falling very rapidly—Has fallen.	2.6–4.0 mb.	4.0–6.0 mb.	5.2–8.0 mb.	8
	(.08–.12 in.)	(.12–.18 in.)	(.15–.24 in.)	
	over 4.0 mb.	over 6.0 mb.	over 8.0 mb.	
	(.12 in.)	(.18 in.)	(.24 in.)	

Barograph.

Table X.

a.—Characteristic of changes of the Barometer in the last three hours.

(Adapted for British Ships.)

	Description of Changes.	Code Figure.
Net result, Barometer same or higher.	Barometer rising at first, then falling by a smaller or like amount	0
	Barometer rising at first, then steady or rising less quickly	1
	Barometer unsteady, but generally rising or stationary	2
	Barometer steady or rising	3
	Barometer falling or steady at first, then rising by the same or larger amount	4
	Barometer rising, at an increasing rate	
	Barometer falling at first, then rising by a smaller amount	5
	Barometer falling at first, then steady or falling less quickly	6
	Barometer unsteady, but falling	7
	Barometer falling	8
Net result, Barometer lower.	Barometer steady or rising at first, then falling by a larger amount	9
	Barometer falling, at an increasing rate	

NOTE.—These changes can generally only be given by ships which have special barographs on board.

For illustration of these characteristic changes and guidance see MARINE OBSERVERS HANDBOOK, 5th Edition.

Table XI.

bb.—Amount of Rise or Fall of the Barometer in the last three hours.

(Adapted for British Ships.)

Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.		Code Figs.
Mbs.	Inches.		Mbs.	Inches.		Mbs.	Inches.		Mbs.	Inches.	
0.2	.01	01	4.6	.14	23	9.0	.27	45	13.4	.40	67
0.4	.01	02	4.8	.14	24	9.2	.28	46	13.6	.41	68
0.6	.02	03	5.0	.15	25	9.4	.28	47	13.8	.41	69
0.8	.02	04	5.2	.16	26	9.6	.29	48	14.0	.42	70
1.0	.03	05	5.4	.16	27	9.8	.29	49	14.2	.43	71
1.2	.04	06	5.6	.17	28	10.0	.30	50	14.4	.43	72
1.4	.04	07	5.8	.17	29	10.2	.31	51	14.6	.44	73
1.6	.05	08	6.0	.18	30	10.4	.31	52	14.8	.44	74
1.8	.05	09	6.2	.19	31	10.6	.32	53	15.0	.45	75
2.0	.06	10	6.4	.19	32	10.8	.32	54	15.2	.46	76
2.2	.07	11	6.6	.20	33	11.0	.33	55	15.4	.46	77
2.4	.07	12	6.8	.20	34	11.2	.34	56	15.6	.47	78
2.6	.08	13	7.0	.21	35	11.4	.34	57	15.8	.47	79
2.8	.08	14	7.2	.22	36	11.6	.35	58	16.0	.48	80
3.0	.09	15	7.4	.22	37	11.8	.35	59	16.2	.49	81
3.2	.10	16	7.6	.23	38	12.0	.36	60	16.4	.49	82
3.4	.10	17	7.8	.23	39	12.2	.37	61	16.6	.50	83
3.6	.11	18	8.0	.24	40	12.4	.37	62	16.8	.50	84
3.8	.11	19	8.2	.25	41	12.6	.38	63	17.0	.51	85
4.0	.12	20	8.4	.25	42	12.8	.38	64	17.2	.52	86
4.2	.13	21	8.6	.26	43	13.0	.39	65	17.4	.52	87
4.4	.13	22	8.8	.26	44	13.2	.40	66			

Visibility.

Table XII.

V.—Visibility.

	Code Figure.
Dense fog. Objects not visible at 50 yards	0
Thick fog. Objects not visible at 1 cable	1
Fog. Objects not visible at 2 cables	2
Moderate fog. Objects not visible at $\frac{1}{2}$ mile (nautical)	3
Mist or haze, or very poor visibility. Objects not visible at 1 mile (nautical)	4
Poor visibility. Objects not visible at 2 miles (nautical)	5
Moderate visibility. Objects not visible at 5 miles (nautical)	6
Good visibility. Objects not visible at 10 miles (nautical)	7
Very Good visibility. Objects not visible at 30 miles (nautical)	8
Excellent visibility. Objects visible more than 30 miles (nautical)	9

Clouds.

Table XIII.

C_L.—Form of Low Cloud.

Form of Cloud.	Code Figure.
No low clouds	0
Cumulus of fine weather	1
Cumulus (Large, without anvil)	2
Cumulo-Nimbus	3
Strato-Cumulus (spread from Cumulus)	4
Stratus or Strato-Cumulus (in layer)	5
Nimbus	6
Cumulus and Strato-Cumulus of fine weather	7
Cumulus, large (or Cumulo-Nimbus) and Strato-Cumulus	8
Cumulus, large (or Cumulo-Nimbus) and Nimbus	9

Table XIV.

C_M.—Form of Middle Cloud.

Form of Cloud.	Code Figure.
No middle cloud	0
Alto-Stratus, typical thin	1
Alto-Stratus, typical thick (Sun or Moon invisible)	2
Alto-Cumulus or high Strato-Cumulus, single layer	3
Alto-Cumulus, in bands, decreasing	4
Alto-Cumulus, in bands, increasing	5
Alto-Cumulus, spread out from Cumulus	6
Alto-Cumulus with Alto-Stratus; or Alto-Stratus with parts resembling Alto-Cumulus	7
Alto-Cumulus Castellatus (Alto-Cumulus in ragged fragments)	8
Alto-Cumulus in several layers, generally with fibrous veils and chaotic appearance of sky	9

Table XV.

C_H.—Form of Upper Cloud (Cirrus Cloud).

Form of Cloud.	Code Figure.
No upper clouds (cirrus type)	0
Cirrus, fine, not increasing: scarce	1
Cirrus, fine, not increasing: plentiful, but not a continuous layer	2
Cirrus, anvil	3
Cirrus, fine, increasing	4
Cirrus or Cirro-Stratus increasing, below 45° altitude	5
Cirrus or Cirro-Stratus increasing, and reaching above 45° altitude	6
Cirro-Stratus, veil covering whole sky	7
Cirro-Stratus, not increasing, and not covering whole sky	8
Cirro-Cumulus predominating, and a little Cirrus	9

Table XVI.

C.—Predominating Form of Cloud.

Form of Cloud.	Code Figure.
Cirrus	1
Cirro-Stratus	2
Cirro-Cumulus	3
Alto-Cumulus	4
Alto-Stratus	5
Strato-Cumulus	6
Nimbus	7
Cumulus or Fracto-Cumulus	8
Cumulo Nimbus	9
Stratus or Fracto-Stratus	0

Table XVII.

N. and (N_L).—Amount of Cloud.

Proportion of Sky covered, in tenths.	Code Figure.
Less than 1	0
1	1
2 to 3	2
4 to 6	3
7 to 8	4
9	5
More than 9, but with openings	6
10, completely covered	7
Sky obscured by fog, duststorm or other phenomenon	8
	9

Temperatures.

Table XVIII.

t_a.—Difference between Air and Sea Surface Temperature.

Air Temperature higher than Sea Temperature.	Code Figure.
More than 9° Fahrenheit	0
6° to 9° "	1
3° to 6° "	2
1° to 3° "	3
0° to 1° "	4
Air Temperature lower than Sea Temperature.	
0° to 1° Fahrenheit	5
1° to 3° "	6
3° to 6° "	7
6° to 9° "	8
More than 9° "	9

Swell.

Table XIX.

K.—Swell.

	Code Figure.
No swell	0
Low swell, short or average length	1
Low swell, long	2
Moderate swell, short	3
Moderate swell, average length	4
Moderate swell, long	5
Heavy swell, short	6
Heavy swell, average length	7
Heavy swell, long	8
Confused swell	9

Speed.

Table XX.

f.—Speed of Ship.

Speed in Knots.	Code Figure.
Ship stopped	0
1 to 3 knots	1
4 to 6 "	2
7 to 9 "	3
10 to 12 "	4
13 to 15 "	5
16 to 18 "	6
19 to 21 "	7
22 to 24 "	8
More than 24 knots	9

To come into force on May 1st, 1930, for British Ships.

f = Speed of ship in knots. (See Table XX.)

ww = The actual weather at the time of observation. (See Table VI.)

KEY: PQLLL. lllGG DDF_{WW} BBVTT 3 C_L C_M C_H N t_dKdWN_L
d_sfabb 6KdCN t_dd_sAWC_H.

Write the figures of the messages in the order received, down the columns, taking great care to put the first figure of the fifth group in its proper place so that the supplementary groups may be correctly decoded.

[illegible]

DECODE TABLES FOR W.T. WEATHER REPORTS FROM SHIPS AT SEA TO ALL SHIPS AND SHORE STATIONS.

Day and Position.

Table I.

P.—Day of the Week.

Code Figure.	Code Figure.
1 = Sunday.	5 = Thursday.
2 = Monday.	6 = Friday.
3 = Tuesday.	7 = Saturday.
4 = Wednesday.	

Table II.

Q.—Octant of the Globe.

Code Figure.	Longitude.	
0	0° W. — 90° W.	} North Latitude.
1	90° W. — 180° W.	
2	180° E. — 90° E.	
3	90° E. — 0° E.	
5	0° W. — 90° W.	} South Latitude.
6	90° W. — 180° W.	
7	180° E. — 90° E.	
8	90° E. — 0° E.	

Compass.

Table III.

DD.—Compass Table for Wind Direction to points.

Code Figures.	True Direction.	Code Figures.	True Direction.
00	Calm.	17	S. by W.
01	N. by E.	18	S.S.W.
02	N.N.E.	19	S.W. by S.
03	N.E. by N.	20	S.W.
04	N.E.	21	S.W. by W.
05	N.E. by E.	22	W.S.W.
06	E.N.E.	23	W. by S.
07	E. by N.	24	W.
08	E.	25	W. by N.
09	E. by S.	26	W.N.W.
10	E.S.E.	27	N.W. by W.
11	S.E. by E.	28	N.W.
12	S.E.	29	N.W. by N.
13	S.E. by S.	30	N.N.W.
14	S.S.E.	31	N. by W.
15	S. by E.	32	N.
16	S.		

Table IV.

d and d_s.—Compass Table to Half Cardinal Points.

Code Figures.	True Direction.
0	No Sea or Swell or Ship hove to.
1	N.E.
2	E.
3	S.E.
4	S.
5	S.W.
6	W.
7	N.W.
8	N.
9	No observation or no information.

Wind.

Table V.

F.—Wind Force, Beaufort Scale.

Code Figure.	Beaufort Number.
0	Calm Nought
1	Light airs One
2	Light breeze Two
3	Gentle breeze Three
4	Moderate breeze Four
5	Fresh breeze Five
6	Strong breeze Six
7	Moderate gale Seven
8	Fresh gale Eight
9	Strong gale Nine
9	Whole gale Ten
9	Storm Eleven
9	Hurricane Twelve

When force 10, 11 or 12, figure 9 transmitted, words "gale," "storm" or "hurricane" respectively, added at end of the message.

Weather.

Table VI.

ww.—Present Weather.

00-19 Abbreviated description of sky and special phenomena.

00	Cloudless.
01	Partly cloudy.
02	Cloudy.
03	Overcast.
04	Fog over the Sea.
05	Haze (but visibility greater than 2000 metres).
06	Dust devils seen.
07	Distant lightning.
08	Mist.
09	—
10	Precipitation within sight.
11	Thunder, without precipitation at the station.
12	—
13	Ugly, threatening sky.
14	Squally weather.
15	Heavy squalls
16	Waterspouts seen } in last three hours.
17	—
18	Signs of tropical storm forming.
19	Signs that tropical storm has formed.

20-29 Precipitation in last hour but not at time of observation.

20	Precipitation (rain, drizzle, hail, snow or sleet)	} In last hour but not at time.
21	Drizzle	
22	Rain	
23	Snow	
24	Sleet	
25	Rain shower(s).	
26	Snow shower(s).	
27	Hail or rain and hail shower(s).	
28	Slight thunderstorm.	
29	Heavy thunderstorm.	

Table VI—(continued).

ww.—Present Weather.

30-39 Dust storms and storms of drifting snow (visibility less than 1000 metres).

- 30 Dust or sand storm.
 31 Dust or sand storm has decreased.
 32 Dust or sand storm no appreciable change.
 33 Dust or sand storm has increased.
 34 Line of dust storms.
 35 Storm of drifting snow.
 36 Slight storm of drifting snow } generally low.
 37 Heavy storm of drifting snow }
 38 Slight storm of drifting snow } generally high.
 39 Heavy storm of drifting snow }

40-49 Fog or thick dust haze (visibility less than 1000 metres).

- 40 Fog.
 41 Moderate fog in last hour.
 42 Thick fog in last hour.
 43 Fog, sky discernible } has become thinner during last
 44 Fog, sky not discernible } hour.
 45 Fog, sky discernible } no appreciable change during
 46 Fog, sky not discernible } last hour.
 47 Fog, sky discernible } has become thick during last
 48 Fog, sky not discernible } hour.
 49 Fog in patches.

50-59 Precipitation at time of observation.**50-59 Drizzle (precipitation consisting of numerous minute drops).**

- 50 Drizzle.
 51 Intermittent } slight drizzle.
 52 Continuous }
 53 Intermittent } moderate drizzle.
 54 Continuous }
 55 Intermittent } thick drizzle.
 56 Continuous }
 57 Drizzle and fog.
 58 Slight or moderate } drizzle and rain.
 59 Thick }

60-69 Rain.

- 60 Rain.
 61 Intermittent } slight rain.
 62 Continuous }
 63 Intermittent } moderate rain.
 64 Continuous }
 65 Intermittent } heavy rain.
 66 Continuous }
 67 Rain and fog.
 68 Slight or moderate } rain and snow.
 69 Heavy }

70-79 Snow.

- 70 Snow or sleet.
 71 Intermittent } slight snow in flakes.
 72 Continuous }
 73 Intermittent } moderate snow in flakes.
 74 Continuous }
 75 Intermittent } heavy snow in flakes.
 76 Continuous }
 77 Snow and fog.
 78 Granular snow.
 79 Ice crystals.

80-89 Shower(s).

- 80 Shower(s).
 81 Shower(s) of slight or moderate } rain.
 82 " " heavy }
 83 " " slight or moderate } snow.
 84 " " heavy }
 85 " " slight or moderate } rain and snow.
 86 " " heavy }
 87 " " granular snow.
 88 " " slight or moderate } hail, or rain and hail.
 89 " " heavy }

Table VI—(continued).

ww.—Present Weather.

90-99 Thunderstorm.

- 90 Thunderstorm.
 91 Rain at time } thunderstorm during last hour, but
 92 Snow or sleet at time } not at time of observation.
 93 Thunderstorm, slight, without hail or soft hail, }
 but with rain or snow }
 94 " slight, with soft hail }
 95 " moderate, without hail, but with } at time
 rain (or snow) } of
 96 " moderate, with soft hail } observation.
 97 " heavy, without hail, but with }
 rain (or snow) }
 98 " combined with dust storm }
 99 " heavy, with hail }

Table VII.

W.—Past Weather.

Code
Figure.

- 0 Fair (clear or slightly clouded).
 1 Variable sky.
 2 Mainly overcast.
 3 Fog or thick dust haze (visibility less than 5 cables).
 4 Drizzle.
 5 Rain.
 6 Snow or sleet.
 7 Showers.
 8 Sandstorm or duststorm.
 9 Thunderstorm.

Barometer.

Table VIII.

BB.—Decode Table for corrected barometer readings in millibars and inches.

Code Figs.	Mb.	In.	Code Figs.	Mb.	In.	Code Figs.	Mb.	In.	Code Figs.	Mb.	In.
25	925	27.32	60	960	28.35	95	995	29.38	25	1025	30.27
26	926	27.35	61	961	28.38	96	996	29.41	26	1026	30.30
27	927	27.38	62	962	28.41	97	997	29.44	27	1027	30.33
28	928	27.41	63	963	28.44	98	998	29.47	28	1028	30.36
29	929	27.44	64	964	28.47	99	999	29.50	29	1029	30.39
30	930	27.46	65	965	28.50	00	1000	29.53	30	1030	30.42
31	931	27.49	66	966	28.53	01	1001	29.56	31	1031	30.45
32	932	27.52	67	967	28.56	02	1002	29.59	32	1032	30.48
33	933	27.55	68	968	28.59	03	1003	29.72	33	1033	30.51
34	934	27.58	69	969	28.62	04	1004	29.65	34	1034	30.53
35	935	27.61	70	970	28.65	05	1005	29.68	35	1035	30.56
36	936	27.64	71	971	28.67	06	1006	29.71	36	1036	30.59
37	937	27.67	72	972	28.70	07	1007	29.74	37	1037	30.62
38	938	27.70	73	973	28.73	08	1008	29.77	38	1038	30.65
39	939	27.73	74	974	28.76	09	1009	29.80	39	1039	30.68
40	940	27.76	75	975	28.79	10	1010	29.83	40	1040	30.71
41	941	27.79	76	976	28.82	11	1011	29.86	41	1041	30.74
42	942	27.82	77	977	28.85	12	1012	29.89	42	1042	30.77
43	943	27.85	78	978	28.88	13	1013	29.92	43	1043	30.80
44	944	27.88	79	979	28.91	14	1014	29.94	44	1044	30.83
45	945	27.91	80	980	28.94	15	1015	29.97	45	1045	30.86
46	946	27.94	81	981	28.97	16	1016	30.00	46	1046	30.89
47	947	27.97	82	982	29.00	17	1017	30.03	47	1047	30.92
48	948	28.00	83	983	29.03	18	1018	30.06	48	1048	30.95
49	949	28.03	84	984	29.06	19	1019	30.09	49	1049	30.98
50	950	28.05	85	985	29.09	20	1020	30.12	50	1050	31.01
51	951	28.08	86	986	29.12	21	1021	30.15	51	1051	31.04
52	952	28.11	87	987	29.15	22	1022	30.18	52	1052	31.07
53	953	28.14	88	988	29.18	23	1023	30.21	53	1053	31.10
54	954	28.17	89	989	29.21	24	1024	30.24	54	1054	31.13
55	955	28.20	90	990	29.24						
56	956	28.23	91	991	29.26						
57	957	28.26	92	992	29.29						
58	958	28.29	93	993	29.32						
59	959	28.32	94	994	29.35						

NOTE.—It will be seen that the code figures may represent two values of barometric pressure, but this only takes place with a very high or a very low barometer, so that recipients of a message will be able to decide which value is intended.

