

VOL. XI. No. 114.

THE MARINE OBSERVER.

APRIL 1934.

TABLE OF PRINCIPAL CONTENTS

	PAGE		PAGE
Clarity	42	Southern Ice Reports:—	
The Marine Observer's Log:—		April, May and June, 1933	69
April, May and June	44	Wireless Weather Signals:—	
Weather Charts made at Sea in the South Pacific, by		Wireless Stations Detailed to receive Routine Coded	
Lieutenant H. HILL, R.N.R.	46	Weather Reports from "A Selected Ships"	70
Icebergs in the South Atlantic, by Lieutenant R. A. B.		Wireless Stations Detailed to intercept Routine Coded	
ARDLEY, R.N.R.	51	Weather Reports from "B Selected Ships"	72
Duration of Atmospheric Obscurity in the Irish Sea, by		British Isles, Coasts of Europe, North Coast of Africa and	
Commander M. CRESSWELL, R.N.R.	53	adjacent islands as far as Longitude 40°W.	74
Summary of Ice conditions, Western North Atlantic, 1933, by		Lithographic illustrations after page 82:—	
Commander J. HENNESSY, R.D., R.N.R.	56	Ship's Wireless Weather Signals, Chart of the World.	
Weather Forecasting in London, for those at Sea in Home		Currents in the Red Sea— May, June and July.	
Waters, by R. CORLESS, O.B.E., M.A.	59	Currents in the portion of the Indian Ocean North of Australia—	
Fog, by H. KEETON	62	May, June and July.	
The John Murray Expedition I, by Professor J. STANLEY		Chart of Limits of Ice, Western North Atlantic.	
GARDINER, F.R.S.	66	Ice Chart of the Southern Hemisphere— April, May and June.	
Currents of the Red Sea and the part of the Indian Ocean			
North of Australia, by E. W. BARLOW, B.Sc.	67		

CLARITY.

"Now you know why it is that I want sailors' words and words connected with sailing ships kept in our language, even though the sailing ship may be passing away. Our sailors have exported our terms into nearly every language on earth, and I myself, who have always an immense faith in the plain and simple people of my country, wish indeed that the care of the English language may be left to the sailors to look after. Even in the last generation we have got the good English words 'steamer' 'battleship' 'ironclad' 'dreadnought'—words that hit you like a hammer.

"Other people are floundering about and inventing words like 'cinematograph' and 'hydroplane'. There is poetry too, in the names of ships. Take for example, 'Cloak of the Wind' or Drake's little 'Golden Hind' or in our own time, the 'Cutty Sark'."

So said the Right Honourable STANLEY BALDWIN in the presence of the Master of the Merchant Navy and Fishing Fleets, H.R.H. The PRINCE OF WALES, to a great assemblage at the Mansion House, London, of the Honourable Company of Master Mariners only six years ago.*

The Committee on the Examination of Masters and Mates which was appointed by the Board of Trade at the end of 1927 under the chairmanship of the Right Honourable WALTER RUNCIMAN, M.P. (now President of the Board of Trade) and which included amongst its members representatives of the Merchant Navy, laid stress upon the importance of clear English. They said in their report in 1928:—

"In view of the increasing administrative and business responsibilities of officers in foreign-going ships, it is manifest that ability to use English is a matter of fundamental importance, and we consider that it should be adequately tested in Board of Trade examinations. Throughout, the test should be of a practical nature, the object being simply to determine the candidates' ability to write clear and grammatical English on practical subjects that come within their scope.

"We are satisfied that the time-honoured essay should no longer enjoy a monopoly. When it is used, it should always be on a subject that is well within the practical experience of the candidate, but alternative tests should be given as, for example, in *précis* writing, letter writing and the construction of reports on the basis of a skeleton or statement of facts supplied. We have included an English test in the examinations for Second Mate and Master (foreign-going) and for Master (home-trade), and we lay considerable stress on proficiency in the subject, particularly in the Master's examination."

Now if clarity in the writing and speech of the officers of the British Merchant Navy is so desirable—which of course it is—it is necessary that the literature provided for them should be clear and to the point.

Master Mariners have to have a working knowledge of a great range of subjects. To mention some of them only—discipline, maritime law, health regulations, first aid and the care and treatment of the sick and wounded, quarantine, catering, insurance, ventilation, the sea carriage of goods, naval architecture, ship stability, salvage, wireless, hydrographic survey, tides, weather, currents and ice, to say nothing of seamanship, pilotage and navigation.

Last but by no means least they do the work at sea of the parson and the squire ashore.

If literature for seamen upon weather, currents, and ice, is to be effective and to take its proper place, it should above all things be clear and concise.

THE MARINE OBSERVER is intended mainly for the information of those Captains and Officers and other seafarers who as volunteers do the greater part of meteorological work at sea.

Their work not only assists to provide information for seamen, but it also provides information to highly specialised scientific workers in all parts of the world ashore; and scientific workers whose

working range of subjects is much smaller than of the officers of the merchant navy.

There is a constant tendency for THE MARINE OBSERVER to become too involved, that is wrapped up in words and detail.

After THE MARINE OBSERVER had been going for nine years, we made a renewed effort to correct this shortcoming. The following is an extract from the instructions to those who assist with THE MARINE OBSERVER in the Marine Division:—

"THE MARINE OBSERVER as far as possible, within the limits required for official publications, should be human. Long scientific or technical (other than technique of seamen) terms and sentences should as far as possible be conspicuous by their absence. Crispness, simplicity, and brevity of expression should be the aim of every writer in THE MARINE OBSERVER."

This is a very difficult aim to achieve amidst the concentration of so much detailed work.

We ask all concerned ashore within and without the Marine Division, and all at sea to assist us in securing this desirable clarity.

At present, and for more than a year, we have been endeavouring to compress and clarify much of the information most useful to seamen, into a handy volume, in the hope that the great majority of the Merchant Navy who cannot share in the work of the voluntary corps of marine observers, may be provided with this long-felt want of the merchant service.

The British Weather Shipping Bulletin.

In this number commencing with the British Isles, the most suitable Wireless Weather, Ice, and Time signals, for the West Coasts of Europe and Africa are given.

The British Weather Shipping Bulletin was commenced on January 1st, 1924, and its plan has been altered very little since then. A few years ago the Northern Area was added when so many fishing vessels using Northern waters had been fitted with Wireless Telegraphy or Telephony.

Some of the skippers of the fishing vessels who receive the bulletin may have guessed where the idea of naming the districts as they are named came from; but some officers and particularly the younger ones may be interested to know.

The Western Sea Board Weather Message, the first of the sort broadcast for shipping by the Meteorological Office, having proved useful, Shipping and Seamen were desirous that the service should be extended to cover Home Waters.

A plan was drawn up in the Marine Division and as far as possible a consensus of opinion of the Merchant Navy and those concerned at the ports obtained. That plan had not only to serve the purpose of the Meteorological Office and those who navigated ships fitted with W/T in 1923, but it had to be suitable for the many who might be able to receive the bulletin when the human voice could be broadcast to reach far out to sea, and which, in 1923, seemed likely in the future. The British Broadcasting Company had commenced transmissions at the end of 1922.

Now early in 1915, when after many years' service in mail steamers and recent mine sweeping with the Grand Fleet, we were suddenly called upon to take charge of a large flotilla of Drifters, it was forced upon us that to get the best out of those sterling skippers and crews, we should have to use the utmost clarity in orders.

With our Drifter flotilla we had to net with steel nets fitted with indicator buoys and later with electro contact mines the North Channel, and to patrol adjacent waters, to prevent submarines entering the Irish Sea from the Northward. They had then penetrated the Irish Sea to off the mouth of the Mersey where several vessels had recently been torpedoed.

There must be no mistake in the movements of the Drifters. A certain number of sections had to be towing nets across the fairway. Certain sections had to be patrolling certain areas. Reliefs had to

* Page 126, Vol. V, MARINE OBSERVER.

be made at the proper stage of the tide. Drifters were required in harbour for stores, coal, repairs, to give leave, and provide working parties, and be back at sea on a certain day at the appointed rendezvous at the proper stage of the tide. The movements had to be continually varied so that they would not become known to the enemy.

A very simple and effective way of giving the necessary orders was used. The Rendezvous and areas to be netted and patrolled were named after some well-known place adjacent to them. The strip of the sea next Tor Point was called Tor, that near Sanda Island, San, off the Wigtonshire coast, Wig, and so on. This worked splendidly, and so in 1923 we named the districts for the bulletin after the appropriate rivers and islands and shoals. Though the fishermen know that Forties means the Long Forties, there have been others who have not: but still the plan has helped the Meteorological Office to make itself clear in passing the word by W/T about the weather expected as learned from those maps of which Mr. CORLESS is telling us something in this number.

The Work of British Selected Ships.

"Weather forecasting in London, for those at sea in Home waters", with the accompanying Weather Maps gives proof again of that important aspect, and it is one which is much encouraged, and rightly so.

There is another and wider aspect in which the British Merchant Navy has shown the way and which is illustrated in this number.

In the "Marine Observer's Log" there are four weather charts made by Lieutenant H. HILL, R.N.R., on board S.S. *Remuera*, Captain E. HOLLAND, in the South-West Pacific, on the opposite side of the world from those of Mr. CORLESS.

May be that those highly specialized in the drawing and use of weather maps ashore will think that the isobars could be more accurately drawn and so indicate the gradients, and that more details of the reports could be charted. They too prefer large conical maps.

Mr. HILL and the officers of the Merchant Navy have to do this work in a confined space, often with the ship rolling or pitching, and they have many and other more important duties.