Table IX.

Code Figure.	A.—Barometric Tendency.
0	Barometer steady. (The barometer has not fallen or risen more than $\frac{1}{2}$ millibar in 3 hours.)
1	Barometer rising slowly. (The barometer has risen 1 to $1\frac{1}{2}$ millibars (.03-.04 in.) in last 3 hours.)
2	Barometer rising. (The barometer has risen 2 to $3\frac{1}{2}$ millibars (.06-.10 in.) in last 3 hours.)
3	Barometer rising quickly. (The barometer has risen 4 to 6 millibars (.12-.18 in.) in last 3 hours.)
4	Barometer rising very rapidly. (The barometer has risen over 6 millibars (.18 in.) in last 3 hours.)
5	Barometer falling slowly. (The barometer has fallen 1 to $1\frac{1}{2}$ millibars (.03-.04 in.) in last 3 hours.)
6	Barometer falling. (The barometer has fallen 2 to $3\frac{1}{2}$ millibars (.06-.10 in.) in last 3 hours.)
7	Barometer falling quickly. (The barometer has fallen 4 to 6 millibars (.12-.18 in.) in last 3 hours.)
8	Barometer falling very rapidly. (The barometer has fallen over 6 millibars (.18 in.) in last 3 hours.)

Barograph.

Table X.

a.—Characteristic of changes of the Barometer in the last three hours.

(Adapted for British Ships.)

Code Figure.	Description of Changes.	
0	Barometer rising at first, then falling by a smaller or like amount.	Net result, Barometer same or higher.
1	Barometer rising at first, then steady or rising less quickly.	
2	Barometer unsteady; but generally rising or stationary.	
3	Barometer steady or rising.	
4	Barometer falling or steady at first, then rising by the same or larger amount.	Net result, Barometer lower.
5	Barometer rising, at an increasing rate.	
6	Barometer falling at first, then rising by a smaller amount.	
7	Barometer falling at first, then steady or falling less quickly.	
8	Barometer unsteady, but falling.	
9	Barometer falling.	
	Barometer steady or rising at first, then falling to a larger amount.	
	Barometer falling, at an increasing rate.	

NOTE.—These changes are generally only given by ships which have special barographs on board.

For illustration of these characteristic changes and guidance, see MARINE OBSERVERS' HANDBOOK, 5TH EDITION.

Table XI.

bb.—Amount of Rise or Fall of the Barometer in the last three hours. (In fifths of Millibars.)

Code Figs.	Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.		Code Figs.	Amount of Rise or Fall.	
	Mbs.	Ins.		Mbs.	Ins.		Mbs.	Ins.		Mbs.	Ins.
01	0.2	.01	23	4.6	.14	45	9.0	.27	67	13.4	.40
02	0.4	.01	24	4.8	.14	46	9.2	.28	68	13.6	.41
03	0.6	.02	25	5.0	.15	47	9.4	.28	69	13.8	.41
04	0.8	.02	26	5.2	.16	48	9.6	.29	70	14.0	.42
05	1.0	.03	27	5.4	.16	49	9.8	.29	71	14.2	.43
06	1.2	.04	28	5.6	.17	50	10.0	.30	72	14.4	.43
07	1.4	.04	29	5.8	.17	51	10.2	.31	73	14.6	.44
08	1.6	.05	30	6.0	.18	52	10.4	.31	74	14.8	.44
09	1.8	.05	31	6.2	.19	53	10.6	.32	75	15.0	.45
10	2.0	.06	32	6.4	.19	54	10.8	.32	76	15.2	.46
11	2.2	.07	33	6.6	.20	55	11.0	.33	77	15.4	.46
12	2.4	.07	34	6.8	.20	56	11.2	.34	78	15.6	.47
13	2.6	.08	35	7.0	.21	57	11.4	.34	79	15.8	.47
14	2.8	.08	36	7.2	.22	58	11.6	.35	80	16.0	.48
15	3.0	.09	37	7.4	.22	59	11.8	.35	81	16.2	.49
16	3.2	.10	38	7.6	.23	60	12.0	.36	82	16.4	.49
17	3.4	.10	39	7.8	.23	61	12.2	.37	83	16.6	.50
18	3.6	.11	40	8.0	.24	62	12.4	.37	84	16.8	.50
19	3.8	.11	41	8.2	.25	63	12.6	.38	85	17.0	.51
20	4.0	.12	42	8.4	.25	64	12.8	.38	86	17.2	.52
21	4.2	.13	43	8.6	.26	65	13.0	.39	87	17.4	.52
22	4.4	.13	44	8.8	.26	66	13.2	.40			

Visibility.

Table XII.

V.—Visibility.

Code Figure.	
0	Dense fog. Objects not visible at 50 yards.
1	Thick fog. Objects not visible at 1 cable.
2	Fog. Objects not visible at 2 cables.
3	Moderate fog. Objects not visible at $\frac{1}{2}$ mile (nautical).
4	Mist or haze, or very poor visibility. Objects not visible at 1 mile (nautical).
5	Poor visibility. Objects not visible at 2 miles (nautical).
6	Moderate visibility. Objects not visible at 5 miles (nautical).
7	Good visibility. Objects not visible at 10 miles (nautical).
8	Very good visibility. Objects not visible at 30 miles (nautical).
9	Excellent visibility. Objects visible at more than 30 miles (nautical).

Clouds.

Table XIII.

CL.—Form of Low Cloud.

Code Figure.	Form of Cloud.
0	No low clouds.
1	Cumulus of fine weather.
2	Cumulus (Large, without anvil).
3	Cumulo-Nimbus.
4	Strato-Cumulus (spread from Cumulus).
5	Stratus or Strato-Cumulus (in layer).
6	Nimbus.
7	Cumulus and Strato-Cumulus of fine weather.
8	Cumulus, large (or Cumulo-Nimbus) and Strato-Cumulus.
9	Cumulus, large (or Cumulo-Nimbus) and Nimbus.

Table XIV.

CM.—Form of Middle Cloud.

Code Figure.	Form of Cloud.
0	No middle cloud.
1	Alto-Stratus, typical thin.
2	Alto-Stratus, typical thick (Sun or Moon invisible).
3	Alto-Cumulus or high Strato-Cumulus, single layer.
4	Alto-Cumulus, in bands, decreasing.
5	Alto-Cumulus, in bands, increasing.
6	Alto-Cumulus, spread out from Cumulus.
7	Alto-Cumulus with Alto-Stratus; or Alto-Stratus with parts resembling Alto-Cumulus.
8	Alto-Cumulus Castellatus (Alto-Cumulus in ragged fragments).
9	Alto-Cumulus in several layers, generally with fibrous veils and chaotic appearance of sky.

Table XV.

CH.—Form of Upper Cloud (Cirrus Cloud).

Code Figure.	Form of Cloud.
0	No upper clouds (cirrus type).
1	Cirrus, fine, not increasing: scarce.
2	Cirrus, fine, not increasing: plentiful, but not a continuous layer.
3	Cirrus, anvil.
4	Cirrus, fine, increasing.
5	Cirrus or Cirro-Stratus increasing, below 45° altitude.
6	Cirrus or Cirro-Stratus increasing, and reaching above 45° altitude.
7	Cirro-Stratus, veil covering whole sky.
8	Cirro-Stratus, not increasing, and not covering whole sky.
9	Cirro-Cumulus predominating, and a little Cirrus.

Table XVI.

C.—Predominating Form of Cloud.

Code Figure.	Form of Cloud.
1	Cirrus.
2	Cirro-Stratus.
3	Cirro-Cumulus.
4	Alto-Cumulus.
5	Alto-Stratus.
6	Strato-Cumulus.
7	Nimbus.
8	Cumulus or Fracto-Cumulus.
9	Cumulo Nimbus.
0	Stratus or Fracto-Stratus.

Table XVII.

N. and N_L.—Amount of Cloud.

Code Figure.	Proportion of Sky covered, in tenths.
0	0.
1	Less than 1.
2	1.
3	2 to 3.
4	4 to 6.
5	7 to 8.
6	9.
7	More than 9, but with openings.
8	10, completely covered.
9	Sky obscured by fog, duststorm or other phenomenon.

Temperatures.

Table XVIII.

t_a.—Difference between Air and Sea Surface Temperatures.

Code Figure.	Air Temperature higher than Sea Temperature.
0	More than 9° Fahrenheit.
1	6° to 9° ,,
2	3° to 6° ,,
3	1° to 3° ,,
4	0° to 1° ,,
	Air Temperature lower than Sea Temperature.
5	0° to 1° Fahrenheit.
6	1° to 3° ,,
7	3° to 6° ,,
8	6° to 9° ,,
9	More than 9° ,,

Swell.

Table XIX.

K.—Swell.

Code Figure.	
0	No swell.
1	Low swell, short or average length.
2	Low swell, long.
3	Moderate swell, short.
4	Moderate swell, average length.
5	Moderate swell, long.
6	Heavy swell, short.
7	Heavy swell, average length.
8	Heavy swell, long.
9	Confused swell.

Speed.

Table XX.

f.—Speed of Ship.

Code Figure.	Speed in Knots.
0	Ship stopped.
1	1 to 3 knots.
2	4 to 6 ,,
3	7 to 9 ,,
4	10 to 12 ,,
5	13 to 15 ,,
6	16 to 18 ,,
7	19 to 21 ,,
8	22 to 24 ,,
9	More than 24 knots.

Special Notices Regarding Personnel.

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

Captain W. E. Crumplin.

Captain W. E. CRUMPLIN of the BIBBY LINE, who has commanded a number of that Company's ships including *Yorkshire*, *Oxfordshire* and *Lancashire*, has recently had the great distinction of being elected an Elder Brother of Trinity House.

Captain CRUMPLIN has been a member of the Corps of Voluntary Marine Observers for several years and the ships under his command have secured several "Excellents."

The Corps of Voluntary Marine Observers and Marine Division join in heartily congratulating Captain CRUMPLIN upon gaining a position which is honoured throughout the Sea Services.

F. J. MOSELEY in 1922, Captain WHITTON received his promotion to Marine Superintendent.

He was for a short time as 2nd Officer a member of the Corps of Voluntary Marine Observers and since becoming Marine Superintendent at Southampton has given much encouragement to those members of our corps who came in contact with him. He has given valuable support in the modernizing process to which the work has been subject of late years. The Corps of Voluntary Marine Observers and Marine Division join in wishing Captain WHITTON long life and happiness in a well earned retirement.

Captain John B. Whitton.

Captain J. B. WHITTON, Marine Superintendent, UNION CASTLE LINE, Southampton, has recently retired.

Commencing his seafaring in 1880 he continued in sail until 1892 when he joined the CASTLE LINE as fourth officer, rising through all ranks and gaining command in 1910. He commanded a number of the Company's ships including *Garth Castle*, *Guildford Castle*, *Goorkha*, *Carrisbrook Castle*, and *Norman*.

When in command of *Goorkha* during the Great War in 1917 she was torpedoed off Malta. Captain WHITTON after disembarking 370 wounded men in the ship's boats and destroyers succeeded in making port under the ship's own steam. Upon the death of Captain

Captain E. A. Singeisen, R.D., R.N.R.

Captain E. A. SINGEISEN late of *Armada Castle* has been promoted to Marine Superintendent of the UNION CASTLE LINE at Southampton vice Captain WHITTON.

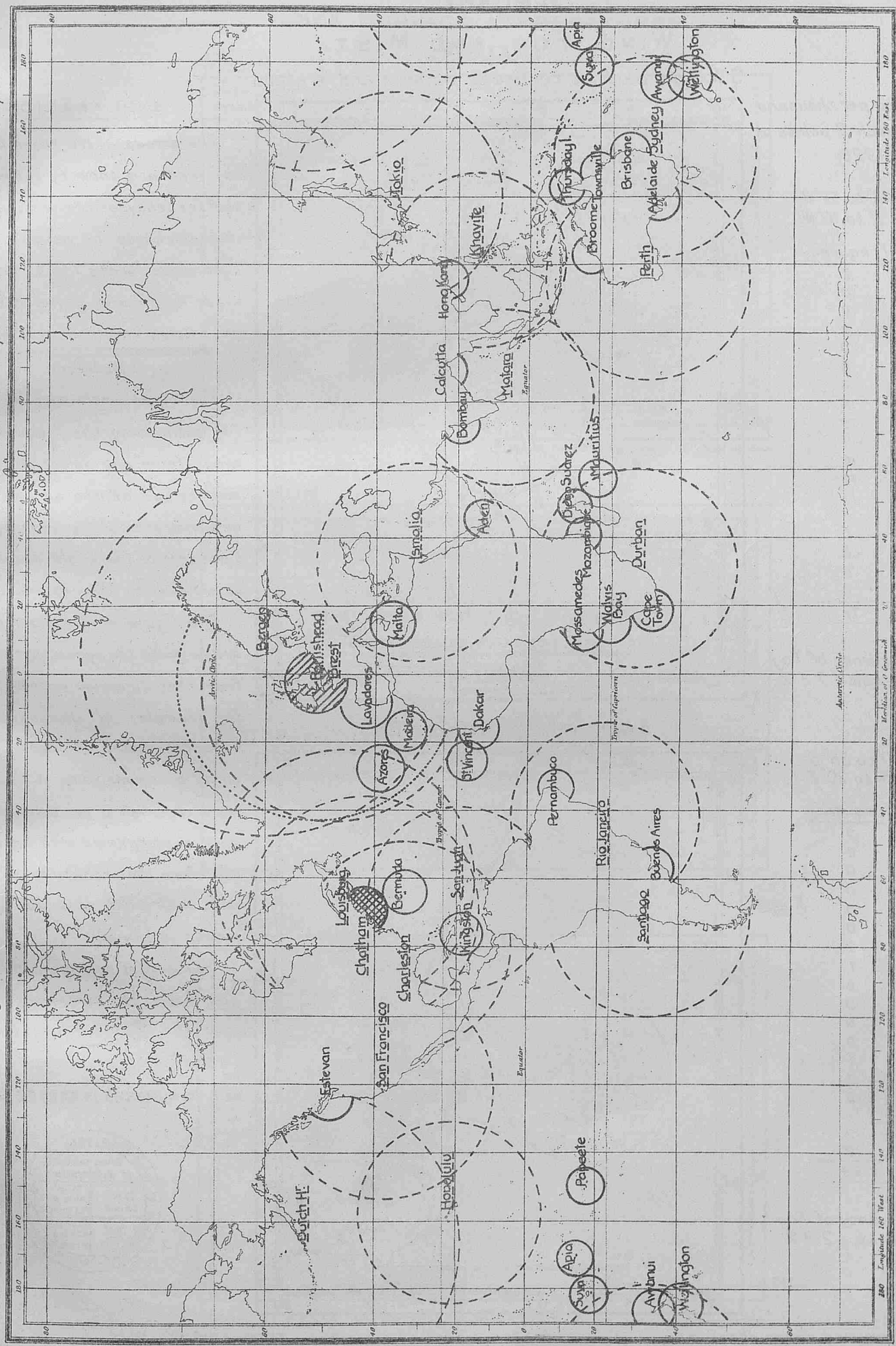
A DEVITT & MOORE midshipman from 1892 to 1896 after putting in time for master in cargo steamers he joined the UNION CASTLE LINE as 4th Officer in 1900.

He served in H.M. Fleet throughout the Great War commanding H.M.S. *Duchess of Devonshire* from 1916 to the end of hostilities and in 1920 obtained his first command in the UNION CASTLE LINE *Carlow Castle*.

Since 1926 Captain SINGEISEN has been a member of the Corps of Marine Observers who with the Marine Division wish him every success in his new appointment.

Chart II.— SHIPS' WIRELESS WEATHER SIGNALS.

Showing Stations which might in future be detailed to receive Routine Wireless Weather Reports from Selected Ships.



The dotted circle indicates the area in which British ships would report to Portishead. The small shaded circle indicates the area from which reports are prohibited to Portishead.

The pecked circles indicate the reporting areas around stations in other countries which would probably be capable of working the same system as Portishead. The cross-hatched circle indicates the area from which reports are prohibited to Chatham, U.S.A.

The full-line circles indicate the areas round islands and coast stations which could receive spark selected ships' reports to C.Q.

JANUARY.

WIND, FOG AND MIST.

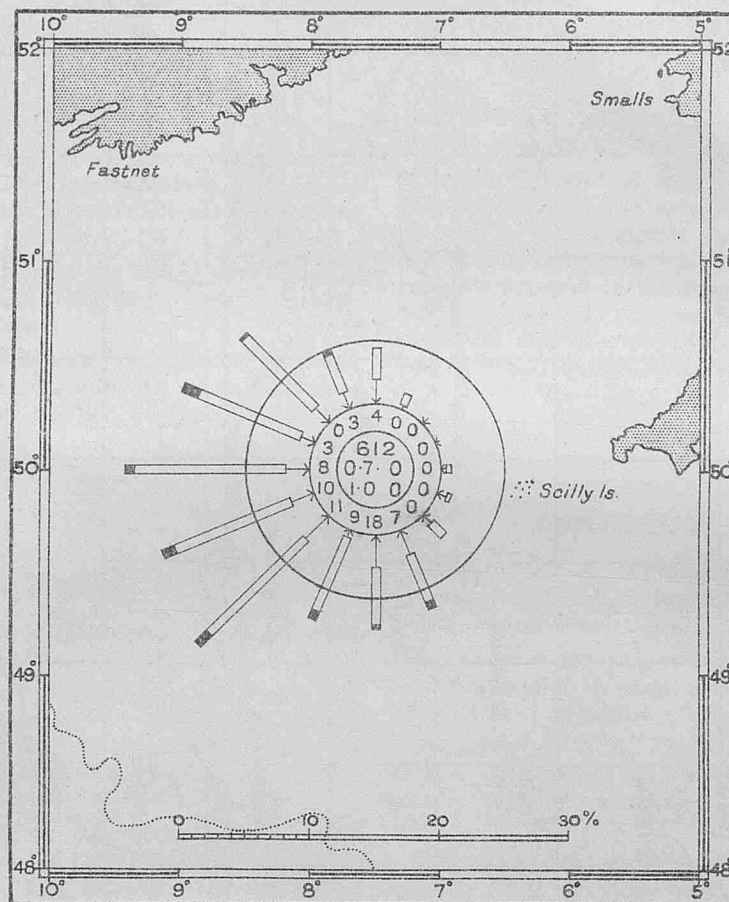
S.W. Approaches to Great Britain and Ireland.