These charts indicate much that is useful to the sea officer with his wide outlook and great experience of weather. To the navigator they serve their purpose well. We give this work our greatest encouragement. British Selected Ships are setting a fine example all over the world, their reports are used ashore in most maritime countries, and can be received direct by ships at sea, without the delay of collection and re-transmission from the shore.

Not only are they used in some ships by charting, but they give valuable information to many ships where there may not be time to make Weather Charts.

With a knowledge of the Laws of Storms at sea much may be visualized with a few reports from ships on different bearings.

The "fronts" drawn on the weather maps may be new to some at sea who have not read the early volumes of *THE MARINE OBSERVER* and *WIRELESS AND WEATHER AN AID TO NAVIGATION*. The cold front is a term of comparatively recent years. We have so long known this at sea as the squall line, the trough, where the warm wind from lower latitudes rises and the cold wind from higher latitudes cuts under the warm air. The passing of the squall line was a time when we used to stand by the halcyards and when the yards were trimmed smartly, for that is when the shift of wind came. Hence the angles in the isobars on the maps.

Maritime Losses and Casualties.

The following from the Annual Report of The Liverpool Underwriters' Association is interesting:—

The casualties to steam and motor vessels (sailing ships omitted) of 500 tons gross register and upwards, which have been posted in

the books of the Association during the five years ended 31st December, 1933, are as follows:—

Nature of Casualty	1933	1932	1931	1930	1929
Weather Damage	356	343	421	571	693
Foundering and Abandonments ...	28	24	13	16	42
Strandings	1,268	1,177	1,354	1,428	1,786
Collisions	1,306	1,269	1,687	1,943	2,214
Fires and Explosions	303	314	377	435	582
Missing	1	2	7	6	5
Damage to Machinery, Shafts and Propellers	736	695	886	1,170	1,237
Other Casualties	1,074	1,132	1,308	1,686	1,935
Totals	5,072	4,956	6,053	7,255	8,494

Number and total gross tonnage of vessels totally lost during the years:—

	1933		1932		1931		1930		1929	
	No.	Tonnage	No.	Tonnage	No.	Tonnage	No.	Tonnage	No.	Tonnage
British—										
Sail ...	—	—	—	—	1	615	4	2,510	7	8,348
Steam & Motor	18	53,376	27	67,691	15	46,097	22	70,811	39	124,054
Totals	18	53,376	27	67,691	16	46,712	26	73,321	46	132,402
Foreign—										
Sail ...	18	19,584	17	22,079	9	8,661	14	15,955	17	20,464
Steam & Motor	94	228,202	95	269,320	97	214,065	108	261,999	146	372,577
Totals	112	247,786	112	291,399	106	222,726	122	277,954	163	393,041
Grand Totals	130	301,162	139	359,090	122	269,438	148	351,275	209	525,443

"L'Atlantique" (Fr.) held in abeyance.

These figures generally indicate that during the last five years there has been a nearly steadily reducing number of losses and casualties, and this is very apparent in the total losses of British ships. No doubt this is due largely to improving naval architecture, improving propulsion, and the ever growing efficiency of lighting including D.F. and pilotage of the Trinity House and similar authorities in different parts of the world; but freedom from loss and casualty *largely* depends upon seamanship and navigation.

To claim that weather intelligence was directly responsible for reduction of casualties and losses would be extravagant. Foundering, collisions and strandings are often largely due to heavy or thick weather.

Clear information which gives the master and his navigating officers the best knowledge of weather currents and ice for their purpose, will best help them in their seamanship and navigation, and so help to reduce the casualty list and be a factor in making shipping pay.

The resolutions passed at the meetings of the International Meteorological Committee at Copenhagen in 1929 for guidance in conducting the work of Selected Ships indicate all that is necessary. If correctly and liberally interpreted by those experienced at sea in the nautical languages of respective countries they will enable Selected Ships of the different nations to further this work.

MARINE SUPERINTENDENT.

London.

29th January, 1934.



April, May and June.

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

FOUR SAILING SHIPS SIGHTED ON PASSAGE.

THE following remarks and photographs are contributed by Captain T. McNAMARA, S.S. *El Uruguayo*.

On our last voyage to the River Plate we had the novel experience of sighting four sailing vessels at sea, so it appears that "White Wings" do still sail the seas.

On the outward passage we passed one of the German "Vinnens" at daybreak off Cape Frio, and when homeward bound passed the other three within 24 hours. The first, which we passed on November 2nd, in Latitude 16° 05' N., Longitude 23° 28' W., proved to be the Spanish four-masted auxiliary training schooner *Juan Sebastian de Elcano*. The following day we spoke the Finnish four-masted barque *Ponape* in Latitude 19° 58' N., Longitude 21° 16' W., who wished to be reported to Lloyds. Shortly afterwards "Sail ho" was again reported, and within four hours we spoke the Finnish three-masted barque *Penang* in Latitude 20° 40' N., Longitude 20° 54' W.

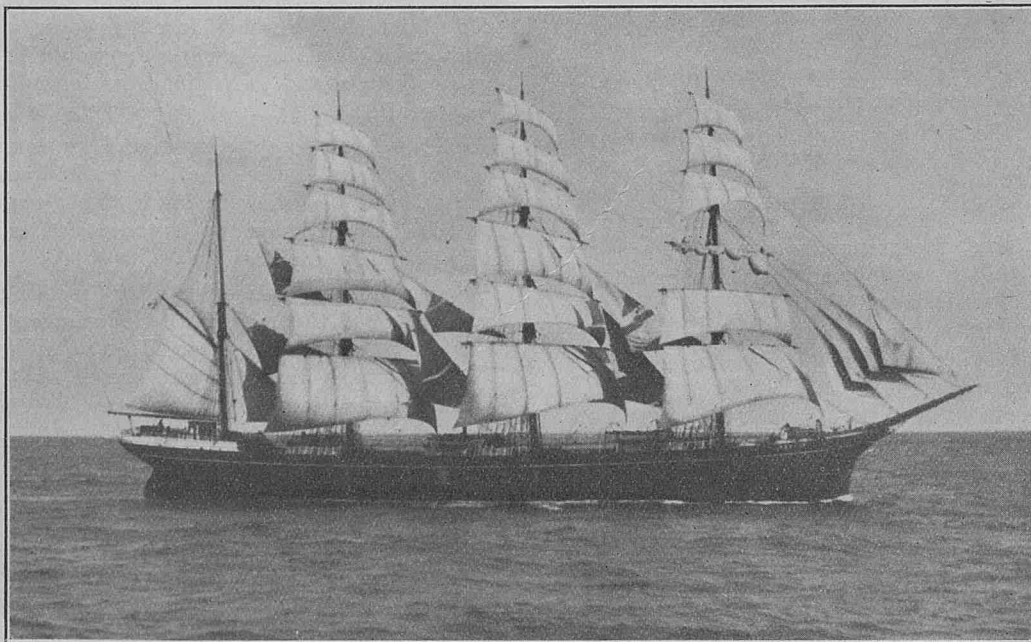
When we passed the *Ponape* it was noticed they were clewing up the fore upper topsail, and that there were three men on the yard, so one can only surmise that they were bending their fine weather topsails on entering the tropics.

On passing the *Penang* at sunset we noticed that the hands, which had apparently finished work for the day, mustered on the forecastle head to watch us go by.

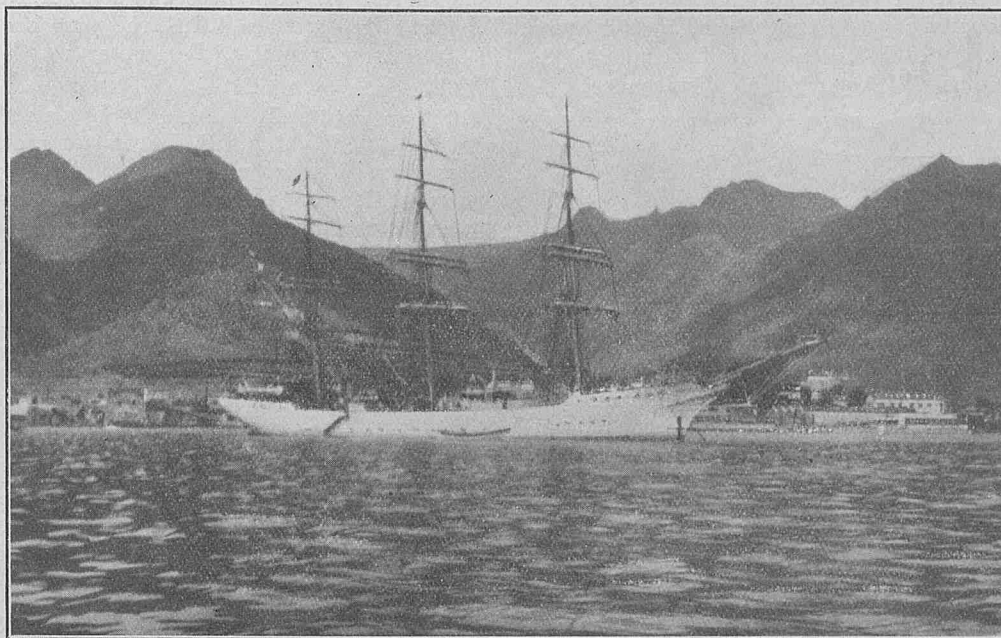
At the time of our passing both vessels were taking full advantage of the moderate to fresh N.E. trades then blowing, running with the wind on the port quarter and doing about 7 or 8 knots.

It is interesting to note that the *Ponape* and *Penang* passed Elsinore the same day, October 8th, outward bound for South Australia, and were still only about 70 miles apart when we spoke them on November 3rd.

Although on the race homeward from Australia this year the *Ponape* and *Penang* took 121 and 123 days respectively, they are both credited with having a good turn of speed, as I remember



Finnish 4-masted barque "Ponape," November 3rd, 1933.



Danish Ship "Danmark," Teneriffe, November 5th, 1933.

the *Ponape* making the passage from Cardiff to Port Lincoln in 86 days in 1929, and the *Penang* going out to Port Victoria last year in 75 days from Dungeness. The *Ponape*, 1,974 tons, was originally the *Bellhouse* and built at Genoa in 1903; the *Penang*, 1,743 tons, ex *Albert Rickmers*, built at Bremerhaven in 1905.

There does not seem to be much notice taken of these vessels' outward passage, but it should be interesting to watch their progress to Australia to see how they fare, and also when they depart homewards on the fourteen thousand stretch around Cape Horn.

Captain G. ERIKSON, the owner of these vessels, I believe, is besieged with applications for jobs from all countries, but now owing to the Finnish law which says "Finn crews for Finnish ships" they can only be accepted as passengers at 10s. per day.

On our arrival at Teneriffe, November 5th, we found the new Danish training ship *Danmark* at anchor, and the cadets gathered abaft the mainmast receiving instruction.

23rd May, 1933, 0400 G.M.T., vessel passed through numerous irregular banks and patches of phosphorescence; this phenomenon lasted for approximately three-quarters of an hour, and at times the whole sea (as far as the eye could observe) was affected, emitting a light milky colour.

Close to the vessel it had the appearance of milky patches thickly studded with bright stars, some of which seemed to expand and contract with little change in brilliance, but mainly they appeared to be floating inanimately on surface.

Conditions at time, wind N.E. force 3, smooth sea, and short low N.N.E. swell, sky heavily overcast throughout. 0530 G.M.T. observed further patches of phosphorescence similar to, but less bright than, those seen previously.

Position of ship: Latitude $7^{\circ} 35' N.$, Longitude $27^{\circ} 20' W.$

PHOSPHORESCENCE.

New Zealand Waters.

THE following is an extract from the Meteorological Record of S.S. *Tasmania*, Captain J. V. WILLIAMS, Sydney to Lyttleton, New Zealand, observer Mr. L. MERCER, 3rd Officer.

May 21st, 1933, 23.30 A.T.S., ship was seen to be approaching what appeared to be a long line of surf; upon entering it was found to be a large field of phosphorescent sea composed of what seemed to be roundish blobs arising from bottom, each blob being approximately 1 ft. in diameter.

The wake of vessel appeared to be a sheet of green flame to horizon. It was remarked no phosphorescent water was seen before or after patch, which was very defined. Ship clear of patch midnight. Sample of water obtained. Density 1025. Nothing unusual appeared about it.

Position of ship: Latitude $38^{\circ} S.$, Longitude $169^{\circ} E.$ approximately.

PHOSPHORESCENCE.

North Atlantic Ocean.

THE following is an extract from the Meteorological Record of S.S. *Princesa*, Captain A. B. FRIEND, Santos to Teneriffe, observer Mr. E. J. LOUGHEED, 2nd Officer.

PHOSPHORESCENCE.

South Pacific.

THE following is an extract from the Meteorological Log of S.S. *Rotorua*, Captain C. B. LAMB, Balboa to Wellington, observer Mr. W. J. GLASSBOROW, 2nd Officer.

May 26th, 1933, 01.05 A.T.S. passing through a number of very phosphorescent streaks in sea, spaced fairly regularly about 1 cable apart and extending in a N.E. to S.W. direction, as far as could be seen on either hand. About 30 streaks were noticed and three could be seen at one time; the bow wave and wake, however, did not show unusual phosphorescence. Night cloudless with clear atmosphere.

Position of ship: Latitude $3^{\circ} 12' S.$, Longitude $91^{\circ} 50' W.$

EARTHQUAKE TREMORS.

South Pacific.

THE following is an extract from the Meteorological Log of S.S. *Northumberland*, Commander H. L. UPTON, D.S.C., R.D., R.N.R., Balboa to Auckland, observer Mr. C. B. CATHIE, 3rd Officer.

May 20th, 1933, at 20.37 A.T.S. (0815 G.M.T., May 21st) in Latitude $36^{\circ} 07' S.$, Longitude $177^{\circ} 29' W.$, experienced sustained earthquake

tremors, causing vessel to vibrate for 12 seconds. Tremors estimated to be about one-fifth the intensity of those experienced by this vessel in Napier on February 2nd, 1931. S.S. *Mahia* in Latitude 39° S., Longitude $177\frac{1}{2}^{\circ}$ W. (approximately), reported no disturbance.

PAMPERO.

Off Bahia Blanca.

THE following is an extract from the Meteorological Record of S.S. *Cumberland*, Captain T. L. MALTBY, Wellington to London, via Cape Horn. Observer, Mr. H. H. MACKILLICAN, 3rd officer.

25th June, 1933, weather gave indications of becoming unfavourable.

At 04:00 A.T.S. wind north, force 3, slight sea and N'y swell. Barometer 1005 mb. falling, air 41° , sea 42° . Heavy banks of nimbus clouds passing overhead very rapidly from N.W., sky nearly overcast.

At 05:00 A.T.S., after barometer had fallen 5.0 mb., wind backed sharply to N.E., force 3 to 4, freshening, sea and swell increasing. By 09:00 A.T.S. wind was blowing with gale force, sky overcast (Nb), weather "ugly and threatening" with considerable drizzle.

Noon A.T.S., wind N. by E., force 9, with frequent fierce squalls of force 10 accompanied by heavy rain. Speed was reduced and course adjusted to prevent damage to the ship, because by this time the sea and swell had become very rough (swell very steep

and short). Between 13:00 and 15:00 A.T.S. the weather moderated somewhat but at 16:00 A.T.S. the wind backed to N.N.W., force 5 to 6, freshening rapidly. Barometer at this time reading 984 mb. steady.

16:30 to 20:00 A.T.S., wind backed slowly to W. by N., force 10.

20:00 to midnight A.T.S., barometer rising slowly, wind W. by N., force 10, with frequent violent squalls of force 11 to 12 (wind estimated at blowing at nearly a hundred miles an hour—vessel lying over to starboard with a list of approximately ten degrees for from five to twenty minutes at a time). Sea very high and a very heavy short, steep swell.

It is of interest to note that although speed was reduced between 10:00 and 16:41 A.T.S. to 11.5 knots, very good stellar observations showed that vessel had averaged a speed of 14.51 knots over the ground from noon on 24th July to 16:41 A.T.S. on this day (speed before gale started was 14.0 knots).

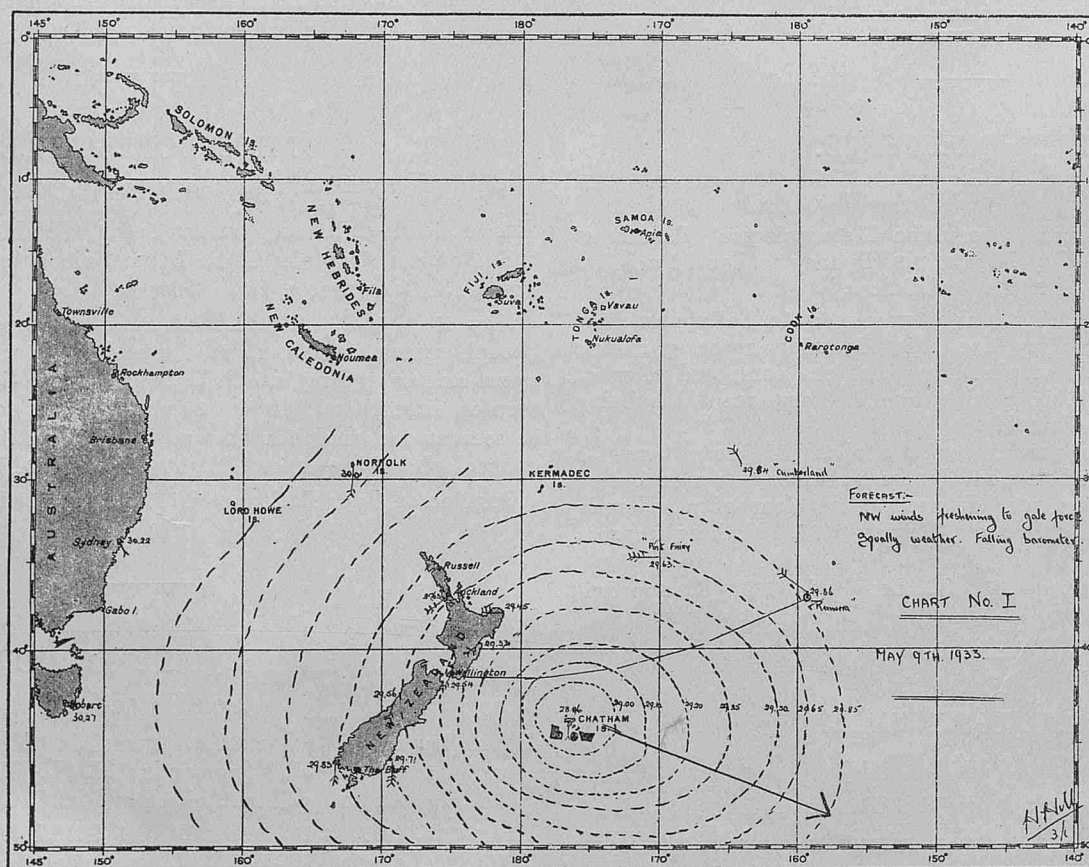
There was no change in the weather conditions until 06:00 A.T.S., 26th June, when wind backed to W. by S., force 9 to 10. Barometer rising rapidly throughout. 10:00 to 18:00 A.T.S. (26th), wind backing slowly to S.W., force 9 to 10, with frequent fierce rain and hail squalls (wind force 12 at times).