Frequency of fog per thousand observations for each 2 points of compass, 1921 to 1928.

Latitude 48° to 52° N.
Longitude 5° to 10° W.

Direction.	Frequency.
N	2
NNE	0
NE	0
ENE	0
E	0
ESE	0
SE	0
SSE	5
S	13
SSW	7
SW	16
WSW	13
W	11
WNW	3
NW	0
NNW	2
Calm	0
Var.	0
TOTAL	72

Percentage Frequency of Fog and Mist for area = 7.2 %.



EXPLANATION.

The arrows in the roses fly with the wind and show by their length the frequency of the winds and by their thickness the various forces, light winds forces 1 to 3, moderate winds 4 to 7 and gales 8 to 12.

Gales Light
Moderate

The outer circle supplies a scale for estimating the frequency of winds from any direction. From the heads of the arrows to the circumference of the circle represents 5 per cent of the whole number of observed winds. (100 per cent = 10° longitude).

The figure at the head of the arrow gives the percentage of wind from that direction with fog or mist, for example:- In January off the west coast of Cape Colony, on all occasions when N.W. winds were observed 2 per cent of them were accompanied with fog or mist, therefore the probability of fog or mist with a NW wind during this month is 1 in 50.

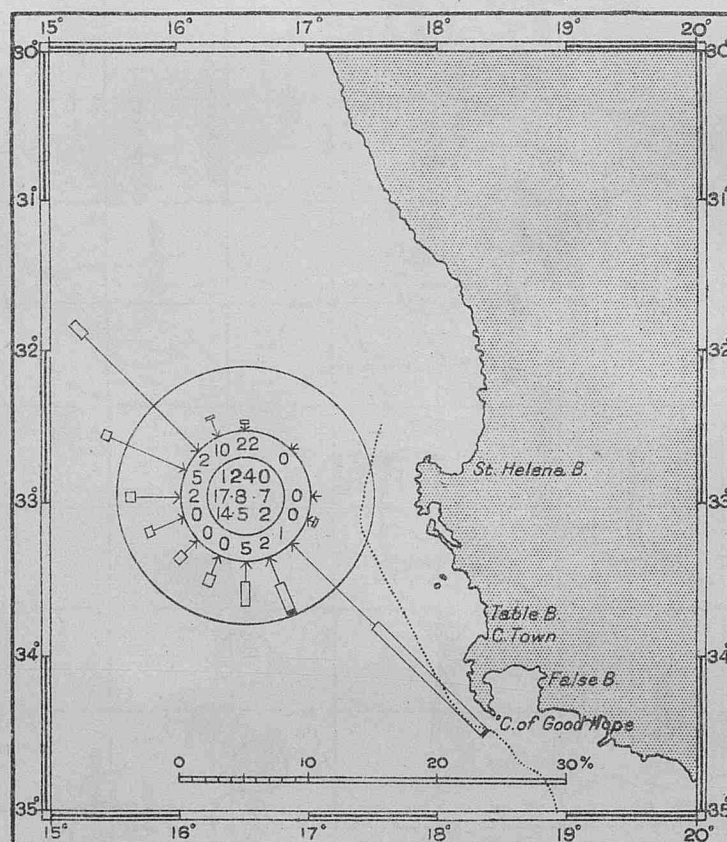
Fog is most probable in this month with Calm the percentage being 1.2.

Approaches to Table Bay.

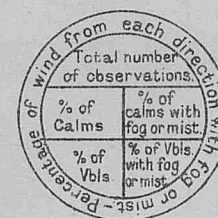
Latitude 30° to 35° S.
Longitude 15° to 20° E.

Direction.	Frequency.
N	2
NNE	0
NE	0
ENE	0
E	0
ESE	0
SE	2
SSE	1
S	2
SSW	0
SW	0
WSW	0
W	1
WNW	3
NW	2
NNW	1
Calm	12
Var.	3
TOTAL	29

Percentage Frequency of Fog and Mist for area = 2.9 %.



KEY TO NUMBERS IN CENTRE OF ROSES.



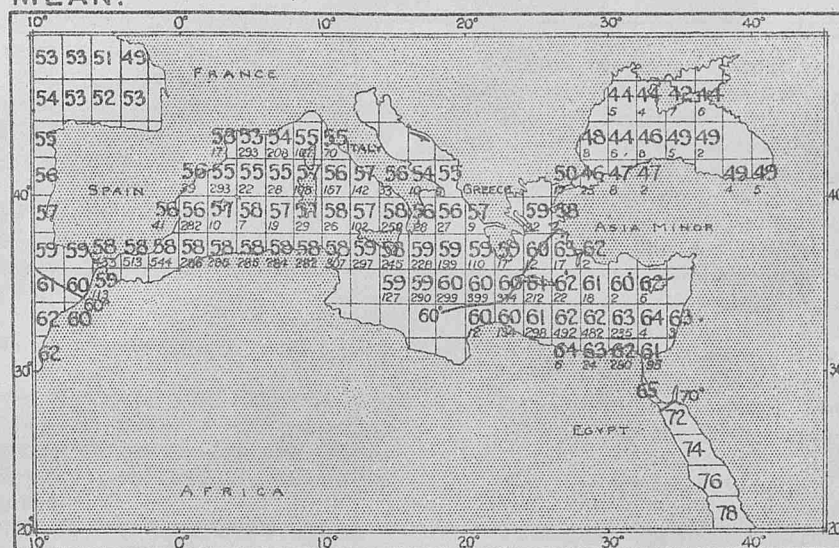
Compiled from observations of British Ships received since the adoption of the Hollerith system of extraction covering the years 1921 to 1928.

MEDITERRANEAN SEA

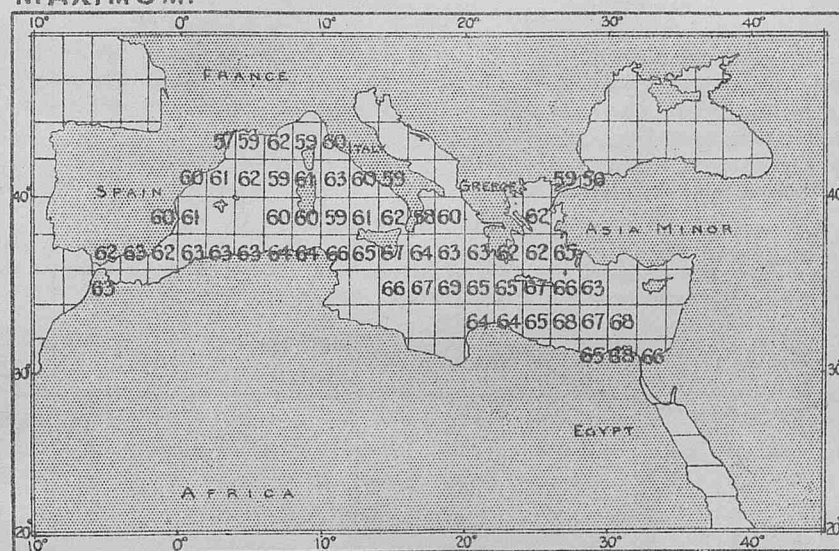
SEA SURFACE TEMPERATURES

JANUARY.

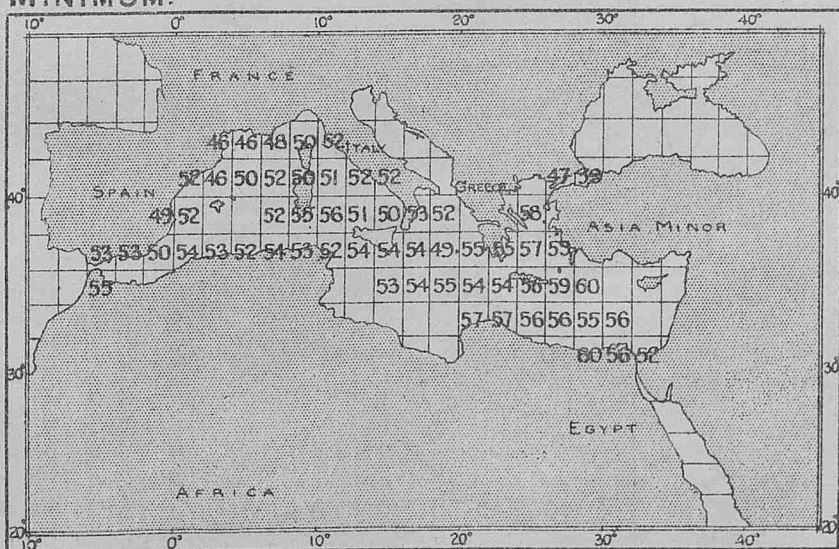
MEAN.



MAXIMUM.



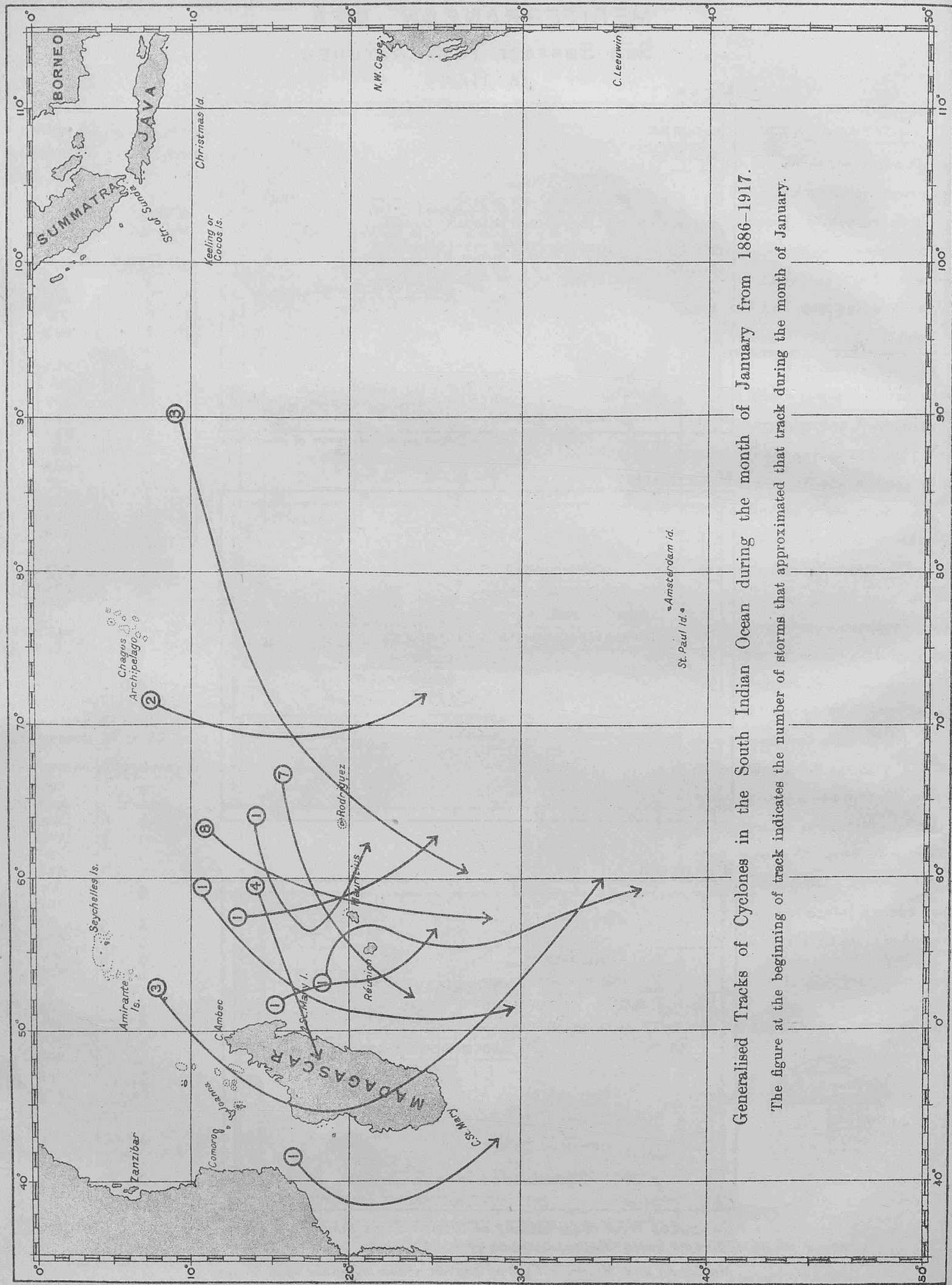
MINIMUM.



Computed from observations of British Ships during the years 1900-1914 in the Mediterranean and Black Seas.

Maximum and Minimum figures are not shown unless the Mean Temperature has been computed from not less than 12 observations.

CYCLONE TRACKS OF THE SOUTH INDIAN OCEAN.



Generalised Tracks of Cyclones in the South Indian Ocean during the month of January from 1886-1917.

The figure at the beginning of track indicates the number of storms that approximated that track during the month of January.

i

FLEET LIST.

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

Explanation of Abbreviations.

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

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 a number and symbols indicating W/T apparatus before their names are "Selected ships" invited to make by W/T, reports of observations taken at arranged G.M. Times to "All Ships."