Midnight, weather slowly moderating to strong S.W. breeze which continued until arrival in Monte Video. Swell decreased rapidly shortly after midnight. Day's run from noon on 26th to noon on 27th was 350 miles, an average speed of 14.68 knots. (Ship steamed by revolutions 303 miles approximately.)

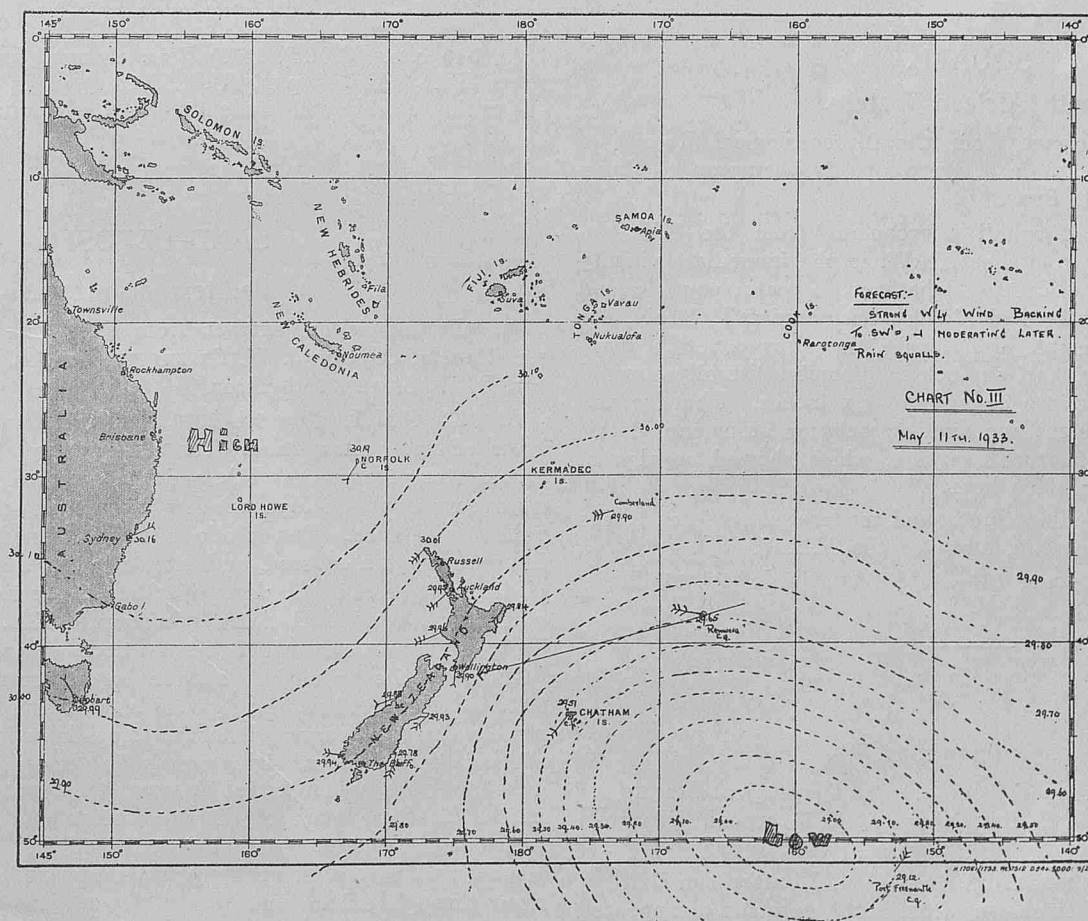
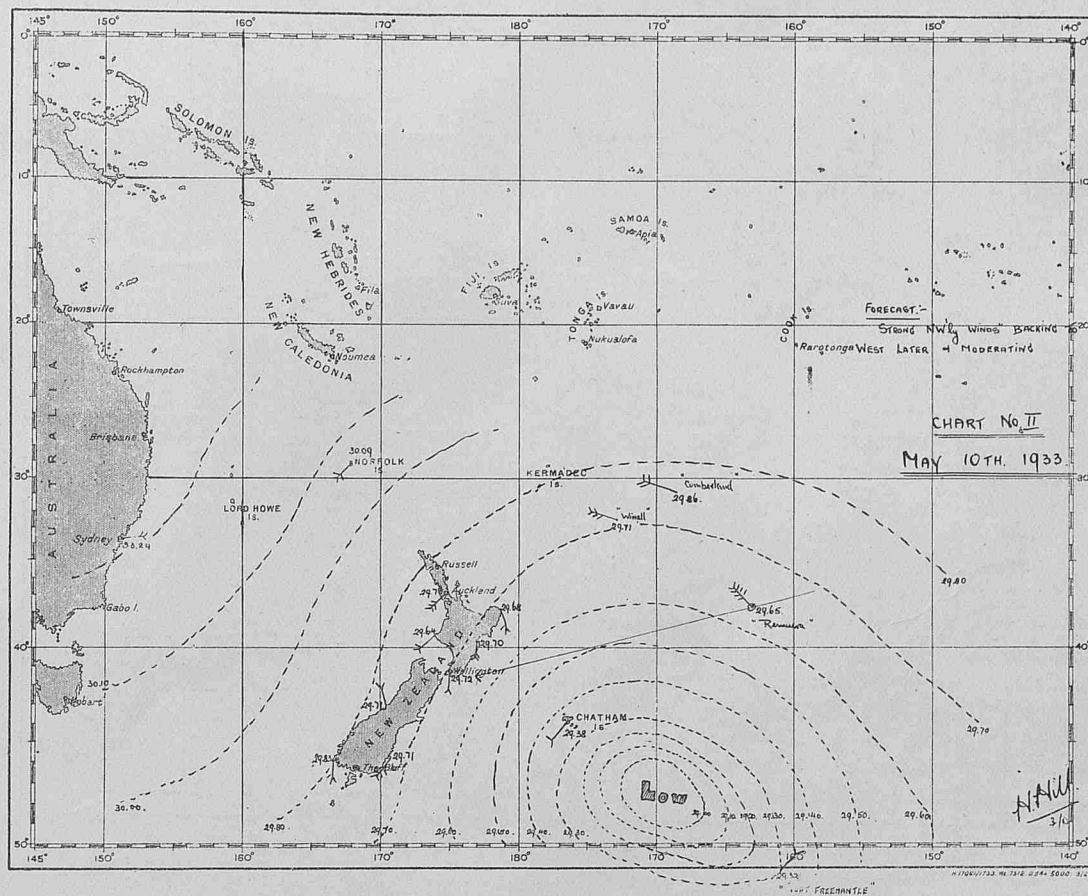
WEATHER CHARTS MADE AT SEA.

South Pacific Ocean.

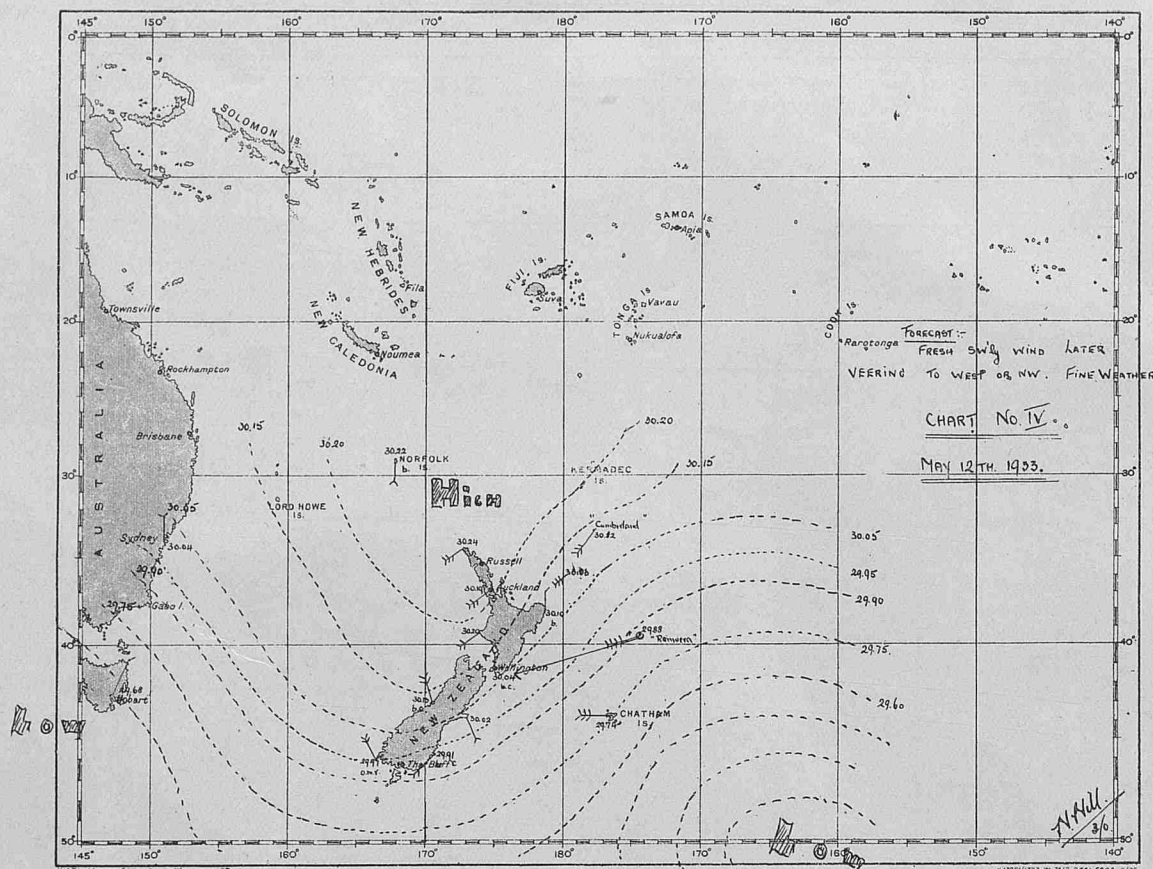
A series of weather charts made at sea on board S.S. *Remuera*, Captain E. HOLLAND, Balboa to Wellington, by Lieut. H. HILL, R.N.R. 3rd officer.



Weather Charts made at Sea—cont.



Weather Charts, made at Sea—cont.

**SQUALL.****South African Waters.**

THE following is an extract from the Meteorological Record of S.S. *Balmoral Castle*, Captain J. ATTWOOD, Southampton to Cape-town. Observer, Mr. H. BUNN.

24th May, 1933 a hard squall approaching from the S.W. encountered a similar one from the W.N.W. in the immediate vicinity of the vessel. With no warning whatever, a waterspout formed beneath each squall, but instead of the anticipated fall of rain, the vessel was assailed from all directions at once by a terrific hail-storm, stones up to fully half an inch in diameter literally covered the vessel's superstructure to a depth of six inches. Thunder and lightning of the most violent and vivid description accompanied this violent manifestation of nature's powers, which showed no sign of abatement for a quarter of an hour.

The wind finally backed to South and moderated to force 3, the combined disturbances passing away to the N.N.W.

Position of ship: Latitude 34° 20' S. Longitude 23° 08' E.

GREEN RAYS AT SUNSET.**Arabian Sea.**

THE following is an extract from the Meteorological Record of S.S. *Tuscania*, Captain W. B. ROME, Bombay to Liverpool. Observer, Mr. J. NOBLE, 3rd officer.

1st April, 1933, 6.45 p.m. A.T.S. 1515 G.M.T., after sun had set two green rays appeared emanating from spot where sun disappeared behind a low bank of fracto-cumulus clouds bearing 265°. Altitude of clouds forming bank 2°.

At 7-10 p.m. (G.M.T. 1540) Rays changed into an arc of diffused green light. At 7-16 p.m. (G.M.T. 1546) green light disappeared. Position of ship: Latitude 15° 29' N. Longitude 58° 13' E.

SAND DEPOSIT.**Mediterranean Sea.**

THE following is an extract from the Meteorological Record of s.s. *Manela*, Captain J. W. GILCHRIST, London to Calcutta, observer Mr. D. W. SPEIRS, 2nd officer.

At 0430 G.M.T. May 9th 1933, the vessel became coated with a layer of fine yellow sand. The atmosphere at the time was very humid (temperature 64° F.), and the combination of dampness and sand caused the Bridge window to become coated with a greasy yellow substance. The windows were cleaned off, but two hours later were again covered, and after cleaning a second time remained clear for the rest of the day. Weather at the time was dull, overcast and heavy, wind N.E. force 4, moderate N.E. sea and swell, visibility moderate. Previous observations during the middle watch (4 hours earlier) showed that the barometer fell from 29.84 in. to 29.74 in. (corrected readings), wind backed from E. to N.E. 4 to 5 and sky clouded from eastward. Observations later in the day 1635 G.M.T. showed the barometer rising slowly, but the wind back to N. 2 to 3. It can only be assumed that this was the result of some disturbance in the Eastern Basin of the Mediterranean, and that the atmosphere at the time of observation had held the sand in suspension for some time. Several small birds flew on board, and three were found dead through exhaustion.

Position of ship: Latitude 35° 11' N., Longitude 19° 06' E. Course 100°. Speed 11 knots.

LUNAR RAY.

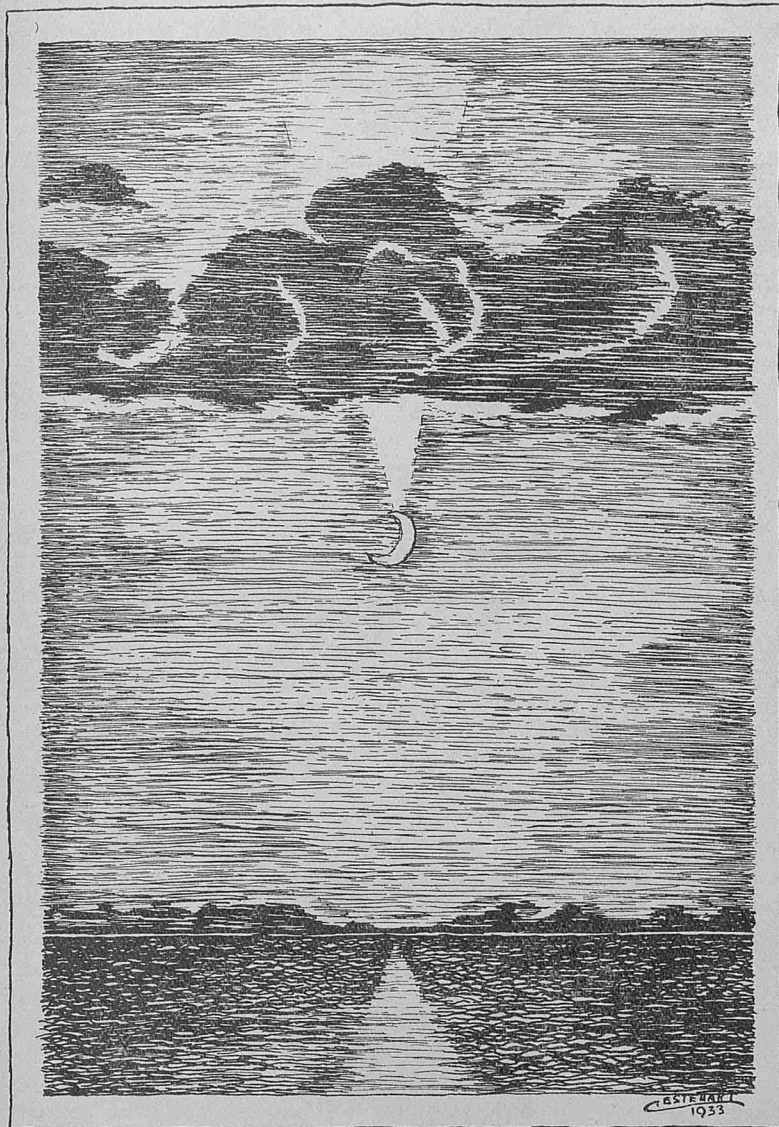
North Atlantic.

THE following is an extract from the Meteorological Record of S.S. *Transylvania*, Captain D. W. BONE, New York to Moville,

Observers, Messrs. C. B. STEUART, 1st officer, and A. Middleton, 3rd officer.

On 2nd May, 1933, at 0230 G.M.T., an orange-coloured vertical ray was observed projecting from the moon's upper limb at an altitude of about 6 degrees. This ray was very pronounced until it was covered by cloud at 0245 G.M.T. and was not seen again. Weather at time was very clear with sky 4/5 covered by Cumulus and Fracto-Cumulus cloud. Auroral displays had been noted to northward about four hours previously.

Position of ship: Latitude $53^{\circ} 40' N$. Longitude $25^{\circ} 12' W$.



CLOUD FORMATION.

Bay of Bengal.

THE following is an extract from the Meteorological Record of S.S. *Manela*, Captain J. W. GILCHRIST, London to Calcutta, Observers, Messrs. D. W. SPEIRS, 2nd officer, and L. B. MOFFATT, 3rd officer.

An unusual cloud formation bearing 270° and stationary was observed in the Bay of Bengal at 1305 G.M.T. on Monday, May 30th, 1933. The cloud effect consisted of three separate formations, imposed one above the other, and relieved out to make each have a very marked appearance, viz., stratus layers, then cumulo-nimbus (very dark and heavy), surmounted by streaks of black cirrus at the apex. The whole combination laid against a background of blue sky, presented an extremely unusual appearance, the cirrus streaks making the cloud appear to be turning about its apex, in fact a small revolving storm on its own. Lightning, although not vivid, was observed, but confined to the cloud. One hour later the whole had dispersed to an alto-cumulus formation. Wind S.S.E. 4. Other clouds:—cirrus, stratus, total proportion covered 4.

Position of ship: Latitude $13^{\circ} 58' N$., Longitude $81^{\circ} 12' E$. Course 45° .

NOTE.—The weather in May in the Bay of Bengal is frequently disturbed and is changeable in the south, with intervals of fine weather alternating with cloudy and squally conditions and heavy rain. The above observation was made near the coast northward of Madras. The Indian Daily Weather Reports for May 30th and 31st, 1933, show that a low-pressure area was situated over N.W. India, but that there was no general disturbance over the Bay of Bengal. Reports from coast stations indicate the occurrence on these days of thunderstorms, squalls and dust storms in various places in Madras and elsewhere.



MIRAGE.

Red Sea.

THE following is an extract from the Meteorological Record of S.S. *Aeneas*, Captain J. HATFIELD, Birkenhead to Colombo, Observer, Mr. G. H. SMITH, 3rd officer.