5726

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received.
156 *† <i>Ascanius</i> ...	Wilson, C. A. ...	J. T. Collin, J. D. Auld, W. J. E. Wright.	M.L.	A. Holt ...	Met. Log. 13.5.29 to 12.9.29 ...	18.9.29
<i>Atlantian</i> ...	Masters, W. ...	...	No. A.	Leyland ...	Form 911 5.10.29 to 16.10.29 ...	22.10.29
<i>Atrous</i> ...	Wilkinson, T. G. ...	H. Nicholas ...	" A.	A. Holt ...	" 5.9.29 to 18.10.29 ...	11.11.29
281 *† <i>Auditor</i> ...	Owen, W. T. ...	D. O. Percy ...	" M.	Harrison ...	" 13.8.29 to 14.9.29 ...	19.9.29
212 *† <i>Australia</i> ...	Scutt, W. ...	...	M.L.	British India ...	...	...
282 *† <i>Author</i> ...	Whyte, D. L. ...	...	No. M.	Harrison ...	...	...
<i>Balmoral Castle</i> ...	Knight, A. ...	H. A. Deller ...	" A.	Union Castle ...	" 13.9.29 to 3.11.29 ...	13.11.29
179 *† <i>Bairnald</i> ...	Nicholl, R. N. C. ...	A. H. G. Storrs ...	" M.	P. & O. Branch ...	" 13.5.29 to 14.8.29 ...	28.8.29
051 †† <i>Baltic</i> ...	Kearney, J. Lt-Commr. R.N.R.	N. E. Banks, A. C. T'Anson ...	W.T.	White Star ...	W.T. Reg. 7.10.29 to 26.10.29 ...	31.10.29
<i>Bampton Castle</i> ...	James, J. S. D.S.C. ...	W. A. Cooke ...	No. A.	Union Castle ...	Form 911 7.10.29 to 26.10.29 ...	29.10.29
248 *† <i>Banffshire</i> ...	Westropp, T. G. ...	A. Mc L. Pilcher ...	" M.	Turnbull Martin ...	" 5.7.29 to 18.8.29 ...	30.8.29
180 *† <i>Baradine</i> ...	Allin, C. H. C. ...	C. B. Roche, B. W. Pollitt, P. Haworth, L. A. Hill.	M.L.	P. & O. Branch ...	Met. Log. 12.4.29 to 18.7.29 ...	16.9.29
213 *† <i>Barpeta</i> ...	Rudge, J. G. ...	J. F. B. Hore ...	No. M.	British India ...	Form 911 22.8.29 to 18.9.29 ...	14.10.29
181 *† <i>Barrabool</i> ...	Rhodes, H. R. ...	T. G. Davies ...	" M.	P. & O. Branch ...	" 11.1.29 to 28.1.29 ...	5.3.29
<i>Baychimo</i> ...	Cornwall, S. A. ...	...	" A.	Hudson's Bay Co. ...	" 8.7.29 to 24.9.29 ...	10.10.29
059 †† <i>Belgenland</i> ...	Morehouse, W. A. ...	C. H. Otterson, F. Good, W. Jackman.	W.T.	Red Star ...	W.T. Reg. 7.10.29 to 25.10.29 ...	28.10.29
182 *† <i>Beltana</i> ...	Rollo, W. ...	G. V. Legassick ...	No. M.	P. & O. Branch ...	Form 911 6.10.29 to 26.10.29 ...	28.10.29
<i>Benaider</i> ...	Fairweather, J. J. ...	D. T. McCullum ...	" A.	Ben Line ...	" 2.3.29 to 12.6.29 ...	19.6.29
183 †† <i>Bendigo</i> ...	Wyatt, F. N. ...	G. V. Legassick ...	" M.	P. & O. Branch ...	" 3.8.29 to 21.9.29 ...	12.10.29
283 *† <i>Benefactor</i> ...	Jones, C. W. ...	S. M. Smith, R. Huntingdon.	" M.	Harrison ...	" 29.7.29 to 24.9.29 ...	10.10.29
081 *† <i>Bogota</i> ...	Cox, F. D. ...	C. J. Cartson ...	" M.	Pacific S.N.Co. ...	" 15.4.29 to 13.5.29 ...	23.5.29
031 †† <i>Berengaria</i> ...	Roston, Sir A. H. K.B.E., R.D. Capt. R.N.R.	F. P. Collins, W. C. Robson, J. Radford.	W.T.	Cunard ...	W.T. Reg. 19.10.29 to 5.11.29 ...	7.11.29
<i>Brenda</i> ...	Lamont, A. ...	N. Ross ...	No. A.	Scottish Fishery Brd.	Form 911 5.10.29 to 28.10.29 ...	4.11.29
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	C.C.	Southern Railway ...	Telegraphic Report 4.11.29 ...	4.11.29
320 *† <i>British Dominion</i> , M.V.	Taylor, R. J. ...	J. F. Trickey, C. James ...	No. M.	British Tankers ...	Form 911 14.7.29 to 2.11.29 ...	8.11.29
321 *† <i>British Merchant</i>	Putt, R. O. ...	C. Low ...	" M.	Lamport & Holt ...	" 26.9.29 to 5.11.29 ...	12.11.29
<i>Bruyere</i> ...	Birch, A. ...	...	" A.	Anglo-Saxon ...	" 27.11.28 to 24.2.29 ...	4.3.29
322 *† <i>Bulysses</i> M.V.	Head, B. P. ...	A. J. Clatworthy ...	" M.	Petroleum Co.	" 25.8.29 to 1.10.29 ...	29.10.29
249 *† <i>Buteshire</i> ...	Page, W. J. ...	J. McLeod, R. Owen, S. R. J. Woods.	M.L.	Turnbull Martin ...	Met. Log. 7.4.29 to 3.9.29 ...	24.9.29
065 †† <i>Calgarie</i> ...	Binks, J. W., R.D., Lt-Commr. R.N.R.	G. Kavanagh, E. P. Hughes, C. Cochrane.	W.T.	White Star ...	Form 911 4.10.29 to 27.10.29 ...	29.10.29
<i>Cambria</i> ...	Foy, C. A. ...	...	No.	W.I. and Panama Telegraph Co.	W.T. Reg. 7.10.29 to 26.10.29 ...	29.10.29
<i>Cambria</i> ...	Copland, C. P. ...	O. W. Ll. Jones ...	C.C.	L.M. & S. Rly ...	Form 911 6.3.29 to 27.7.29 ...	31.7.29
250 *† <i>Cambridge</i> ...	Williams, R. ...	J. V. Williams, H. M. Knight, H. C. Walker, R. A. Belfield.	M.L.	Federal ...	Met. Log. 6.3.29 to 27.7.29 ...	31.7.29
026 †† <i>Cameronia</i> ...	Gemmell, W. ...	J. Herbert, D. C. Shedden ...	"	Anchor ...	Met. Log. 27.1.29 to 17.6.29 ...	24.6.29
295 †† <i>Camito</i> ...	Forrester, W. T. O.B.E.	H. H. Dunning, G. M. Roberts, M. H. Thomson.	"	Elders & Fyffes ...	" 14.3.29 to 10.7.29 ...	22.7.29
101 *† <i>Canonesa</i> ...	Brodie, W. H. ...	T. Wetherall ...	No. M.	Furness Houlder ...	Form 911 25.2.29 to 25.3.29 ...	4.4.29
<i>Cape of Good Hope</i> ...	Jacobson, T. A. ...	W. S. Bartlett ...	" A.	Lyle S.S. Co. ...	" 30.8.29 to 5.10.29 ...	2.11.29
035 †† <i>Carmania</i> ...	Brown, F. G., R.D., Capt. R.N.R.	P. O. Davis, E. Gleave, R.P. Campbell.	W.T.	Cunard ...	W.T. Reg. 14.10.29 to 1.11.29 ...	6.11.29
092 †† <i>Carnarvon Castle</i> , M.V.	Stanley, W. F., R.D., Commr. R.N.R.	H. L. Shaw, T. Campbell, S. S. Smith.	M.L.	Union Castle ...	Met. Log. 25.5.29 to 15.9.29 ...	27.9.29
034 †† <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. 5.8.29 to 23.8.29 ...	27.8.29
<i>Casanare</i> ...	Browne, S. ...	R. S. Howlett ...	No. A.	Elders & Fyffes ...	Form 911 4.8.29 to 23.8.29 ...	28.8.29
184 †† <i>Cathay</i> ...	Griffin, R. H., O.B.E., R.D., Capt. R.N.R.	R. A. C. Beeching ...	" M.	P. & O ...	" 22.9.29 to 26.10.29 ...	30.10.29
<i>Cavina</i> ...	Riseley, A. D. ...	R. C. Harradon ...	" A.	Elders & Fyffes ...	" 12.10.29 to 16.10.29 ...	19.10.29
052 †† <i>Cedric</i> ...	Smith, R. G. ...	W. Nicoll, J. Law, J. G. Wallace.	W.T.	White Star ...	W.T. Reg. 29.9.29 to 20.10.29 ...	22.10.29
157 *† <i>Centaur</i> ...	Sturrock, R. G. ...	N. L. Thompson, J. Cockburn, B. L. Brind.	M.L.	A. Holt & Co. ...	Form 911 23.12.28 to 20.4.29 ...	29.8.29
<i>Ceramic</i> ...	Musgrave, T. ...	H. A. R. Daman ...	No. A.	White Star ...	Form 911 13.4.29 to 20.5.29 ...	22.5.29
<i>Changuinola</i> ...	Thorburn, R. A., R.D., Commr. R.N.R.	V. R. Watkins ...	No. A.	Elders & Fyffes ...	Form 911 7.9.29 to 6.10.29 ...	12.10.29
<i>Chindwin</i> ...	Paterson, G. ...	...	" A.	Henderson ...	" 6.7.29 to 27.9.29 ...	8.10.29
<i>Chirripo</i> ...	Sapsworth, S. A. ...	...	" A.	Elders & Fyffes ...	" 26.8.29 to 28.9.29 ...	7.10.29
265 *† <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> ...	Wyper, J. ...	R. W. Kellie ...	No. A.	" ...	Form 911 27.9.29 to 7.10.29 ...	24.10.29
266 *† <i>City of Bombay</i> ...	Brown, O. C. ...	E. H. Roberts ...	" M.	" ...	" 27.6.29 to 23.8.29 ...	31.8.29
267 *† <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.	" ...	" 9.4.29 to 8.5.29 ...	21.5.29
<i>City of Carlisle</i> ...	Mordue, J. A. ...	...	" A.	" ...	" 27.8.29 to 21.9.29 ...	26.10.29
268 *† <i>City of Chester</i> ...	Letton, F. W. ...	C. C. Duncan, P. C. Arthur, M. J. Mc Nicol.	M.L.	" ...	Met. Log. 25.7.29 to 30.8.29 ...	4.9.29
<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. ...	J. H. Wilcox ...	" A.	" ...	" 3.10.29 to 23.10.29 ...	1.11.29
<i>City of London</i> ...	Nicoll, L. ...	...	" A.	" ...	" 2.2.29 to 17.4.29 ...	3.5.29
269 *† <i>City of Osaka</i> ...	Smith, W. H. ...	A. Niblock ...	" M.	" ...	" 14.8.29 to 11.9.29 ...	17.9.29
270 *† <i>City of Rangoon</i> ...	Jones, P. ...	...	M.L.	" ...	Met. Log. 6.10.28 to 27.7.29 ...	6.8.29
271 *† <i>City of Roubais</i> ...	Radcliffe, A. V., R.D., Lt-Comm. R.N.R.	...	No. M.	" ...	Form 911 10.9.29 to 18.9.29 ...	27.9.29
272 *† <i>City of Singapore</i> ...	Rhind, J. ...	...	" M.	" ...	" 6.9.29 to 30.9.29 ...	21.10.29
273 *† <i>City of Valeneta</i> ...	Anderson, W. W. ...	A. Travis, C. B. Bradbury ...	" M.	" ...	Form 911 9.8.29 to 14.9.29 ...	22.10.29
<i>City of Yokohama</i> ...	Singleton, J. G. ...	H. Nish ...	" A.	" ...	" 8.7.29 to 4.10.29 ...	12.10.29
<i>Clan Alpine</i> ...	Lyall, A. B. ...	J. O. H. Kirkwood ...	" A.	Clan ...	" 17.8.29 to 31.8.29 ...	19.9.29
<i>Clan Kenneth</i> ...	Young, A. H., Commr. R.D., R.N.R.	H. C. Carter ...	" A.	" ...	" 9.9.29 to 28.9.29 ...	21.10.29
<i>Clan Lindsay</i> ...	Malpas, J. H. ...	H. W. Peletier ...	" A.	" ...	" 21.9.29 to 10.10.29 ...	15.10.29
<i>Clan MacBean</i> ...	Boag, J. ...	W. Thompson ...	" A.	" ...	"

LIST OF VOLUNTARY OBSERVING SHIPS

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Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received.
<i>Clan Macbeth</i> ...	Worthington, C. D. ...	A. H. Hersee ...	No. A.	Clan ...	Form 911 23.9.29 to 12.10.29 ...	21.10.29
<i>Clan Macfadyen</i> ...	Laird, C. ...	G. L. Roe ...	" A.	" ...	" 3.9.29 to 11.10.29 ...	24.10.29
<i>Clan Macfarlane</i> ...	Redford, L. F. ...	W. H. Simpson, H. F. Town ...	" A.	" ...	" 7.7.29 to 3.10.29... ...	8.10.29
<i>Clan Macgillivray</i> ...	Mackinlay, A. ...	F. H. Thornton ...	" A.	" ...	" 17.6.29 to 6.7.29... ...	6.8.29
<i>Clan Macindoe</i> ...	Holman, W. G. ...	H. Lockyer ...	" A.	" ...	" 5.9.29 to 1.10.29... ...	21.10.29
<i>Clan Mackellar</i> ...	Phillips, G. P. ...	" ...	" A.	" ...	" 30.6.29 to 12.8.29 ...	14.8.29
<i>Clan Macphee</i> ...	Gourlay, J. B. ...	E. H. Stone, D. de Vall, L. R. Legg. ...	M.L.	" ...	Met. Log. 12.2.29 to 3.9.29... ...	10.10.29
<i>Clan Macnaughton</i> ...	Clark, J. ...	R. C. Steel ...	No. A.	" ...	Form 911 14.9.29 to 4.10.29 ...	11.11.29
<i>Clan Macquarrie</i> ...	West, W. F. ...	J. L. Ranford ...	" A.	" ...	" 22.9.29 to 16.10.29 ...	11.11.29
<i>Clan Macquarrie</i> ...	Higgins, C. J. ...	D. McAllister ...	" A.	" ...	" 22.5.29 to 12.6.29 ...	20.6.29
<i>Clan Macwhirter</i> ...	Low, A. ...	F. B. Barker, H. M. Watkins, B. Magill. ...	M.L.	" ...	Met. Log. 2.3.29 to 19.9.29... ...	27.9.29
<i>Clan Malcolm</i> ...	George, L. S. ...	F. B. Fairweather, H. E. Luxton, J. F. Hubbard. ...	"	" ...	" 18.11.28 to 25.5.29 ...	13.6.29
<i>Clan Morrison</i> ...	Porterfield, W. M. Lt.-Commr., R.N.R. ...	L. C. Cuthbert ...	No. A.	" ...	Form 911 9.10.29 to 19.10.29 ...	30.10.29
<i>Clan Murdoch</i> ...	Wynne, R. H. ...	J. B. Davies ...	" A.	" ...	" 9.7.29 to 6.10.29 ...	17.10.29
<i>Clan Ramald</i> ...	Fraser, R. K. ...	K. G. Tucker ...	" A.	" ...	" 21.7.29 to 12.9.29 ...	7.10.29
<i>Clan Ross</i> ...	Neill, G. A. ...	" ...	" A.	" ...	" 14.9.29 to 26.9.29 ...	12.10.29
<i>Clan Sinclair</i> ...	Baker, E. W. ...	" ...	" A.	" ...	" 12.9.29 to 8.10.29 ...	8.11.29
<i>Colonial</i> ...	Worthington, B. ...	A. S. Milne ...	" M.	T. & J. Harrison ...	" 30.7.29 to 17.10.29 ...	23.10.29
<i>Comorin</i> ...	Townshend, W. P., R.D., Capt., R.N.R. ...	E. C. White ...	" M.	P. & O. ...	" 26.7.29 to 5.9.29... ...	21.10.29
<i>Cornthie</i> ...	Freeman, C. P. ...	E. M. Burt, M. Bennett, I. A. Macnaughton. ...	M.L.	White Star ...	Met. Log. 27.4.29 to 12.8.29 ...	15.8.29
<i>Cornwall</i> ...	Lamb, C. B. ...	C. R. Brown ...	No. A.	Federal ...	Form 911 10.12.28 to 17.1.29 ...	18.3.29
<i>Crawford Castle</i> ...	Conley, E. A. ...	" ...	" A.	Union Castle ...	" ...	"
<i>Culebra</i> ...	Goble, C. J., R.D., Commr., R.N.R. ...	H. D. Hooper, H. E. Sang, A. H. Phillipson. ...	M.L.	R.M.S.P. Co. ...	Met. Log. 30.6.29 to 26.8.29 ...	11.9.29
<i>Cumberland</i> ...	Macmillan, D. ...	J. Lunnion, C. Brown, H. Vernon, T. Shillito. ...	"	Federal... ...	" 12.5.29 to 7.10.29 ...	2.11.29
<i>Custodian</i> ...	O'Connor, T. ...	" ...	No. M.	Harrison ...	Form 911 30.7.29 to 30.10.29 ...	7.11.29
<i>Cyclops</i> ...	Cosker, W. ...	C. B. P. Anderson ...	" A.	A. Holt ...	" 4.7.29 to 15.8.29 ...	20.8.29
<i>Daga</i> ...	Wiles, N. ...	I. B. Campbell ...	" M.	P. Henderson... ...	" 4.3.29 to 10.6.29... ...	15.6.29
<i>Dakotian</i> ...	Robb, J. ...	W. R. Atkinson... ...	" A.	Leyland ...	" 5.9.29 to 4.11.29... ...	8.11.29
<i>Dardanus</i> ...	Glossop, S. ...	R. W. Ellis ...	" A.	A. Holt ...	" 27.8.29 to 9.9.29 ...	7.10.29
<i>Darro</i> ...	Shillito, B. ...	" ...	" M.	R.M.S.P. Co. ...	" 26.7.29 to 7.8.29... ...	28.8.29
<i>Defender</i> ...	Haylett, E. ...	" ...	" M.	T. & J. Harrison ...	" ...	"
<i>Delilian</i> ...	Stewart, G. F. ...	" ...	" A.	Leyland ...	Form 911 9.5.29 to 7.8.29 ...	20.8.29
<i>Delphic</i> ...	Vaughan, P. R. ...	E. B. Clark ...	" M.	White Star ...	" 4.5.29 to 18.6.29... ...	26.6.29
<i>Delta</i> ...	Townshend, W. P., R.D., Capt., R.N.R. ...	D. M. Stafford ...	" M.	P. & O. ...	" 24.4.29 to 19.6.29 ...	11.7.29
<i>Demerara</i> ...	Matthews, G. P. ...	P. W. Brundell ...	" M.	R.M.S.P. Co. ...	" 3.9.29 to 25.10.29 ...	29.10.29
<i>Demosthenes</i> ...	Ogilvy, A. ...	S. A. Ferguson ...	" M.	Aberdeen Common-wealth ...	" 11.8.29 to 31.8.29 ...	7.10.29
<i>Denis</i> ...	Harris, F. C. P. ...	A. A. Gerrard ...	" A.	Booth ...	" 12.9.29 to 27.10.29 ...	9.11.29
<i>Deseado</i> ...	F. S. Hannam ...	" ...	" M.	R.M.S.P. Co. ...	" 4.8.29 to 27.9.29... ...	28.9.29
<i>Deucalion</i> ...	Melling, C. F. ...	J. G. Jones ...	" A.	A. Holt ...	" 13.9.29 to 29.9.29 ...	11.11.29
<i>Devon</i> ...	Kinnell, G. ...	G. Chaplin ...	" M.	Federal ...	" 18.9.29 to 29.9.29 ...	4.11.29
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	" C.C.	Southern Railway ...	Telegraphic Report 14.11.29 ...	14.11.29
<i>Dimboola</i> ...	Dawson, J. ...	" ...	No. A.	Melbourne S.S. Co. ...	Form 911 31.8.29 to 29.9.29 ...	4.11.29
<i>Discovery, Auxy.</i> ...	King Davis, J. ...	W. R. Colbeck ...	M.L.	Douglas Mawson Expedition. ...	" ...	"
<i>Domala, M.V.</i> ...	Kitson, A. G. ...	H. Robertson ...	No. M.	British India... ...	" 30.6.29 to 9.9.29 ...	23.9.29
<i>Domitia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr., R.N.R. ...	S. A. Garnham, A. S. Muir, W. F. Anderson, W. Weeks. ...	M.L.	Telegraph Construction & Maintenance. ...	Met. Log. 9.7.29 to 18.10.29 ...	23.10.29
<i>Dominic</i> ...	Jackson, T. H. ...	G. H. Clark ...	No. A.	Booth ...	Form 911 6.5.29 to 29.7.29... ...	15.8.29
<i>Doric</i> ...	Hume, R., ...	F. E. Patchett, S. A. Jones, A. Blewett. ...	W.T.	White Star ...	W.T. Reg. 22.9.29 to 9.11.29 ...	14.11.29
<i>Dorington Court</i> ...	Clarke, E. J. ...	" ...	No. A.	Haldin & Co. ...	Form 911 10.4.29 to 22.7.29 ...	25.7.29
<i>Dromore Castle</i> ...	MacMahon, J., R.D., Commr., R.N.R. ...	J. A. Sowden ...	" A.	Union Castle ...	" 15.4.29 to 9.5.29... ...	5.6.29
<i>Dryden</i> ...	Major, T. W. ...	" ...	" M.	Lamport & Holt ...	" 21.10.28 to 14.1.29 ...	7.2.29
<i>Duchess of Atholl</i> ...	McQueen, D. S. ...	A. Mackie ...	" M.	Canadian Pacific ...	" 22.9.29 to 11.10.29 ...	17.10.29
<i>Duchess of York</i> ...	Stuart, R.N., V.O., D.S.O., Commr., R.N.R. ...	A. Mansey ...	" M.	" ...	" 12.10.29 to 31.10.29 ...	5.11.29
<i>Dunaff Head</i> ...	Butt, H. L. R.D., Lt.-Commr., R.N.R. ...	D. Martin ...	" A.	Ulster S.S. Co. ...	" 22.1.29 to 6.2.29 ...	18.2.29
<i>Dunluce Castle</i> ...	Jackson, C. R. ...	C. C. Page ...	" A.	Union Castle ...	" 3.10.29 to 23.10.29 ...	11.11.29
<i>Dunrobin</i> ...	Ramsay, J. D. ...	W. Martin ...	" A.	Glen & Co. ...	" 25.8.29 to 5.9.29... ...	11.11.29
<i>Duquesa</i> ...	Barker, A. W. ...	F. D. Jones ...	" M.	Furness Withy ...	" 26.8.29 to 30.9.29 ...	4.11.29
<i>Durenda, M.V.</i> ...	Parkes, C. E. ...	J. E. Miles ...	" M.	British India ...	" 7.8.29 to 13.9.29... ...	21.10.29
<i>Edinburgh Castle</i> ...	Gardner, G.F., O.B.E., Lt.-Commr., R.N.R. ...	A. R. J. Tilston ...	" A.	Union Castle ...	" 4.10.29 to 20.10.29 ...	11.11.29
<i>Egori</i> ...	Sola, P., D.S.O. ...	J. T. Townson ...	" A.	Elder Dempster ...	" 2.5.29 to 16.7.29... ...	17.7.29
<i>El Argentino</i> ...	Ellis, F., D.S.C. ...	C. H. Hughes, W. Findlay, J. Barch. ...	" M.	Houlder ...	" 31.8.29 to 23.10.29 ...	12.11.29
<i>Eldon Park</i> ...	Burns, R. ...	D. Rankine ...	" M.	Denholm S.S. Co. ...	" 1.6.29 to 3.9.29 ...	1.10.29
<i>Elmworth</i> ...	Dick, J. ...	" ...	" M.	R. S. Dalgleish ...	" ...	"
<i>Elpenor</i> ...	Wilson, R. J. ...	E. Roberts, S. Burton, J. E. Hiff. ...	M.L.	A. Holt ...	Met. Log. 26.5.29 to 5.10.29 ...	17.10.29
<i>Elstree Grange</i> ...	Todhunter, L. J. ...	J. G. Freeman ...	No. M.	Houlder ...	Form 911 8.7.29 to 5.9.29 ...	30.9.29
<i>El Paraguay</i> ...	Frost, C. R. ...	F. J. G. Rice ...	" M.	" ...	" 3.6.29 to 7.8.29 ...	26.8.29
<i>El Uruguayo</i> ...	McNamara, T. ...	F. E. Hailstone ...	" M.	" ...	" ...	"
<i>Elysia</i> ...	Bone, D. W. ...	D. Blair, J. Herbert, W. Beveridge. ...	M.L.	Anchor ...	Met. Log. 10.8.29 to 15.10.29 ...	11.11.29
<i>Empress of Asia</i> ...	Hailey, A. J., Lt.-Commr., R.N.R. ...	L. M. Goddard, A. Lovegrove, D. Smith. ...	"	Canadian Pacific ...	" 13.6.29 to 20.9.29 ...	29.10.29
<i>Empress of Canada</i> ...	Douglas, L. D. ...	C. W. A. G. Hamley ...	"	" ...	" ...	"
<i>Empress of France</i> ...	Robinson, S., C.B.E., R.D., Commr., R.N.R. ...	G. M. Fawcett ...	"	" ...	Met. Log. 4.7.29 to 12.10.29 ...	4.11.29
<i>Empress of Russia</i> ...	Hosken, A. J. ...	R. A. Leicester, H. B. Metcalf, A. C. Jones. ...	"	" ...	" 31.3.29 to 12.7.29 ...	4.10.29
<i>Endeavour</i> ...	Law, E. F. B., Commr., R.N. ...	M. B. Thomas ...	"	His Majesty's Ship ...	" 15.3.29 to 8.7.29 ...	18.7.29