June 30th, 1933, proceeding down the Red Sea from Straits of Jubal, atmospheric conditions were very abnormal, mirage and distortion being very common.

Approaching the Brothers Lighthouse from the Northward, a very distinct mirage was observed, the inverted image of the lighthouse and island being exceptionally clear. Passing ships suffered remarkable distortion, but the forms were too varied and changed too rapidly for any sketches to be made. Temperature Air 90°, Sea 80°. The Brothers Light was passed at 7.30 p.m. (A.T.S.) and remained visible until 11 p.m. (A.T.S.), ship steaming 18 knots. In this case, the number of images was constantly changing, seven, vertically disposed, being the maximum number observed.

These were constantly merging, separating and disappearing, at times, the top and bottom images only remaining visible with a gap between.

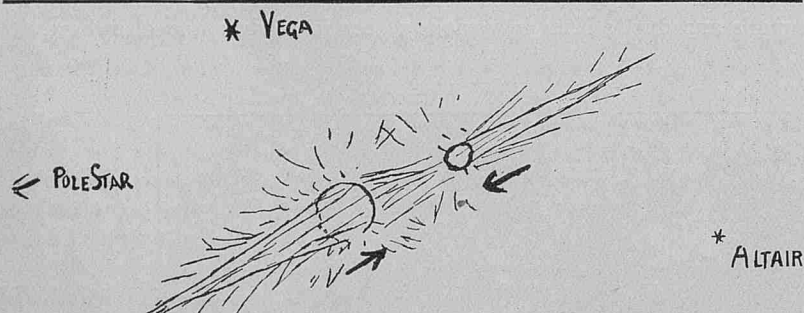
From a distance of 25 miles onward, the lower part of the image showed a distinct reddish tinge, but this was not always confined to the lowest image. In some instances this appeared white, while the second, or third images from the bottom showed red. The wind at the time was W.N.W. force 3. Air 84°, sea 79°. It is interesting to notice that there appeared to be less distortion to the southward, approaching vessels showing little or no sign of abnormal refraction, while the Daedalus Reef light was observed 27 miles, only 8 miles outside the extreme range of visibility.

METEORS.

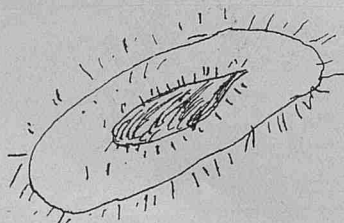
North Atlantic Ocean.

THE following report has been received from S.S. *Gaelic Star*, Captain J. ROBERTS, Colon to Liverpool, Observer, Mr. R. S. HOPPER, 2nd officer.

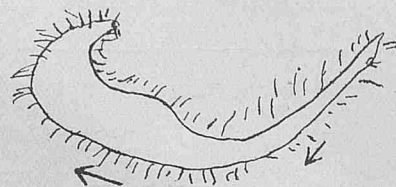
May 2nd, 1933, meteors observed about 03.05 A.T.S., 0607 G.M.T., in Latitude 36° 50' N., Longitude 46° 55' W. At 3.05 a.m. two vivid white balls appeared in this relative position between Altair and Vega about 35 degrees high bearing N.W. As they approached, the larger one shot out a tongue of flame into which the small ball disappeared. From first sight to disappearance took about a minute.



3.06 a.m. The two balls merged into one in approximately this shape. There was a darkness in the centre which may have been due to optical illusion caused by the surrounding brightness. About two minutes elapsed before it started to change its shape again.

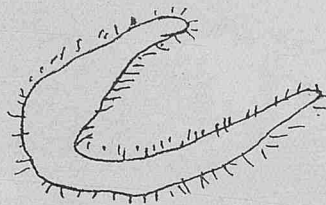


3.08 a.m. There was a sudden movement in direction of arrow gradually slowing up in speed until movement was barely perceptible. None of the original brightness was lost and the appearance was that of white-hot gas.

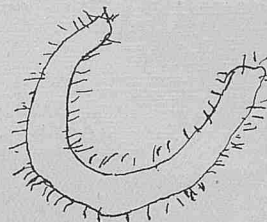


3.12 a.m. At the end of four minutes it had attained this shape and was starting to dim a little.

The position in the sky was the same throughout and at the commencement the brightness seemed about that of vivid lightning.



3.14 a.m. This was the final shape which was maintained until it faded, about twelve minutes later. Until about 3.20 a.m. it was still bright enough to show up objects about the deck.



METEOR.

New Zealand Waters.

THE following is an extract from the Meteorological Log of M.V. *Port Fremantle*, Captain W. GILLING, Port Chalmers to Dakar. Observer, Mr. C. J. GORLEY, 4th Officer.

7th May, 1933, at 11.34 p.m. A.T.S. observed bright meteor travelling from the zenith in an East to West direction and passing close to Jupiter which was bearing about W. by N. with an approximate altitude of 15°.

Just before reaching Jupiter the meteor burst, taking on the form of a diamond, bright white in colour and bisected by a green band.

The green band had its origin in the lower corner in the shape of a ball.

This phenomenon remained visible two or three seconds, illuminating the surrounding sky and leaving a thin tail in its wake.

Sky at the time was cloudy, Ci and Cu 5/10, with good visibility.

Position of ship: Latitude 47° 05' S. Longitude 175° 04' E.

METEOR.

South Pacific.

THE following is an extract from the Meteorological Log of S.S. *Makura*, Captain D. MACDONALD, Papeete to San Francisco. Observer, Mr. G. H. EDWARDS, 4th Officer.

22nd June, 1933, 9.49 p.m. observed exceptionally brilliant meteor between Altair and Saturn, bearing East (true) at an approximate altitude of 21° . Without a previous track of light to indicate its direction of travel, the meteor suddenly burst into existence and fell

vertically from the above-mentioned altitude, lighting up the whole of the heavens like daylight for a period of about 3 seconds. Numerous fragments emanated from it upon bursting; the whole phenomenon giving the appearance of a star shell or rocket bursting and falling.

Position of ship: Latitude $3^{\circ} 13' S$. Longitude $143^{\circ} 30' W$.

At 11 p.m. another brilliant meteor of the same characteristics fell vertically from exactly the same point in the sky.

Position of ship: Latitude $2^{\circ} 53' S$. Longitude $143^{\circ} 22' W$.

ICEBERGS IN THE SOUTH ATLANTIC.

BY LIEUTENANT R. A. B. ARDLEY, R.N.R., 2ND OFFICER, R.R.S. "DISCOVERY II," CAPTAIN A. L. NELSON.

In the Atlantic sector of the Southern Ocean, between Cape Horn and the Cape of Good Hope, icebergs are generally more numerous and larger, and drift into lower latitudes than is usually the case in other parts of the Ocean.

The chief source of this continuous output of large bergs is the basin of the Weddell Sea. In the western part of this great bight, the current sets northerly, then along the coast of Graham Land until clear of Joinville Island, where it joins the main stream of the Antarctic easterly drift and the bergs are carried up in a general North-easterly direction and scattered over the whole of the South Atlantic eastward of the South Shetlands.

The main stream of the berg-drift debouches from the Weddell Sea through the passage between the South Orkneys and Clarence Island in the South Shetlands. In this passage, 200 miles wide, hundreds of bergs are always met with. The majority of these are large tabular bergs of recent appearance, usually with clean-cut fracture planes and very little evidence of sea-wear, and there is little doubt that they come up almost directly from their parent barrier. Many of them are from one to five miles in length. In this passage, three large ice-islands have been seen in recent years. One, 35 miles long in one direction and probably even more in the other, was encountered by the *Discovery* in February, 1927; one, 40 miles long and 10 wide, by *Discovery II* in March, 1931, and one 38 miles long and 12 wide by *Discovery II* in February, 1933. Another, at least 70 miles long, was coasted by *Discovery II* in February, 1930, in latitude $55^{\circ} S$. Longitude $32^{\circ} W$. and it is reasonable to assume that this enormous mass of ice also passed through the Orkney passage. These ice-islands are perfectly level-surfaced and of uniform height, individuals varying usually from 60 to 180 feet, and they must calve from some great barrier similar to the Ross Barrier. In the writer's opinion, there must exist, between Vahsel Bay at the head of the Weddell Sea, and the Larsen barrier fringing the east coast of Graham Land, an enormous ice-shelf of the same character as the Ross Barrier and probably of greater extent. This hypothetical barrier could easily have a 700 mile long front. FILCHNER, in 1912, found a barrier with cliffs 60 to 85 feet high, trending to the North-westward from Vahsel Bay, which lends weight to this supposition. This is the only possible explanation for the great ice-islands which so frequently come out from the Weddell Sea, for on the Coats Land or eastern shore the land rises close behind the fringing ice-cliffs, and no very large bergs can have their origin there.

SHACKLETON found an ice-tongue in Latitude $74^{\circ} S$., Longitude $25^{\circ} W$., in 1914, but this tongue was only 40 miles square. It was the only large example of shelf-ice along the entire eastern coast of the Weddell Sea.

On the accompanying chart, the approximate western limits of the main drift of large bergs, after they have passed clear of the Weddell Sea, is shown by a pecked line. Again, further north, the main stream of the drift, in normal years, seems to lie in the 300-mile wide passage between South Georgia and the northern isles of the South Sandwich group.

Hundreds of bergs are always met with here, though large bergs are not usually abnormally numerous round the Sandwich Isles themselves.

After passing the latitude of South Georgia, the drift continues to the east and northward, probably not very rapidly, and the bergs break up on reaching warmer latitudes.