Name of Vessel.	Captain.	Observing Officers.	Meteoro- logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received.
<i>Enterprise</i> ...	Pridham-Wippell, H.D., Capt., R.N.	C. W. A. G. Hamley ...	M.L.	His Majesty's Ship ...	Met. Log. 18.3.29 to 15.7.29 ...	29.8.29
306 *† <i>Essequibo</i> ...	Roberts, E. ...	L. Marsland ...	No. M.	R.M.S.P. Co. ...	Form 911 8.8.29 to 24.9.29... ..	3.10.29
<i>Eumaeus</i> ...	Hodgson, R. N. ...	R. T. Dryden ...	" A.	A. Holt ...	" 22.9.29 to 2.10.29 ...	10.10.29
<i>Euryades</i> ...	Ewan, W. B. ...	W. K. Hole ...	" A.	A. Holt ...	" 31.8.29 to 1.11.29 ...	14.11.29
287 *† <i>Explorer</i> ...	Ling, J. T. ...	A. E. Rogers ...	" M.	Harrison ...	" 23.6.29 to 27.10.29 ...	4.11.29
<i>Explorer</i> ...	Allan, J. ...	A. Stout, F. O. Sheehy ...	" A.	Scottish Fishery Board.	" 4.10.29 to 29.10.29 ...	2.11.29
074 *† <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. ...	B. Scholefield ...	" A.	Ellerman Wilson ...	" 4.10.29 to 9.11.29 ...	13.11.29
<i>Freya</i> ...	J. M. Murray ...	W. Pirrie ...	" A.	Scottish Fishery Board.	" 16.10.29 to 31.10.29 ...	5.11.29
<i>Garth Castle</i> ...	Morgan, A.O., R.D., Commr. R.N.R.	F. O. Wilbraham ...	" A.	Union Castle ...	" 21.8.29 to 12.9.29 ...	4.11.29
159 *† <i>Gascoyne</i> ...	Johnson, L. ...	W. J. Macphedran, C. Melson, J. S. Macbryde.	M.L.	A. Holt & Co. ...	Met. Log. 3.3.29 to 15.7.29... ..	28.8.29
307 *† <i>Glamorganshire</i> ...	Womersley, H. ...	R. E. E. Hadlow ...	No. M.	R.M.S.P. Co. ...	Form 911 24.8.29 to 7.10.29 ...	23.10.29
125 *† <i>Glenamoy, M.V.</i> ...	Homan, C. E. ...	F. B. C. Wetherley, C. Met- calf, N. B. Jones.	M.L.	Glen Line ...	Met. Log. 9.6.29 to 19.10.29 ...	28.10.29
<i>Glenapp</i> ...	Ingram, T. F. ...	" ...	No. A.	" ...	Form 911 19.1.29 to 27.2.29 ...	2.4.29
<i>Glenbeg</i> ...	Newing, L. ...	F. B. Angier ...	" A.	" ...	" 5.3.29 to 9.7.29 ...	11.7.29
126 *† <i>Glenagarry</i> ...	Angier, J. ...	J. Tyler ...	" M.	" ...	" 24.8.29 to 25.10.29 ...	30.10.29
<i>Glenluce, M. V.</i> ...	Kennett, W. H. ...	H. B. Porter ...	" A.	" ...	" 12.9.29 to 10.10.29 ...	5.11.29
<i>Glenishane</i> ...	Martin, F. V. ...	A. C. Radley ...	" A.	" ...	" 2.5.29 to 29.9.29... ..	21.10.29
<i>Glenworth</i> ...	Kilgour, H. A. ...	W. C. Wright ...	" A.	R. S. Dalgleish ...	" 16.9.29 to 3.10.29 ...	10.10.29
<i>Gloucestershire</i> ...	Robin, E. ...	W. Moore ...	" A.	Bibby ...	" 1.12.28 to 8.2.29... ..	12.2.29
<i>Glocinia</i> ...	Pool, F. G. ...	D. Coughlan ...	" A.	Stag Line ...	" 14.9.29 to 26.10.29 ...	30.10.29
<i>Guildford Castle</i> ...	Atwood, J. ...	" ...	" A.	Union Castle ...	" 8.6.29 to 18.7.29... ..	23.7.29
<i>Halestus</i> ...	Samuels, C. ...	N. MacLeod ...	" A.	R. P. Houston ...	" 6.8.29 to 3.9.29 ...	17.9.29
<i>Haliartus</i> ...	Felton, W. J. ...	F. D. Bonney ...	" A.	" ...	" 13.6.29 to 7.7.29... ..	8.8.29
111 *† <i>Hardwicke Grange</i> ...	Fowler, W. H. ...	W. Rogers, R. D. Seybold ...	" M.	"Houlder" ...	" 20.7.29 to 25.9.29 ...	7.10.29
<i>Harmonides</i> ...	Elwell, F. R. ...	" ...	" A.	R. P. Houston ...	" 18.7.29 to 8.8.29... ..	17.9.29
216 *† <i>Hatimura</i> ...	Hemmings, W. H. ...	L. E. Heath ...	" M.	British India ...	" 30.6.29 to 19.7.29 ...	25.7.29
262 *† <i>Hauraki, M.V.</i> ...	Norton, A. T. ...	D. M. McLeish, T. Davis, L. English, G. H. Kime, G. M. Scholfield, F. W. Collins	M.L.	Union S.S. Co., N.Z. ...	Met. Log. 17.11.28 to 9.6.29 ...	29.10.29
<i>Herald</i> ...	Maxwell, P. S. E., Commr. R.N.	H. J. C. Stokes... ..	"	His Majesty's Ship ...	" 1.4.29 to 29.7.29... ..	11.9.29
<i>Hermintus</i> ...	Roberts, T. V. ...	D. W. MacGregor ...	No. A.	Aberdeen Common- wealth.	Form 911 13.7.29 to 23.8.29 ...	23.9.29
<i>Herschel</i> ...	Watson, W. W. ...	A. J. Corney ...	" A.	Lampport & Holt ...	" 4.5.29 to 19.7.29... ..	20.7.29
253 *† <i>Hertford</i> ...	Burton Davies, J. ...	" ...	M.L.	Federal ...	" ...	"
<i>Hesione</i> ...	McComish, A. B. ...	W. H. Ball ...	No. A.	R. P. Houston ...	Form 911 7.9.29 to 2.10.29... ..	21.10.29
<i>Hibernia</i> ...	Dudgeon, L. T. ...	A. Marsh ...	C.C.	L.M. & S. Railway ...	Telegraphic Report 2.11.29 ...	2.11.29
116 *† <i>Highland Chieftain, M.V.</i> ...	Robinson, R. H. ...	" ...	No. M.	Nelson ...	Form 911 13.8.29 to 29.9.29 ...	14.10.29
<i>Highland 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> ...	Buck, R. H. ...	H. Sapsworth ...	" A.	Booth ...	" 18.9.29 to 1.11.29 ...	5.11.29
075 *† <i>Hobson's Bay</i> ...	Kydd, O. J. ...	J. Worrall, D. Horn, G. Cook	M.L.	Aberdeen Common- wealth.	Met. Log. 6.3.29 to 14.6.29... ..	3.7.29
<i>Holbein</i> ...	Gough, W. A. ...	F. Delaney ...	No. A.	Lampport & Holt ...	Form 911 2.5.29 to 3.8.29 ...	27.8.29
054 *† <i>Homerie</i> ...	White, E. R., R.D., Commr. R.N.R.	H. G. Morgan, A. E. Dyer, W. Poustie.	W.T.	White Star ...	W.T. Reg. 10.10.29 to 25.10.29 ...	29.10.29
<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> ...	Furieux, R. B. ...	A. S. Richardson, J. Stretch	" A.	Booth ...	" 17.9.29 to 1.11.29 ...	11.11.29
<i>Huntingdon</i> ...	Griffiths, W. ...	" ...	"	" ...	" ...	"
288 *† <i>Huntsman</i> ...	Field, H. G. B. ...	N. S. Lesmere ...	" A.	Federal... ..	" 6.3.29 to 19.7.29... ..	29.7.29
009 *† <i>Hyaspes</i> ...	Russell, H. ...	G. R. R. Lettin ...	" M.	Harrison ...	" 28.1.29 to 27.6.29 ...	3.8.29
<i>Ingoma</i> ...	Williams, P. E. ...	J. W. Charles ...	" M.	R. P. Houston ...	" 17.7.29 to 11.10.29 ...	4.11.29
289 *† <i>Inkum</i> ...	Brown, A. P. ...	R. J. Weeks, J. E. Greenhalgh	" M.	Harrison ...	" 14.9.29 to 27.10.29 ...	4.11.29
<i>Irania, M.V.</i> ...	Meethan, J. T. ...	" ...	" A.	J. H. Welsford ...	" 18.8.29 to 1.9.29... ..	19.9.29
<i>Iris, C.S.</i> ...	Adams, P. A. ...	E. Allen ...	" A.	Iranian Tanker Co. ...	" 19.8.29 to 25.9.29 ...	14.10.29
<i>Iroquois</i> ...	Hughes, H. R. ...	" ...	No.	Pacific Cable Board... ..	Met. Log. 23.2.29 to 19.3.29 ...	18.7.29
<i>Ixon</i> ...	Nares, J. D., D.S.O., Capt. R.N.	A. B. Foulerton... ..	M.L.	His Majesty's Ship ...	" 11.4.29 to 31.7.29 ...	4.9.29
160 *† <i>Javanese Prince, M.V.</i> ...	Collins, H. M. ...	D. Law ...	"	A. Holt ...	" 28.11.28 to 18.4.29 ...	28.6.29
187 *† <i>Jeypore</i> ...	Smith, J. ...	J. B. Morrison ...	No. A.	Prince ...	Form 911 11.9.29 to 11.10.29 ...	26.10.29
<i>Justin</i> ...	Cooper, C. P., O.B.E., R.D. Capt. R.N.R.	F. M. Squire ...	" M.	P. & O. ...	" 16.6.29 to 2.8.29... ..	7.8.29
<i>Kaisar-i-Hind</i> ...	Briscoe, W. ...	J. Stretch... ..	" A.	Booth ...	" 24.9.29 to 6.10.29 ...	11.11.29
188 *† <i>Kalyan</i> ...	Headlam, P. C. R.D., Commr. R.N.R.	W. T. Banks ...	" M.	P. & O. ...	" 15.9.29 to 6.11.29 ...	9.11.29
189 *† <i>Kangaroo</i> ...	Cornwall Jones, B. Norris, H. C. ...	W. R. B. Noal ... J. Sinclair, J. S. Airey, E. Hutchinson, J. Edward, H. Reynolds, V. L. Gilbert.	" M. M.L.	P. & O. ... State Service Aus- tralia.	Met. Log. 24.8.29 to 13.9.29 ... 3.9.28 to 24.2.29... ..	7.10.29 27.5.29
041 *† <i>Karama</i> ...	McIntosh, A. ...	K. D. Fisher, G. A. Harvey, N. S. Milne, H. M. Clark.	"	Shaw, Savill & Albion	" 25.7.29 to 10.11.29 ...	15.11.29
217 *† <i>Karapara</i> ...	Miller, A. C. ...	M. Rose ...	No. M.	British India... ..	Form 911 9.9.29 to 27.9.29... ..	26.10.29
190 *† <i>Kashgar</i> ...	Sudell, F., R.D., Commr., R.N.R.	R. P. Eddy ...	" M.	P. & O. ...	" 4.5.29 to 10.8.29... ..	13.8.29
191 *† <i>Kashmir</i> ...	Mallalue, R., Lt- Commr., R.N.R.	D. S. Charles ...	" M.	P. & O. ...	" 19.7.29 to 5.10.29 ...	10.10.29
218 *† <i>Khandalla</i> ...	Baird, S.K. ...	F. N. B. Johnson ...	" M.	British India ...	" 25.8.29 to 4.9.29... ..	25.10.29
192 *† <i>Khiva</i> ...	Britten, P. O. ...	C. E. Arundel, J. A. Ridley, H. V. Williamson.	M.L.	P. & O. ...	Met. Log. 16.5.29 to 26.8.29 ...	2.9.29
335 *† <i>Klungchow</i> ...	Stringer, C. B. L. ...	J. H. Isherwood ...	No. M.	China Navigation Co. A. Holt ...	" ... Form 911 29.8.29 to 18.9.29 ...	26.9.29
161 *† <i>Knight Companion</i> ...	Davis, A. L. ...	" ...	"	" ...	" ...	"
037 *† <i>Laconia</i> ...	Doyle, M. ...	E. W. Connell, A. B. Fasting, F. G. Russell ...	W.T.	Cunard ...	W.T. Reg. 7.10.29 to 27.10.29 ... Form 911 7.10.29 to 27.10.29 ...	1.11.29 31.10.29
<i>Laguna</i> ...	Dunn, R. E., O.B.E. ...	R. W. Hanson ...	No. A.	Pacific S.N. Co. ...	" 28.6.29 to 27.9.29 ...	1.10.29
193 *† <i>Lahore</i> ...	Charters, W. ...	N. Bell ...	" M.	P. & O. ...	" 28.5.29 to 22.7.29 ...	26.7.29
<i>Lalande</i> ...	Hamill, H. ...	L. A. G. Owen ...	" A.	Lampport & Holt ...	" 27.2.29 to 11.7.29 ...	10.10.29
<i>Lancashire</i> ...	Foster, W. L. ...	W. H. Campe ...	" A.	Bibby ...	" 22.8.29 to 21.9.29 ...	24.9.29
036 *† <i>Lancastria</i> ...	Bond, H. A. L., R.D., Commr., R.N.R.	G. Overton, P. L. Williams, J. W. Counce.	W.T.	Cunard ...	W.T. Reg. 7.10.29 to 25.10.29 ... Form 911 6.10.29 to 26.10.29 ...	30.10.29 29.10.29
<i>Laomedon</i> ...	Hatfield, F. ...	O. P. H. Wynne... ..	No. A.	A. Holt ...	" 9.10.29 to 19.10.29 ...	21.10.29

LIST OF VOLUNTARY OBSERVING SHIPS

v

Name of Vessel.	Captain.	Observing Officers.	Meteoro- logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received.
082 *† La Paz, M.V. ...	Benson, C. W. ...	H. Eardley ...	No. M.	Pacific S.N. Co. ...	Form 911 22.8.29 to 8.9.29...	30.9.29
055 †† Lapland ...	Harvey, H. ...	L. Williams, J. Gladstone, J. Mackie.	W.T.	Red Star ...	W.T. Reg. 21.10.29 to 8.11.29 ...	11.11.29
076 *† Largs Bay ...	Jenkyn, W. M. ...	... ..	No. M.	Aberdeen Common-wealth.	Form 911 21.10.29 to 8.11.29 ...	11.11.29
112 *† La Rosarina ...	Webb, C. ...	W. S. Hamblin... ..	" M.	Houlder ...	" 25.1.29 to 4.5.29 ...	7.5.29
064 †† Laurentic ...	Trant, E. L., R.D., Commr. R.N.R.	R. Conway, J. W. Peters ...	W.T.	White Star ...	W.T. Reg. 7.9.29 to 31.10.29 ...	4.11.29
083 *† Lautaro, M.V. ...	Leyne, R. W. ...	G. A. Thexton ...	No. M.	Pacific S.N. Co. ...	Form 911 13.10.29 to 1.11.29 ...	5.11.29
327 *† Leicestershire ...	Griffiths, C. A. ...	H. G. Walton, E. D. Brand, T. A. Thomson.	M.L.	Bibby ...	Form 911 13.10.29 to 2.11.29 ...	5.11.29
254 *† Limerick ...	Molyneux, P. L. ...	E. Roberts ...	No. M.	Federal... ..	Met. Log. 17.7.29 to 8.11.29 ...	11.11.29
093 *† Llandaff Castle ...	Gilbert, E. F. ...	R. F. Bayer, A. E. Denn, S. H. Parry.	M.L.	Union Castle ...	Met. Log. 24.8.29 to 31.10.29 ...	5.11.29
094 *† Llandovery Castle	Stuart, C. E., Capt. R.N.R.	L. H. Farrow, G. Moon, S. Goldstone.	"	" " " " " "	Form 911 13.10.29 to 2.11.29 ...	31.10.29
Llanstephan Castle	Whitfield, G. J. ...	A. W. Chandler... ..	No. A.	" " " " " "	Met. Log. 15.8.29 to 24.10.29 ...	28.10.29
084 *† Lobos, M.V. ...	Pape, E. R. ...	S. E. Ayland ...	" M.	Pacific S.N. Co. ...	" 8.3.29 to 4.9.29 ...	1.10.29
Loch Katrine ...	Schlanbusch, O. V. ...	L. H. Smith ...	" A.	R.M.S.P. Co. ...	Form 911 18.7.29 to 26.9.29 ...	27.9.29
290 *† Logician ...	Herschel, R. F. ...	A. G. S. Madrell ...	" M.	Harrison ...	" 22.5.29 to 9.6.29 ...	12.6.29
103 *† London Importer ...	Nuttall, E. L. ...	F. F. Feint, J. H. Metcalfe, J. G. Freeman.	" M.	Furness Withy ...	" 28.5.29 to 23.8.29 ...	27.8.29
Lord Antrim	Jarvis, F. E. ...	W. A. Haddock ...	" A.	Ulster S.S. Co. ...	" 2.6.29 to 5.9.29 ...	1.10.29
Loriga, M.V. ...	Large, E. H. ...	" " " " " "	" A.	Pacific S.N. Co. ...	Form 911 17.9.29 to 1.10.29 ...	14.10.29
085 *† Losada, M.V. ...	Ross, J. ...	D. Beamer ...	" M.	" " " " " "	" 28.6.29 to 16.7.29 ...	27.8.29
					" 15.8.29 to 3.9.29...	10.9.29
194 †† Macedonia ...	Morton, A. J. ...	... ..	" M.	P. & O. ...	" 5.7.29 to 22.8.29...	26.8.29
013 *† Macharda ...	Hanna, R. G. ...	A. C. Hocking ...	" M.	Brocklebank ...	" 20.9.29 to 17.10.29 ...	22.10.29
Macquarie ...	Heyen, G. H. ...	... ..	" A.	On Chang & Co. ...	" 15.5.29 to 27.5.29 ...	30.9.29
048 *† Mahana ...	Cameron, J. M. ...	... ..	M.L.	Shaw, Savill & Albion	Form 911 6.3.29 to 24.4.29...	10.6.29
264 *† Maharaja ...	Elliot, G. F. ...	... ..	No. M.	Asiatic S.N. Co. ...	" 26.10.29 to 4.11.29 ...	14.11.29
014 *† Mahronda ...	Sharpe, G. ...	L. Lee ...	" M.	Brocklebank... ..	" 29.7.29 to 3.9.29...	7.9.29
015 *† Mahsud ...	Kershaw, R. W. ...	B. K. Ward ...	" M.	" " " " " "	" 7.7.29 to 26.9.29...	10.10.29
016 *† Maidan ...	Ison, W. A. ...	G. W. Pierpoint ...	" M.	" " " " " "	Met. Log. 12.4.29 to 6.7.29...	12.8.29
017 *† Maihar ...	Charlton, W. L. ...	J. W. B. Robertson, C. Cadwallader, A. D. Spring.	M.L.	" " " " " "	" 28.4.29 to 23.8.29 ...	26.8.29
042 *† Maimoa ...	Johnson, J. W. ...	J. H. Fuller, P. Savill, H. G. Withell.	"	Shaw, Savill & Albion	Form 911 2.9.29 to 29.9.29...	21.10.29
Maimyo ...	Smith, G. C. ...	J. L. Rodgers ...	No. A.	Brocklebank ...	W.T. Reg. 17.10.29 to 30.10.29 ...	4.11.29
058 †† Majestic ...	Marshall, W., C.B., D.S.O., R.D., Commr. R.N.R.	A. Fisher, W. T. Fitz Gerald, A. H. Young, W. W. Pearson.	W.T.	White Star ...	Form 911 19.9.29 to 4.10.29 ...	4.11.29
018 *† Makalla ...	Maugham, J. W. ...	J. B. Newman ...	No. M.	Brocklebank ...	Met. Log. 13.4.29 to 9.9.29 ...	29.10.29
Makambo ...	Williams, D. J. ...	R. Perry, R. A. Williams, H. R. Hendy.	No.	Burns Philp ...	" 21.2.29 to 9.6.29...	2.9.29
314 ** Makura ...	Brown, J. F. S. ...	W. A. Todd, J. Billingham, G. Edwards, D. A. Menlove.	M.L.	Canadian-Australasian	" 10.11.28 to 21.4.29 ...	28.6.29
298 ** Malabar, M.V. ...	Donaldson, A. ...	... ..	" M.	Burns, Philp & Co. ...	Form 911 22.7.29 to 10.9.29 ...	13.9.29
019 *† Malakuta ...	Adamson, F. L. ...	A. Horspool ...	No. M.	Brocklebank ...	" 16.8.29 to 27.8.29 ...	16.9.29
020 *† Malancha ...	Whitham, F. ...	R. Humble ...	" M.	" " " " " "	" 26.8.29 to 26.10.29 ...	31.10.29
219 *† Malda ...	Denn, G. ...	B. R. Faithful ...	" M.	British India ...	" 24.8.29 to 13.9.29 ...	7.10.29
195 †† Maloja ...	Browning, J. B., R.D., Commr. R.N.R.	R. H. Turner ...	" M.	P. & O. ...	" 5.7.29 to 18.9.29 ...	23.9.29
196 †† Malwa ...	Stringer, R. H., O.B.E., R.D., Commr. R.N.R.	F. D. Shaw ...	" M.	" " " " " "	Met. Log. 19.2.29 to 31.8.29 ...	5.9.29
114 *† Manchester Brigade	Stott, C. H. ...	J. H. Round, H. Boyce, E. E. Bonnaud.	M.L.	Manchester Liners ...	" 16.12.28 to 17.7.29 ...	25.9.29
115 *† Manchester Hero ...	Emmett, J. H. ...	G. S. Robertson... ..	"	" " " " " "	Form 911 15.9.29 to 15.10.29 ...	19.10.29
Manchester Producer	Struss, F. D. ...	T. J. Boyd ...	No. A.	" " " " " "	" 31.8.29 to 5.10.29 ...	10.10.29
220 *† Manela ...	Maples, S. H. ...	J. H. Heath ...	" M.	British India... ..	" 21.7.29 to 9.10.29 ...	14.10.29
021 *† Mangalore ...	Mulcahy, G. ...	W. Harris ...	" M.	Brocklebank ...	" 23.8.29 to 22.9.29 ...	10.10.29
022 *† Manipur ...	Cochran, G. N. ...	R. Penston, G. B. Falconer ...	" M.	Elders & Fyffes	Form 911 30.12.28 to 28.3.29 ...	2.4.29
221 *† Manistee ...	Pengelly, J. ...	... ..	" M.	British India... ..	" 10.6.29 to 1.8.29...	8.8.29
Manora ...	Hudson, H. T., R.D., Commr. R.N.R.	... ..	" M.	P. & O. ...	Met. Log. 19.11.28 to 28.3.29 ...	22.6.29
197 †† Mantua ...	Davis, H. C., D.S.O., Commr. R.N.R.	... ..	" M.	Burns Philp ...	" 24.2.29 to 17.8.29 ...	23.9.29
299 ** Marella ...	Mortimer, S. ...	A. G. Hill, F. Vogelmann, B. Helen.	M.L.	Ellerman Wilson ...	Form 911 10.8.29 to 2.10.29 ...	8.11.29
276 *† Marengo ...	Curle, J. ...	H. Bryan, G. W. Revell, J. Ford.	"	British India... ..	Form 911 10.8.29 to 18.10.29 ...	4.11.29
222 †† Margha ...	Hughes, C. G. ...	P. Wright, H. Watkins ...	No. M.	Furness Houlder ...	Met. Log. 14.6.29 to 28.8.29 ...	14.10.29
104 *† Marquesa ...	Smiles, R. S. ...	L. Owen... ..	" A.	Burns, Philp & Co. ...	" 30.3.29 to 30.7.29 ...	3.8.29
Marsina ...	Williams, G. ...	... ..	" M.	Shaw, Savill & Albion	Form 911 10.7.29 to 20.9.29 ...	4.11.29
043 *† Matakana ...	Thurston, H. P. ...	E. Davies, B. Forbes-Moffatt, A. P. Winton, A. G. Collins.	M.L.	Shaw, Savill & Albion	Met. Log. 21.6.29 to 28.9.29 ...	1.10.29
Mataram ...	Voy, W. ...	R. M. Blunt ...	No. A.	Burns, Philp & Co. ...	Form 911 11.7.29 to 30.9.29 ...	4.10.29
044 †† Mataroa ...	Kershaw, W. A. R. ...	F. Eadon, H. A. Hill, C. Meyer.	M.L.	Shaw, Savill & Albion	" 7.7.29 to 25.9.29 ...	21.10.29
023 *† Matheran ...	Douglas, G. C. ...	W. Couling ...	No. M.	Brocklebank ...	" 19.8.29 to 16.9.29 ...	21.10.29
223 *† Matiana ...	Green, F. V. ...	W. Mortimer ...	" M.	British India... ..	" 1.8.29 to 25.8.29...	16.9.29
024 *† Matra ...	Cornish, N. P. ...	W. Gibson, R. V. Andrew ...	" M.	Brocklebank ...	W.T. Reg. 6.10.29 to 21.10.29 ...	25.10.29
Maunganui... ..	Martin, W. ...	G. H. Edwards... ..	" M.	Union S.S. Co. of N.Z.	" 27.10.29 to 11.11.29 ...	14.11.29
032 †† 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 ...	" 1.7.29 to 10.9.29 ...	25.9.29
066 †† Megantic ...	Prothero, W. ...	... ..	"	White Star ...	Form 911 12.1.29 to 23.1.29 ...	28.1.29
145 †† Melita ...	Frank, F. A., D.S.O., R.D., Commr., R.N.R.	J. F. Waltire, A. H. H. Griffiths, F. Rogers.	"	Canadian Pacific ...	W.T. Reg. 31.8.29 to 20.9.29 ...	24.9.29
Memnon ...	Stewart, A. ...	G. Mowatt ...	No. A.	A. Holt... ..	Form 911 4.10.29 to 5.11.29 ...	7.11.29
146 †† Metagama ...	Watson, C. J. ...	J. A. C. McGregor ...	W.T.	Canadian Pacific ...	Form 911 24.9.29 to 20.10.29 ...	24.10.29
255 *† Middlesex ...	Carr-Jones, D. T. ...	J. Hewson, J. H. Tudor, H. Benedictus.	"	Federal... ..	W.T. Reg. 13.10.29 to 1.11.29 ...	8.11.29
Minna ...	Wilde, H. ...	S. J. Woodhouse ...	No. M.	Scottish Fishery Brd.	Form 911 12.10.29 to 2.11.29 ...	8.11.29
147 †† Minnedosa ...	Mackenzie, G. G. ...	A. M. Campbell ...	" A.	Canadian Pacific ...	" 23.9.29 to 12.10.29 ...	18.10.29
067 †† Minnesota ...	McCombie, G. F. R. D., Commr. R.N.R.	C. D. Watt, W. J. P. Roberts, H. M. Sanders.	W.T.	Atlantic Transport ...	" 2.9.29 to 20.9.29...	28.9.29
068 †† Minnetonka ...	Finch, E., R. D., Commr. R.N.R.	R. C. Hill ...	No. M.	" " " " " "		
	Gates, T. F., C.B.E. ...	J. H. Kenworthy ...	" M.	" " " " " "		