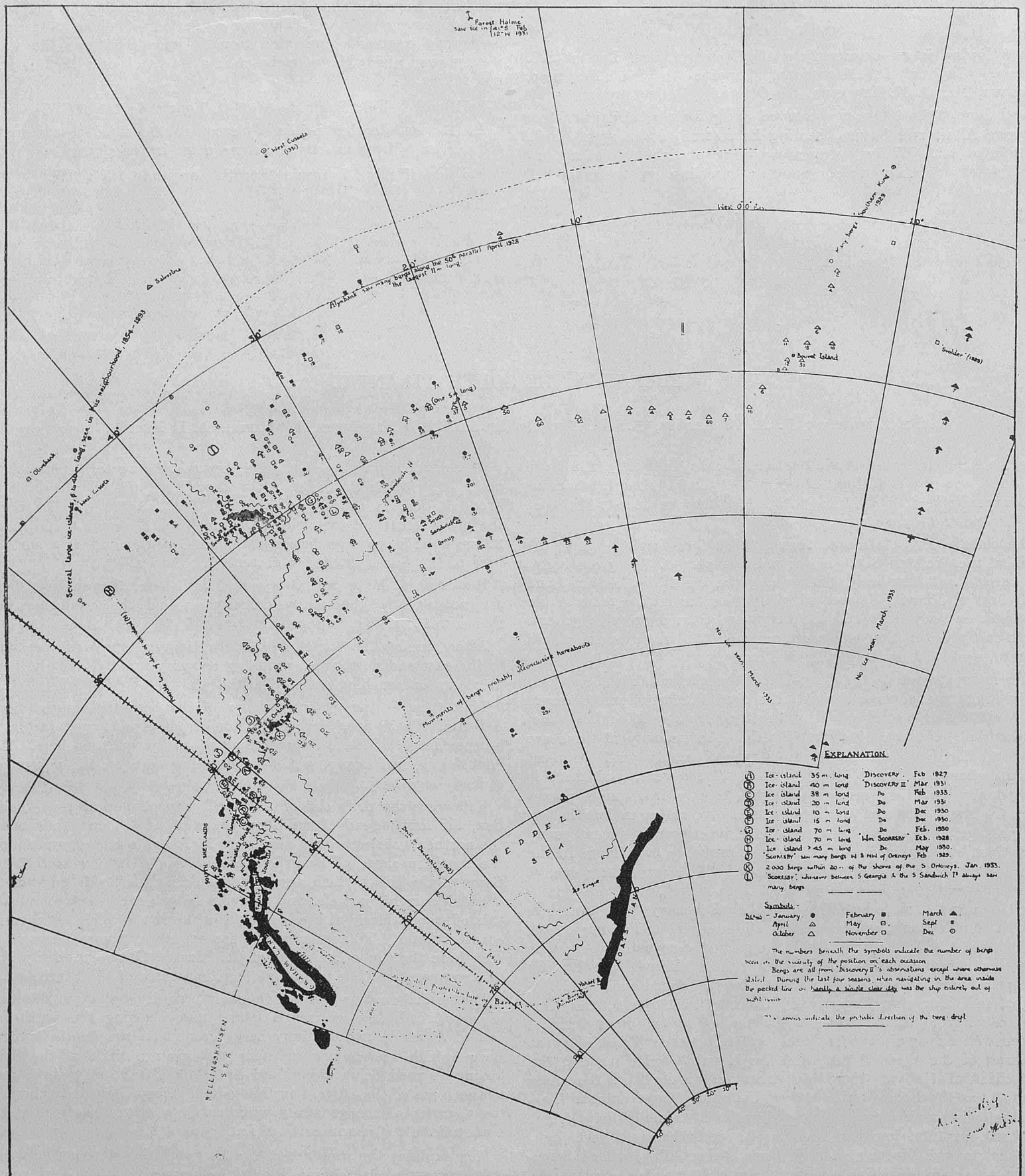
This, then, is the general scheme of the berg-drift in the South Atlantic. There are, however, a number of conditioning factors to be considered. Sea-ice is not brought into the question here. It is doubtful if even heavy pack has much influence on the movements of very large bergs.

Following the drift out of the north-west corner of the Weddell Sea, the first spread of the bergs takes place. A small offshoot of the northerly current turns the corner at Joinville Island, and follows the southern shore of Bransfield Strait as a coastal westerly drift. Some of the bergs which are carried up near the inside edge of the Weddell current, just clearing Joinville Island, are swept round with this offshoot. Many of these ground in the shallows of the northern coast of Trinity Peninsula, and there are always more bergs to be seen here than in other parts of the Strait. Others probably drift into comparatively stagnant water in the centre of the Strait.

The normal western limit of the main stream passing out describes a curve north from Clarence Island and touching the north-west end of South Georgia. Many bergs ground on the South Orkneys. Bergs which are moving up near the western limit of the drift, having escaped being swept into Bransfield Strait, may move clear of the force of the current further north. They then drift about at the vagaries of the generally weak currents prevailing west of the Longitude of $50^{\circ} W$. and north of Latitude $56^{\circ} S$.

This explains the presence of the bergs which are sometimes seen quite near the Patagonian shelf. An undue prevalence of south-easterly gales also tend to bring this condition about. In 1927 and 1928, bergs were very numerous north of the Falkland Islands, and were even seen within 100 miles of the River Plate. It seems probable that either an ice-island, or a large collection of large bergs, escaped from the north-easterly drift during the previous season and moved north and a little west instead of north and east.

It is almost certain that these bergs issued originally from the Weddell Sea, for little ice was seen in the Drake Strait that year.



Ice in the Region of the Weddell Sea.

Also, from our observations, bergs from the west of Graham Land (Bellingshausen Sea ice) are rarely large enough to be capable of performing such a long sea-drift. Probably only a very few bergs, seen sometimes in Drake Strait and north of the South Shetlands, come into the South Atlantic from the Bellingshausen Sea.

As the current reaches South Georgia, many bergs ground off the south shore. An offshoot of the current, after passing the south-eastern corner of the island, sets to the north-west along the northern coast, then diverges till it finally sets northward again, and is lost in the west wind drift of the Forties. This offshoot carries a number

of bergs with it, and in most years more bergs are to be seen north of South Georgia than west of it. A study of the accompanying chart will explain this.

The eastern limit of the Weddell drift is indefinite and variable. Since it lies mainly in high latitudes, it merges with bergs which are floating in comparatively stagnant water off the middle of the Weddell Sea, and which have only a vaguely northerly drift. Some bergs here might drift about in high latitudes till they finally break up from age.

Nothing definite can be said of the movements of icebergs here, then, except that the majority of them finally work north-eastward. In high latitudes odd bergs may always be expected.

An interesting circumstance was experienced in March, 1933, when,

from $62^{\circ} 10' S.$, $6^{\circ} 36' W.$ to $69^{\circ} 05' S.$, $9^{\circ} 19' E.$, no bergs at all were seen. Again, from $68^{\circ} 52' S.$, $10^{\circ} 10' E.$ to $59^{\circ} 56' S.$, $14^{\circ} 36' E.$, no bergs were met. On this particular occasion the eastern limit of the drift was well defined.

In conclusion. Bergs are only in exceptional years seen north of the 40th parallel. South of 50° , they may be met with in any longitude, but only occasionally west of $50^{\circ} W.$ and north of $55^{\circ} S.$

Within the rough limits of the pecked lines however, at any season of the year, bergs are *almost certain* to be encountered, and vessels navigating in this area should exercise special precautions at night and during thick weather. Observations relating to the visual conditions of Antarctic bergs were given in *THE MARINE OBSERVER* for October, 1931.

DURATION OF ATMOSPHERIC OBSCURITY IN THE IRISH SEA.

PREPARED BY COMMANDER M. CRESSWELL, R.N.R.

When visibility is reduced at a light vessel or lighthouse by fog, mist, falling snow, or heavy rain,—or within sight of a light vessel or lighthouse there are fog banks,—which may obscure navigation marks the sound signals are made and the times are noted.

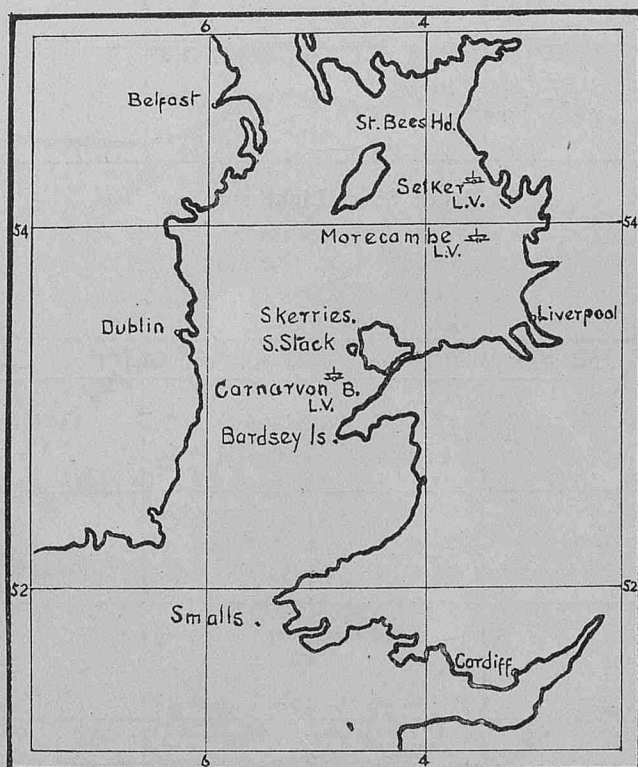


Figure 1.—Chart showing the positions of the Trinity House Stations used along the west coast of England and Wales.