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received.
069 †† <i>Minnewaska</i> ...	Claret, F. H., C.B.E., Commr., R.N.R.	F. J. Mummery ...	No. M.	Atlantic Transport ...	Form 911 14.10.29 to 1.11.29 ...	5.11.29
<i>Mississippi</i> ...	Puttick, J. ...	... ..	" A.	"	16.10.29 to 25.10.29 ...	26.10.29
224 †† <i>Modasa</i> ...	Gilchrist, J. W. ...	B. H. Bentall ...	" M.	British India ...	12.5.29 to 1.8.29 ...	13.8.29
<i>Moeraki</i> ...	Loriard, C. ...	F. G. Harvey ...	" A.	Union S.S. Co. of N.Z.	30.8.29 to 6.10.29 ...	11.11.29
198 †† <i>Moldavia</i> ...	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	C. B. Holmes ...	" M.	P. & O. ...	15.8.29 to 3.9.29 ...	16.9.29
199 †† <i>Mongolia</i> ...	Furlong, G. H. S., R.D., Capt., R.N.R.	A. H. Cole ...	" M.	"	17.2.29 to 1.5.29 ...	6.5.29
148 †† <i>Montcalm</i> ...	Rothwell, A. ...	F. H. Stell ...	W.T.	Canadian Pacific ...	W.T. Reg. 7.10.29 to 23.10.29 ...	28.10.29
149 †† <i>Montclare</i> ...	Griffiths, J. N. ...	E. A. Shergold, T. L. Gillette, T. Sargent.	"	"	14.9.29 to 2.10.29 ...	7.10.29
<i>Montoro</i> ...	Hillman, E. J. ...	J. Middleton, J. Young, J. Campbell.	No.	Burns, Philp & Co. ...	Met. Log. 18.7.28 to 3.2.29 ...	22.6.29
150 †† <i>Montrose</i> ...	Dott, J. F. ...	J. Soame, J. M. Roche ...	No. M.	Canadian Pacific	W.T. Reg. 8.4.29 to 26.4.29 ...	30.4.29
151 †† <i>Montroyal</i> ...	Freer, A., R.D., Capt., R.N.R.	A. H. Piggott, D. Ewing ...	W.T.	"	Form 911 28.9.29 to 17.10.29 ...	25.10.29
** <i>Moresby</i> ...	Henderson, D. A., O.B.E., Commr., R.A.N.	G. A. Gould ...	M.L.	His Majesty's Australian Ship.	W.T. Reg. 28.7.29 to 13.8.29 ...	15.8.29
226 †† <i>Mulbera</i> ...	Caffyn, F. ...	B. Martyn ...	No. M.	British India ...	Form 911 8.12.28 to 27.12.28 ...	3.1.29
308 †† <i>Nagara</i> ...	Morris, C. G. ...	A. H. Frogbrook ...	" M.	R.M.S.P. Co. ...	Met. Log. 7.8.28 to 13.12.28 ...	13.3.29
200 †† <i>Nagoya</i> ...	Cochrane, C. H. ...	S. Spring ...	" M.	P. & O. ...	20.5.29 to 10.8.29 ...	13.8.29
201 †† <i>Naldera</i> ...	Randell, G. G. ...	C. H. Hand, M. F. Shute, J. C. Davies.	M.L.	"	" 13.9.29 to 10.11.29 ...	13.11.29
227 †† <i>Nardana</i> ...	Gulliver, B. ...	F. G. Sharps ...	"	British India ...	23.12.28 to 15.3.29 ...	2.5.29
202 †† <i>Narkunda</i> ...	Parker, J. J. W., R.D., Commr. R.N.R.	S. M. Yates, D. H. Moulton ...	No. M.	P. & O. ...	Met. Log. 20.10.29 to 23.1.29 ...	8.2.29
203 †† <i>Nellore</i> ...	Hignett, A. H., R.D., Lt.-Commr. R.N.R.	T. A. Sergeant ...	" M.	P. & O. ...	Form 911 1.4.29 to 28.7.29 ...	10.8.29
228 †† <i>Nerbudda</i> ...	Williams, B. N. ...	G. A. Farley, S. Henderson ...	" M.	British India ...	" 19.7.29 to 27.9.29 ...	30.9.29
162 †† <i>Nestor</i> ...	Houghton, G. K. ...	A. M. Caird, E. N. Stewart, A. E. Stevenson.	M.L.	A. Holt ...	Form 911 8.4.29 to 7.6.29 ...	12.6.29
274 †† <i>Newby Hall</i> ...	Gorst, W. ...	R. D. Richardson, E. Barfield	No. M.	Ellerman ...	Met. Log. 16.12.28 to 8.2.29 ...	11.2.29
105 †† <i>Newfoundland</i> ...	Foxworthy, A. W. ...	R. F. Handley, E. Sainty ...	M.L.	Furness Withy ...	Form 911 3.8.29 to 10.11.29 ...	14.11.29
315 †† <i>Niagara</i> ...	Hill, T. V. ...	V. Knight, R. N. Turner, J. Webb.	"	Canadian- Australasian	Met. Log. 24.5.29 to 4.10.29 ...	10.10.29
<i>Ningchow</i> ...	Beale, H. E. ...	H. Morley ...	No. A.	A. Holt ...	" 6.3.29 to 20.6.29 ...	19.7.29
229 †† <i>Nirvana</i> ...	Ayres, R. M. ...	A. H. Baird ...	" M.	British India ...	Form 911 6.10.29 to 19.10.29 ...	26.10.29
256 †† <i>Norfolk</i> ...	Mead, G. F. ...	C. R. Wavish, T. M. Devitt, L. W. Fulcher.	M.L.	Federal ...	Met. Log. 9.8.29 to 21.8.29 ...	16.9.29
<i>Norna</i> ...	Wright, J. W. ...	L. Cook ...	No. A.	Scottish Fishery Brd	Form 911 16.3.29 to 14.7.29 ...	19.7.29
318 †† <i>Norseman, C.S.</i> ...	Davis, E. R. ...	W. J. Glassborow, H. R. M. Smith, R. S. Miller.	" M.	Western Tel. Co. ...	Form 911 13.10.29 to 16.10.29 ...	4.11.29
257 †† <i>Northumberland</i> ...	Upton, H. L., D.S.C., R.D., Commr., R.N.R.	... ..	M.L.	Federal ...	Met. Log. 13.7.29 to 3.9.29 ...	28.9.29
<i>Nova Scotia</i> ...	Furieux, S. ...	... ..	No. A.	Furness Withy ...	Met. Log. 26.11.28 to 15.4.29 ...	26.4.29
230 †† <i>Noushera</i> ...	Parker, A. A. ...	W. Ascroft ...	" M.	British India ...	Form 911 25.9.29 to 20.10.29 ...	23.10.29
231 †† <i>Nudea</i> ...	Morrison, W. C. ...	... ..	" M.	British India ...	" 23.8.29 to 4.9.29 ...	7.10.29
<i>Oaklands Grange</i> ...	Davis, Q. C. ...	J. C. Thomas ...	" A.	Houlder Bros. ...	" 1.6.29 to 10.8.29 ...	2.9.29
057 †† <i>Olympic</i> ...	Parker, W. H., C.B.E., R.D., Capt. R.N.R.	A. E. Harvey, J. Day, J. W. Paine.	W.T.	White Star ...	Form 911 12.3.29 to 2.7.29 ...	5.7.29
170 †† <i>Orama</i> ...	Staunton, H. G., C. B.E., R.D., Commr. R.N.R.	J. M. M. Swanson, C. K. Blake, N. Smith.	M.L.	Orient ...	W.T. Reg. 3.10.29 to 17.10.29 ...	21.10.29
<i>Oranian</i> ...	Arkie, J. ...	W. Shepherd ...	No. A.	Leyland ...	Met. Log. 24.10.29 to 7.11.29 ...	9.11.29
309 †† <i>Orbita</i> ...	Dominy, R. H., C.B.E., Commr. R.N.R.	E. Hicks ...	" M.	Pacific S.N. Co. ...	Form 911 21.7.29 to 22.10.29 ...	29.10.29
086 †† <i>Orcoma</i> ...	Harvey, J. G. ...	W. J. Rutter, G. Redmond ...	" M.	"	Form 911 27.7.29 to 2.10.29 ...	10.10.29
087 †† <i>Orduna</i> ...	Daniel, T. ...	R. D. Eckford ...	" M.	"	" 27.7.29 to 14.8.29 ...	21.8.29
171 †† <i>Orford</i> ...	Owens, A. L., Commr. R.D., R.N.R.	O. C. Davies ...	" M.	Orient ...	" 6.7.29 to 19.9.29 ...	23.9.29
088 †† <i>Orita</i> ...	Fape, E. R. ...	G. Gerety ...	" M.	Pacific S.N. Co. ...	" 14.2.29 to 26.4.29 ...	11.5.29
<i>Ormonde</i> ...	Rice, W. V., D.S.O., D.S.C., Commr. R.N.	H. P. Price ...	M.L.	His Majesty's Ship ...	Form 911 24.9.29 to 4.10.29 ...	26.10.29
172 †† <i>Oronsay</i> ...	Shelford, W. S. ...	O. C. Davies, R. S. Hawker, E. M. Mackay.	"	Orient ...	Met. Log. 11.1.29 to 30.5.29 ...	13.6.29
173 †† <i>Orontes</i> ...	O'Sullivan, F. R. ...	... ..	No. M.	Orient ...	" 23.6.29 to 24.9.29 ...	3.10.29
089 †† <i>Oroa</i> ...	Ridyard, A. G. ...	J. M. Forsyth ...	" M.	Pacific S.N. Co. ...	Form 911 20.8.29 to 28.10.29 ...	9.11.29
174 †† <i>Orsova</i> ...	Thorne, G. G., R.D., Commr. R.N.R.	L. J. Vesty, N. W. Smith, J. D. Birch, R. B. Stannard.	M.L.	Orient ...	Met. Log. 31.3.29 to 2.7.29 ...	11.7.29
175 †† <i>Orvieto</i> ...	Kennedy, G. S. ...	H. A. Whittle, C. D. Lane, C. W. Pinckney.	"	"	" 27.4.29 to 31.7.29 ...	2.8.29
176 †† <i>Osterley</i> ...	Sarson, M. J. ...	... ..	No. M.	"	Form 911 16.5.29 to 20.6.29 ...	24.6.29
237 †† <i>Ofaki</i> ...	Clarke, P. B., D.S.C.	G. Dibley, F. Pover ...	M.L.	New Zealand S.S. Co.	Met. Log. 5.5.29 to 11.10.29 ...	17.10.29
177 †† <i>Otranto</i> ...	Matheson, C. G., D.S.O., R.D., Capt. R.N.R.	A. E. Coles ...	No. M.	Orient ...	Form 911 16.9.29 to 4.10.29 ...	26.10.29
<i>Oxfordshire</i> ...	Foster, W. L. ...	E. A. Insley ...	" A.	Bibby Bros. ...	Form 911 24.1.29 to 21.2.29 ...	4.3.29
<i>Pacific Shipper, M.V.</i>	Goodwin, J. ...	... ..	" A.	Furness Withy ...	" 13.1.29 to 19.8.29 ...	30.8.29
<i>Pakeha</i> ...	Elford, H. C. ...	W. Thowless ...	" A.	Shaw, Savill & Albion	" 8.8.29 to 10.9.29 ...	14.10.29
011 †† <i>Paneras</i> ...	Jones, W. C. H. ...	H. Atkinson, R. Parry ...	M.L.	Booth ...	Met. Log. 6.3.29 to 29.7.29 ...	15.8.29
310 †† <i>Parana</i> ...	Rathkins, C.E., R.D., Commr. R.N.R.	... ..	"	R.M.S.P. Co. ...	" ... ..	...
<i>Pareora</i> ...	Evans, J. O. ...	T. M. G. Fenwick ...	No. A.	Hain S.S. Co. ...	Form 911 16.5.29 to 13.6.29 ...	18.8.29
<i>Paris</i> ...	Cook, C. L. ...	Mr. Biles ...	C.C.	Southern Rly.	Telegraphic Report. 2.4.29 ...	2.4.29
<i>Fatia</i> ...	Bower, H. C. ...	R. Laycock ...	No. A.	Elders & Fyffes	Form 911 31.7.29 to 30.8.29 ...	12.9.29
<i>Peisander</i> ...	Slater, H. N. ...	L. Johnston ...	" A.	A. Holt ...	" 9.8.29 to 12.10.29 ...	19.10.29
<i>Pennland</i> ...	Making, V. L. ...	... ..	" A.	Red Star ...	" 29.9.29 to 19.10.29 ...	21.10.29
204 †† <i>Peshawur</i> ...	McBryde, A. M. ...	K. A. H. Cummins, S. H. Bald- win, A. M. Tolfree.	M.L.	P. & O. ...	Met. Log. 10.12.28 to 1.5.29 ...	13.5.29
238 †† <i>Piako</i> ...	Laird, J. ...	J. McCulloch ...	No. M.	New Zealand Co. ...	Form 911 8.9.29 to 3.10.29 ...	5.11.29
<i>Polyarp</i> ...	Reynolds, W. H. B. ...	... ..	" A.	Booth ...	Met. Log. 9.6.29 to 24.8.29 ...	5.9.29
127 †† <i>Port Adelaide</i> ...	Swan, L. H. ...	R. B. Linklater, C. J. Gorley, F. J. Lavers.	M.L.	Commonwealth & Dominion.	Met. Log. 6.1.29 to 19.6.29 ...	15.7.29
128 †† <i>" Auckland</i> ...	Durham, R. S., D.S.C.	J. G. Lewis, E. R. Rowlands, P. S. Ball, E. W. Dingle.	"	"	" 1.4.29 to 13.8.29 ...	7.9.29
129 †† <i>" Campbell</i> ...	Enright, W. J. ...	J. G. Thom, J. C. Goddard, H. B. Walker.	"	"	" 26.2.29 to 5.7.29 ...	11.7.29

LIST OF VOLUNTARY OBSERVING SHIPS

vii

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log, Register, or Report Contributed. Received up to 15.11.29.	Date Received
130 *† Port Caroline ...	Brown, A. H. ...	J. B. Bradley, G. Langford, J. Stannard, L. J. Brice ...	M.L.	Commonwealth & Dominion.	Met. Log. 26.10.28 to 3.4.29 ...	8.4.29
131 *† " Darwin ...	Sawbridge, I. R. ...	H. Pinkney, N. Muzzell, A. McClounan.	"	" " " "	" 31.1.29 to 11.7.29 ...	25.7.29
132 *† " Denison ...	Ferris, J. ...	A. A. Cooper, J. Rowland-Hill, P. J. Howe, I. Soanes.	"	" " " "	" 21.5.29 to 28.10.29 ...	6.11.29
133 *† " Dunedin, M.V. ...	Farmer, F. ...	H. M. Post, C. A. Hodson, W. Hopkins.	"	" " " "	" 26.5.29 to 6.9.29... ..	20.9.29
" Fairy ...	Craven, R. ...	J. Stannard	No. A.	" " " "	Form 911 4.6.29 to 5.7.29 ...	7.11.29
" Fremantle, M.V. ...	Gilling, W. ...	A. Naismith	No. A.	" " " "	" 14.9.29 to 16.10.29 ...	22.10.29
" Gisborne, M.V. ...	Hayter, S. W. ...	H. Boys-Smith	" A.	" " " "	" 25.5.29 to 12.10.29 ...	17.10.29
134 *† " Hobart, M.V. ...	Cottell, S. C. ...	L. Copeland, R. D. Chamberlain, G. J. O. Jinman, W. B. Craig.	M.L.	" " " "	Met. Log. 24.4.29 to 15.8.29 ...	21.8.29
135 *† " Hunter ...	Robinson, C. A. ...	R. B. Stannard, A. McClounan, J. T. Weldin.	"	" " " "	" 1.8.28 to 23.12.28 ...	31.12.28
" Huon ...	Compton, J. E. ...	" " " " " " " "	No. A.	" " " "	Form 911 9.8.29 to 8.9.29 ...	30.9.29
136 *† " Melbourne ...	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
137 *† " Nicholson ...	Jack, J. ...	H. S. Datson, E. E. Roswell, J. H. Sloan, J. A. D. Fisher.	"	" " " "	" 28.3.29 to 3.8.29... ..	8.8.29
138 *† " Pirie ...	Hudson, J. J. ...	A. T. C. Cooper	"	" " " "	" 5.5.29 to 1.10.29... ..	17.10.29
139 *† " Sydney ...	Higgs, W. G. ...	E. N. Rogerson, F. R. Gorman, A. Brown.	"	" " " "	" 8.5.29 to 18.9.29... ..	26.9.29
140 *† " Victor ...	Williams, R. ...	H. G. Newbury, R. D. Elson, C. E. Midwinter.	"	" " " "	" 5.2.29 to 14.6.29 ...	22.7.29
" Wellington ...	Jones, C. N. ...	L. J. Skails	No. A.	" " " "	Form 911 5.6.29 to 6.9.29 ...	11.9.29
106 *† " Princess ...	Friend, A. B. ...	E. Longhead	" M.	" " " "	" 6.10.29 to 25.10.29 ...	14.11.29
" Protea, H.M.S.A.S. ...	Dalgleish, J., Lt.-Commr., S.A.N.S. ...	F. J. Dean	M.L.	South African Naval Service.	Met. Log. 3.3.29 to 16.5.29 ...	3.7.29
163 *† " Proteus ...	Evans, D. L. C. ...	P. McGilligan, R. Alderton, E. A. H. Gepp.	"	A. Holt	" 14.5.29 to 2.11.29 ...	13.11.29
" Pyrrhus ...	Adcock, F. ...	" " " " " " " "	No. A.	" " " " " "	Form 911 24.9.29 to 31.10.29 ...	7.11.29
232 *† " Quiloo ...	Cave, S. G. ...	W. Welch	" M.	British India... ..	" 17.3.29 to 14.4.29 ...	9.7.29
205 †† " Rajputana ...	Cadiz, F. G., D.S.C. ...	R. E. Tucker	" M.	P. & O.	" 18.8.29 to 9.10.29 ...	14.10.29
206 †† " Ranchi ...	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
207 †† " Ranpura ...	Furlong, G. H. S., R.D., Capt. R.N.R. ...	C. H. Hand	" M.	P. & O.	" 28.9.29 to 17.10.29 ...	11.11.29
208 †† " Razmak ...	Harrison, R., D.S.O., R.D., Capt. R.N.R. ...	J. Elliott	" M.	P. & O.	" 24.8.29 to 12.9.29 ...	19.9.29
060 †† " Regina ...	Davies, E. ...	J. H. Walker, R. Crangle, C. W. R. Campbell.	W.T.	White Star - Do- minion (	" 8.9.29 to 27.9.29... ..	30.9.29
239 *† " Remuera ...	McKellar, A. W., R.D., Capt. R.N.R. ...	E. H. Hopkins, T. S. Marchington, R. C. Aldridge.	M.L.	New Zealand S.S. Co.	W.T. Reg. 8.9.29 to 27.9.29... ..	30.9.29
" Rhezenor ...	Stout, G. L. ...	W. E. Barrett	No. A.	A. Holt... ..	Form 911 5.9.29 to 1.11.29 ...	4.11.29
" Rhodesian Trans- port ...	Bullock, F. W. H. ...	W. J. Griffiths	" A.	Houlder Bros. ...	" 2.2.29 to 6.6.29 ...	24.6.29
240 *† " Rimutaka ...	Lamb, C. B. ...	F. Pretty, A. W. Marshall, H. S. Rogers, R. J. S. Stephen.	M.L.	New Zealand S.S. Co.	Met. Log. 5.7.29 to 29.10.29 ...	12.11.29
" Ripley Castle ...	Aylen, C. E. H. ...	A. C. J. Hatt	No. A.	Union Castle ...	Form 911 28.6.29 to 23.9.29 ...	8.10.29
" Rother ...	Woodhead, T. H. ...	N. Thompson	" A.	Goole Steam Shipping	" 21.9.29 to 3.11.29 ...	11.11.29
241 *† " Rotorua ...	Hunter, J. L. B. ...	L. Griffiths, H. Cockerill, E. A. Burton, A. L. Nelson.	M.L.	New Zealand S.S. Co.	Met. Log. 16.3.29 to 4.7.29... ..	11.7.29
" Royal Transport ...	Robinson, F. W. ...	G. R. Thomas	No. A.	Houlder Bros. ...	Form 911 7.2.29 to 12.5.29 ...	17.6.29
242 *† " Ruapehu ...	Bowen, A. C. ...	H. N. Lawson, H. D. Horwood, T. S. Farrar.	M.L.	New Zealand S.S. Co.	Met. Log. 4.4.29 to 8.8.29 ...	16.8.29
333 *† " St. Albans ...	Diamond, S. L. ...	R. L. Harry, J. D. Kavanagh, F. O. Colvin, H. G. Stratford.	"	Eastern and Aus- tralian.	" 29.3.29 to 3.7.29... ..	24.8.29
" St. Helier ...	Richardson, L. ...	C. Bell	C.C.	G.W. Railway ...	Telegraphic Report 14.11.29 ...	14.11.29
" St. Julien ...	Pitman, R. ...	C. W. Sanderson	"	" " " " " "	" 28.9.29	28.9.29
294 *† " St. Andrew ...	Bearpark, E. W. ...	J. Meade	No. A.	Rankin Gilmour ...	Form 911 16.6.29 to 27.8.29 ...	30.8.29
" Samala ...	Edwards, A. C. ...	" " " " " " " "	M.L.	Elders & Fyffes ...	" " " " " " " "	" " " " " "
038 †† " Samaria ...	Malin, R. G., Lieut.-Commr., R.N.R. ...	F. D. Thomas, D. MacMillan, P. G. Britten.	W.T.	Cunard	W.T. Reg. 30.9.29 to 17.10.29 ...	22.10.29
" Sardinian Prince ...	Pearson, F. T. ...	G. A. Davies	No. A.	Prince	Form 911 2.10.29 to 1.11.29 ...	15.11.29
" Saxon ...	Stuart, C. E., R.D., Capt. R.N.R. ...	W. Forsyth	" A.	Union Castle ...	" 10.8.29 to 29.9.29 ...	12.10.29
291 *† " Scholar ...	Peterkin, A. G. ...	G. Baker	" M.	Harrison	" 18.8.29 to 5.11.29 ...	12.11.29
" Scotia ...	Prichard, S. D., M.B.E. ...	W. H. Hughes	C.C.	L.M. & S. Railway ...	Telegraphic Report 14.11.29 ...	14.11.29
033 †† " Seythia ...	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. 21.10.29 to 10.11.29 ...	14.11.29
" Sheaf Mount ...	Groves, C. V. ...	A. Macarthur	No. A.	W. A. Souther ...	Form 911 19.10.29 to 10.11.29 ...	13.11.29
328 *† " Shropshire, M.V. ...	Adamson, B. W. ...	W. L. Whiteside, R. Allen, A. D. Quayle, W. H. Brittain.	M.L.	Bibby	Met. Log. 25.4.29 to 14.5.29 ...	21.5.29
" Silksworth ...	Blacklock, G. ...	" " " " " " " "	No. A.	" " " " " "	" 1.6.29 to 12.8.29... ..	16.8.29
253 *† " Somerset ...	Howell Price, J., D.S.O., D.S.C. ...	L. Malcouonne, A. Bamforth, C. Latch.	M.L.	R. S. Dalgleish ...	Form 911 4.10.29 to 28.10.29 ...	15.11.29
008 †† " Southern King ...	Williams, W. ...	J. S. Gardner	No. M.	Federal... ..	Met. Log. 21.4.29 to 27.9.29 ...	2.10.29
277 *† " Spero ...	Montgomery, H. ...	H. W. Vickers, G. B. Bray ...	M.L.	Southern Whaling & Sealing Co.	Form 911 27.8.29 to 9.10.29 ...	11.11.29
292 *† " Statesman ...	Mowat, J. ...	C. V. Watts	No. M.	Ellerman Wilson ...	Met. Log. 19.1.29 to 29.6.29 ...	9.7.29
" Stephen ...	Evans, L. G. ...	F. G. Jones	" A.	Harrison	Form 911 19.6.29 to 4.9.29 ...	11.9.29
" Stockwell ...	Smith, W. ...	F. Moore	" A.	Booth	" 12.9.29 to 23.9.29 ...	30.9.29
259 *† " Surrey ...	Mac Rae, A. B. ...	A. V. Pearce	M.L.	Brocklebank ...	" 26.10.28 to 22.11.28 ...	28.12.28
" Sutton Hall ...	Walmsley, R. J. ...	G. C. Parry	No. A.	Federal... ..	" 1.8.29 to 7.9.29 ...	11.9.29
" Sylvafield, M.V. ...	Xing, J. E. ...	A. A. Tully	" A.	Ellerman	" 24.6.29 to 17.7.29 ...	20.7.29
" " " " " " " "	" " " " " " " "	" " " " " " " "	" A.	Hunting & Son ...	" 6.8.29 to 14.10.29 ...	29.10.29
045 *† " Tainui ...	Clifton Mogg, W. P., Lieut. Commr., R.N.R. ...	L. J. Hopkins, E. Baker, J. Allen.	M.L.	Shaw, Savill & Albion	" 12.7.29 to 25.10.29 ...	2.11.29
261 *† " Tahiti ...	Aldwell, B. M. ...	F. W. Bates	M.L.	Union S.S. Co. of N.Z.	" 17.4.29 to 16.8.29 ...	12.9.29
234 *† " Talma ...	Hocking, R. W., R.D., Lieut. - Commr., R.N.R. ...	G. H. Sprigge	No. M.	British India... ..	Form 911 8.8.29 to 1.9.29 ...	30.9.29

Name of Vessel.	Captain.	Observing Officers.	Meteoro-logical Equipment.	Line.	Last Log. Register, or Report Contributed. Received up to 15.11.29	Date Received.
164 † Talhybius ...	Flynn, G. A. ...	D. McFarlane, W. Alderton, A. K. Sanderson.	M.L.	A. Holt ...	Met. Log. 20.4.29 to 23.9.29 ...	12.11.29
046 † Tamaroa ...	Hartman, W. H. ...	A. J. Galvin ...	No. M.	Shaw, Savill & Albion	Form 911 28.3.29 to 10.7.29 ...	15.7.29
334 * Tanda ...	Pilcher, E. T., Lieut.-Commr., R.N.R.	H. Murday, B. W. Dun, R. S. Millington.	M.L.	E. & A. S.S. Co. ...	Met. Log 31.5.29 to 28.8.29 ...	21.10.29
165 † Tantalus ...	Dodds, R. ...	F. C. Oppen ...	"	A. Holt ...	" ... 21.3.29 to 25.7.29 ...	7.8.29
047 † Taranaki, M.V. ...	Wood, C., D.S.C. ...	A. Chrystal, G. Campbell, F. Charnley.	"	Shaw, Savill & Albion	" ... 21.3.29 to 25.7.29 ...	7.8.29
Tarantia ...	Fraser, A. ...	" ...	No. A.	Anchor ...	Form 911 11.5.29 to 9.7.29... ...	30.8.29
Tetrestias ...	Wilkinson, W. H. ...	D. Law ...	" A.	A. Holt & Co. ...	" 16.7.29 to 5.9.29... ...	12.9.29
243 † Tekoa ...	McNish, R. ...	" ...	" M.	New Zealand S.S. Co.	" 25.9.29 to 24.10.29 ...	26.10.29
Telamon ...	Willcox, J. H. ...	G. Randall ...	" A.	A. Holt ...	" 31.7.29 to 15.9.29 ...	26.10.29
Tetela ...	Brice, E. H. ...	H. Holmes ...	" A.	Elders & Fyffes	" 31.8.29 to 4.10.29 ...	7.10.29
Teucer ...	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
077 † Themistocles ...	Young, A. D. ...	S. A. Beith ...	" M.	Aberdeen Common-wealth	" 31.3.29 to 6.8.29... ...	18.8.29
Theseus ...	Carnon, C. G. ...	H. C. Large ...	" A.	A. Holt ...	" 2.9.29 to 19.9.29... ...	3.10.29
007 * Thistleglen ...	Whitfield, G.A., O.B.E.	" ...	M.L.	Allan Black & Co. ...	" ...	"
235 † Tilava ...	Tallent, J. M. ...	N. Atkinson ...	No. M.	British India ...	Form 911 23.6.29 to 12.8.29 ...	16.9.29
006 † Tinhow ...	Newton ...	J. S. King ...	" M.	A. Weir & Co. ...	" 21.4.29 to 19.5.29 ...	17.7.29
166 † Titan ...	Power, J. J. ...	P. Cross, R. A. Shennan, E. Saville.	M.L.	A. Holt ...	Met. Log. 3.2.29 to 18.6.29... ...	28.6.29
244 † Tongariro ...	Kettlewell, C. R. ...	G. Cashmore, A. E. Williams, D. Baldwin.	"	New Zealand S.S. Co.	" 9.3.29 to 5.8.29 ...	15.8.29
Transylvania ...	Smart, R. W. ...	P. Middleton ...	No. A.	Anchor ...	Form 911 31.8.29 to 21.9.29 ...	28.9.29
Trefusis ...	Hunt, D. ...	W. A. MacWhinney ...	" A.	Hain S.S. Co. ...	" 14.9.29 to 16.10.29 ...	2.11.29
005 † Trematon ...	Mill, C. ...	J. Jenkyn, C. M. Quick, R. Stitson.	M.L.	Hain S.S. Co. ...	Met. Log. 1.2.29 to 23.8.29... ...	20.9.29
331 † Trojan Star ...	Griffin, G. A. ...	" ...	No. M.	Blue Star	" ...	"
245 † Turakina ...	Ashworth, F. ...	A. M. Dowman ...	" M.	New Zealand S.S. Co.	Form 911 20.7.29 to 29.8.29 ...	2.9.29
028 † Tuscania ...	Rome, W. B. ...	J. Noble ...	W.T.	Anchor ...	W.T. Reg. 21.10.29 to 8.11.29 ...	14.11.29
167 † Tyndareus ...	Hughes, R. T. ...	J. A. Evans, F. V. Smith, D. S. Bruce.	M.L.	A. Holt ...	Form 911 20.10.29 to 9.11.29 ...	14.11.29
Uffington Court ...	Clarke, E. J. ...	" ...	No.	Haldin & Co. ...	Met. Log. 24.4.29 to 16.9.29 ...	3.10.29
Ulimaroa ...	Wylie, W. J. ...	" ...	No. M.	Huddart Parker, Ltd.	Form 911 30.8.29 to 23.9.29 ...	26.10.29
Ulysses ...	Owen, R. D., O.B.E.	A. McDonald ...	" A.	A. Holt ...	" 6.9.29 to 23.9.29... ...	4.11.29
Umvolsi ...	Barnes, E. W. ...	R. A. Dyns ...	" A.	Bullard King ...	" 19.9.29 to 9.10.29 ...	4.11.29
113 † Upwey Grange ...	Goodrick, H. P. ...	G. T. Hurst ...	" M.	Houlder ...	" 10.8.29 to 28.8.29 ...	31.8.29
Valacia ...	Gronow, S. ...	J. Armstrong ...	" A.	Cunard	" 7.8.29 to 30.8.29 ...	23.9.29
Vardulia ...	Fear, E. T. C. ...	W. H. Barker ...	" A.	Anchor Donaldson ...	" 1.12.28 to 11.1.29 ...	15.1.29
209 † Viceroy of India ...	Ohlson, B. J., D.S.O., R.D., Commr. R.N.R.	A. G. Stansfield...	" M.	P. & O. ...	" ...	"
Vigilant ...	Simpson, E. S. S. ...	A. Ross ...	" A.	Scottish Fishery Board.	Form 911 4.10.29 to 31.10.29 ...	5.11.29
316 * Waiotapu ...	Todd, D. ...	E. J. H. Taylor ...	" M.	Canadian - Australasian.	" 1.6.29 to 28.6.29... ...	31.7.29
263 * Wairuna ...	Davies, R. L. ...	J. Ritchie, — Sinclair, A. H. Dunning.	M.L.	Union S.S. Co. of N.Z.	Met. Log. 27.6.29 to 3.9.29... ...	29.10.29
095 † Walmer Castle ...	Morton Betts, W. Steel, R. ...	G. H. Pickering, O. Pitts, E. McKintry.	"	Union Castle ...	" 23.6.29 to 13.10.29 ...	18.10.29
Warfield ...	" ...	" ...	No. A.	" ...	Form 911 5.10.29 to 18.10.29 ...	11.11.29
260 † Westmoreland ...	Hamilton, F. S. ...	A. W. Marshall, W. Timberlake, K. S. Phillips.	M.L.	Federal... " ...	Met. Log. 11.1.29 to 28.5.29 ...	1.6.29
324 † William Scoresby, R.S.S.	Shannon, R. L. V., Lieut.-Commr. R.N.	M. C. Lester ...	"	Falkland Islands Government.	" 22.9.28 to 19.1.29 ...	11.5.29
096 † Windsor Castle ...	Chave, Sir B., K.B.E., Knight, A.	R. Tyser, W. Aldous, J. W. Brooks.	"	Union Castle ...	" 1.3.29 to 26.8.29... ...	29.8.29
Zent ...	Roberts, H. ...	" ...	No. A.	Elders & Fyffes	Form 911 19.7.29 to 5.10.29 ...	10.10.29
Conway, H.M.S. ...	Richardson, F. A., D.S.C., Commr., R.N.	The Senior Cadets ...	Cadets' M.L.	" ...	Cadets' Met. Log. 21.4.29 to 16.7.29 ...	19.7.29
Pangbourne Nautical College	Tracy, A. F. G., Commr., R.N.	" ...	"	" ...	Cadets' Met. Log. 24.4.29 to 23.7.29 ...	3.8.29
Worcester, H.M.S.	" ...	" ...	"	" ...	Cadets' Met. Log. 10.5.29 to 29.7.29 ...	1.8.29
Abaco ...	" ...	The Keepers ...	Lighthouse Register.	" ...	Lighthouse Register 1.7.28 to 31.12.28 ...	28.5.29
Cay Lobos ...	" ...	" ...	"	" ...	Lighthouse Register 9.2.28 to 18.8.28 ...	28.5.29
Double Headed Shot	" ...	" ...	"	" ...	Lighthouse Register 1.3.28 to 31.8.28 } 28.5.29	
Inagua ...	" ...	" ...	"	" ...	Lighthouse Register 10.10.28 to 31.3.29 ...	
Sombrero ...	" ...	" ...	"	" ...	Lighthouse Register 20.7.28 to 31.12.28 ...	28.5.29
Watling Island ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.28 to 31.12.28 ...	5.2.29
Watling Island ...	" ...	" ...	"	" ...	Lighthouse Register 1.7.28 to 31.12.28 ...	28.5.29
Cape Pembroke (Falkland Is.).	" ...	" ...	"	" ...	Lighthouse Register 1.1.29 to 30.6.29 ...	26.8.29

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 31.10.29.	Date Received.
<i>Antillian</i>	Hannaford, W.	J. M. Hayde	Leyland	Water Samples	26.9.29
<i>Albatross</i>	Masters, W.	W. J. Dixon	"	"	28.10.29
<i>Durro</i>	Shillitoe, B.	J. Clark	R.M.S.P. Co.	"	26.9.29
<i>Delilian</i>	Stewart, G.	H. A. Dick	Leyland	"	4.9.29
<i>Hildebrand</i>	Buck, R. H.	H. Sapsworth	Booth	"	4.9.29
<i>Oranian</i>	Arkle, J.	T. J. Jones	Leyland	"	15.10.29

January, M.O., 1930.

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., R.D., Captain 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:—

Meteorological Charts of the Southern Ocean between the Cape of Good Hope and New Zealand. (No. 123, 1917.) 7s. 6d. (12½ × 9½ in.)

BOOKS:—

Wireless and Weather, An Aid to Navigation, with Appendices. (No. 297, 1928.) 5s. (4to.)

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

GEOPHYSICAL MEMOIRS (4to.):—

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

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

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

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

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

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

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

[To face page viii.]

NOTICES.

IMPORTANT.

The special attention of the Agents and Members of the British Corps of Voluntary Marine Observers is invited to this number. In it will be found information of certain changes which are to be made on May 1st, 1930, and they are asked to bring these to the notice of those concerned with whom they come in contact; so that the work of British "Selected Ships" may be of the utmost possible assistance in safe navigation and to all that Marine Meteorology serves.

Revised Meteorological Logs, Forms 911, Registers for Coded W/T Weather Reports, etc., will be despatched to Regular Observing Ships in such time that they may have them on board for use from May 1st, 1930.

BAROGRAPHS.

The Commanders of Meteorological Log-keeping Ships which have on board Barographs the property of the Meteorological Office and which have only Spark transmitting W/T installations, are requested to surrender these instruments on arrival next at their home ports to the Agent or Port Meteorological Office for overhaul, in order that they may be placed on board A Selected Ships by May 1st, 1930, in good order.

By so doing they will assist in distributing available instrumental equipment to the best advantage of the whole Service. In the new system, which comes into force on May 1st, 1930, A Selected Ships will be enabled, when they have a Barograph on board, to include in their reports exact observations of Barometric tendency which may prove of advantage to all who receive or intercept Routine Coded Wireless Weather reports.

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.

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.

ICE CHART. WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

- (C) From 1st September to 31st March inclusive.
(E) From 1st December to 14th February, inclusive.

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

SYMBOLS USED ON THE CHART

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

PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position.	Remarks.
Jan. 14, 1836	H.M.S. Cove...	60°55' N. 5°50' W.	2 bergs.
" 9, 1913	S.S. Oriflamme	48°37' N. 34°42' W.	Berg 40 ft. high, 400 ft. long.
" 27, 1916	S.S. Rio Verde	33°34' N. 70°32' W.	Hummock 2 ft. high, 30 ft. in circumference

Reports of Ice sighted between November 1st and November 30th, 1929, which have been received by the Meteorological Office, are shown by the Symbols plotted in the chart, indicating the day of the month.

LATEST ICE REPORT FROM CANADA.

The following cablegram, dated 12th November, 1929, was received from the Canadian Signal Service, Quebec :—
"Belle Isle occasional berg, other points, no ice in sight."

MARINE METEOROLOGY.

NOTICES.

LATE PRESS.

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.

The instrumental equipment on board each regular observing ship is indicated in the "Fleet List" in THE MARINE OBSERVER.

"Selected Ships," *i.e.*, those ships which are detailed for Voluntary Routine Wireless Weather Telegraphy, are indicated by a number and symbols in the "Fleet List" in THE MARINE OBSERVER.

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.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
5.11.29	53°36'N.	5°35'E.	Object floating under water apparently a yellow painted spar or derrick.
13.11.29	51°54'N.	3°39'E.	Heavy wreckage, drifting.
19.11.29	10 miles N30°W of Haisbro' Lt. V.		Boat 18 feet long, bottom up, no marks visible.
ENGLISH CHANNEL.			
4.11.29	50°40'N.	1°37'W.	Submerged obstruction.
15.11.29	50°31'N.	1°00'W.	Cylinder buoy red on top black underneath ring attached.
17.11.29	49°30'N.	3°05'W.	Small boat, bottom up.
NORTH ATLANTIC.			
3.11.29	45°35'N.	53°15'W.	Piece of wreckage awash.
4.11.29	18 miles due E from Miami.		Large grey painted motor boat.
5.11.29	49°08'N.	10°29'W.	Wreck of wooden vessel 35 feet long, covered barnacles, ribs projecting 2 feet out of water
10.11.29	48°28'N.	4°49'W.	Drifting wreck.
14.11.29	37°27'N.	74°20'W.	Conical shaped latticework buoy, upper part white, lower red.
15.11.29	40°52'N.	9°46'W.	Large conical buoy staff attached, dangerous to navigation.
16.11.29	41°45'N.	9°44'W.	Wooden hull of about 30 metres floating awash, dangerous to navigation.
16.11.29	41°06'N.	9°20'W.	Drifting wreck, mast about 2 metres out of water.
17.11.29	48°13'N.	5°35'W.	Whale boat, stove in, painted white.
20.11.29	48°50'N.	5°45'W.	Large piece floating wreckage painted black and white also large spar 8 feet out of water, apparently attached to submerged wreck.
20.11.29	41°11'N.	9°40'W.	Piece of floating wreckage about 20 feet long, dangerous to navigation.
25.11.29	33°10'N.	72°53'W.	Drifting light buoy, double flash every second.
25.11.29	S.44°W.	7 miles from Creach Lt. V.	Conical red buoy.
CARIBBEAN SEA.			
6.11.29	19°53'N.	84°02'W.	Log 50 feet long, 8 feet diameter, half submerged, covered with barnacles.
NORTH PACIFIC.			
1.11.29	36°57'N.	122°20'W.	Several logs bound together.
1.11.29	37°04'N.	121°47'W.	Wreckage about 60 feet long 25 feet wide.
4.11.29	46°29'N.	124°17'W.	Derelict log raft of about 24 logs, 100 feet long 6 feet diameter.
RED SEA.			
15.11.29	25°28'N.	35°23'E.	Capsized native boat, partly submerged, dangerous to navigation.
ARABIAN SEA.			
8.11.29	17°05'N.	73°16'E.	Capsized cotia reported adrift, dangerous to navigation.

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

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(Telephone No.: B 1391).

HONG KONG, China.

HULL

LEITH

SOUTHAMPTON

SYDNEY, New South Wales.

TYNE

VANCOUVER, British Columbia.

Agents (contd.).

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