Since these fog signals are an aid to navigation when there is obscurity of the atmosphere they give a good indication for the purpose of the navigator of the frequency of fog, mist, etc., at the different times of the year, if averages are worked for a long period.

The Elder Brethren of Trinity House have kindly provided the Marine Division every year since 1910 with monthly summaries, giving the number of hours during which sound signals were made.

In this investigation the following have been used:—

Shore Stations.—Smalls, Bardsey Island, South Stack, Skerries and St. Bees' Head.

Light Vessels.—Carnarvon Bay, Morecambe Bay and Selker.

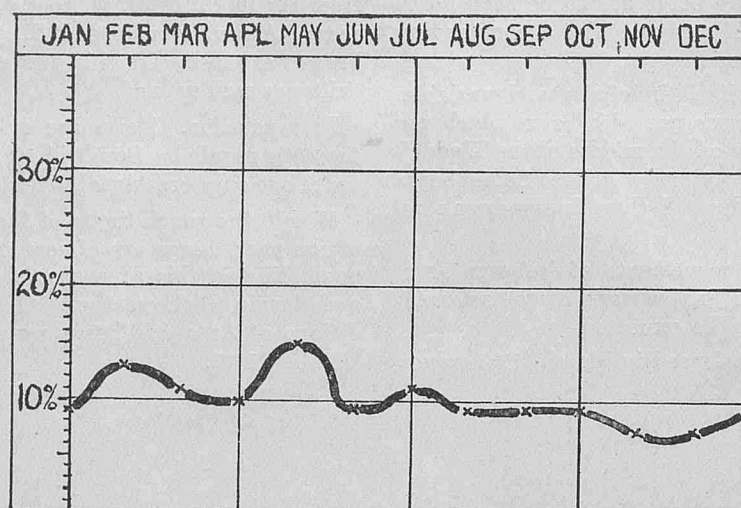
As the returns available date back to 1910, the full period of 23 years has been used in the case of the Shore Stations. During that period however several withdrawals and alterations have occurred in the positions of West Coast Light Vessels, and varying periods have of necessity had to be used. In any case it cannot be considered advisable to compare the records of Lightships with Lighthouses, as Lightships generally keep their fog horns going for a longer period than Lighthouses; possibly on account of being away from the land with nothing in the way of a distant mark to govern the working of the signal, and also from lying near considerable traffic. Separate curves for Lighthouses and Lightships have accordingly been produced.

Before proceeding further it may be helpful to give a brief description of general conditions governing visibility in this area.

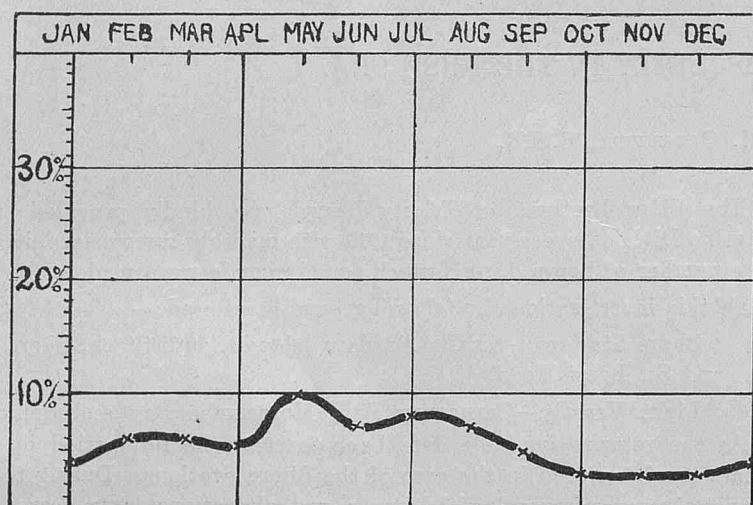
The low visibilities which occur in Spring and Summer are due to the fog which readily develops when air which has become warmed in passing over the adjacent land drifts over the relatively cold sea, or by the arrival of air direct from Equatorial Regions. The air in contact with the water becomes cooled, resulting in what is termed a shallow temperature inversion, in which a sheet of fog is formed.

Winds from North to N.E. sometimes blow with great persistence, and during their continuance the land is generally covered with a white fog resembling smoke, an appearance common during all Easterly winds.

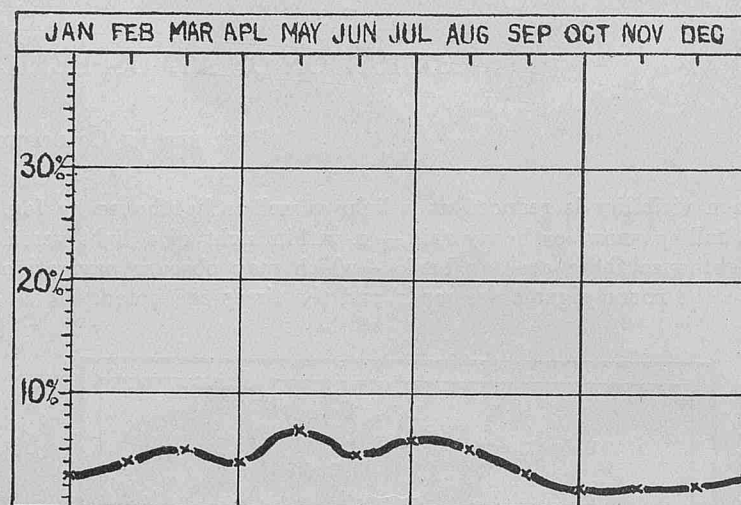
Fogs and mists are frequent when anti-cyclonic conditions prevail, especially in the Winter. In summer they generally hide the land in the morning only, and disperse as the sun acquires strength. The moist haze accompanying Westerly winds is more tenacious, and only yields to a freshening breeze, which however frequently turns to rain.



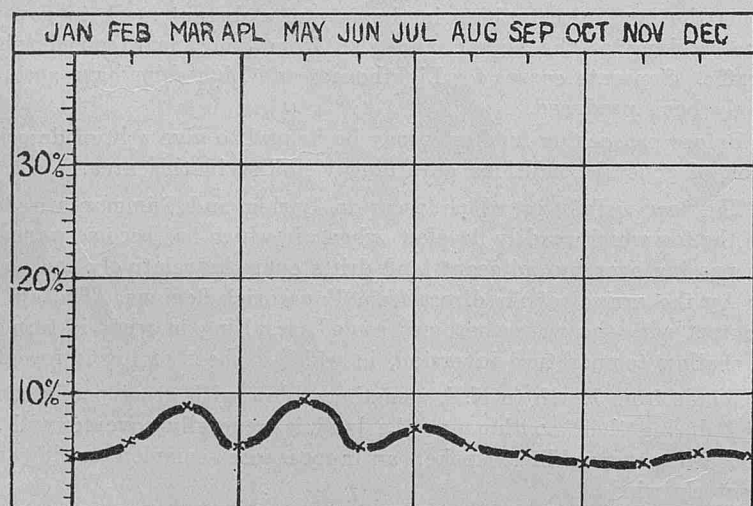
Smalls Lighthouse.



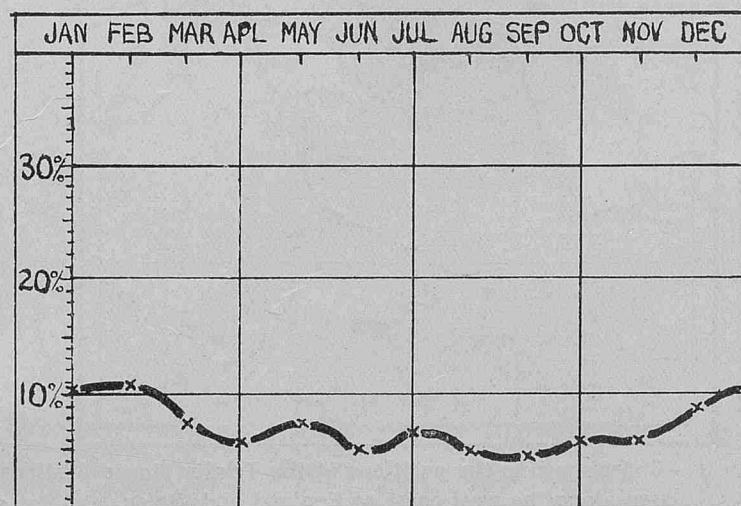
Bardsey Lighthouse.



South Stack Lighthouse.

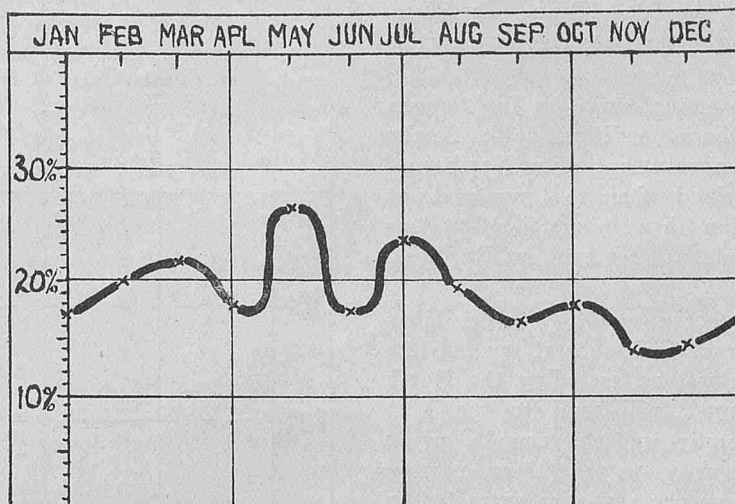


Skerries Lighthouse.

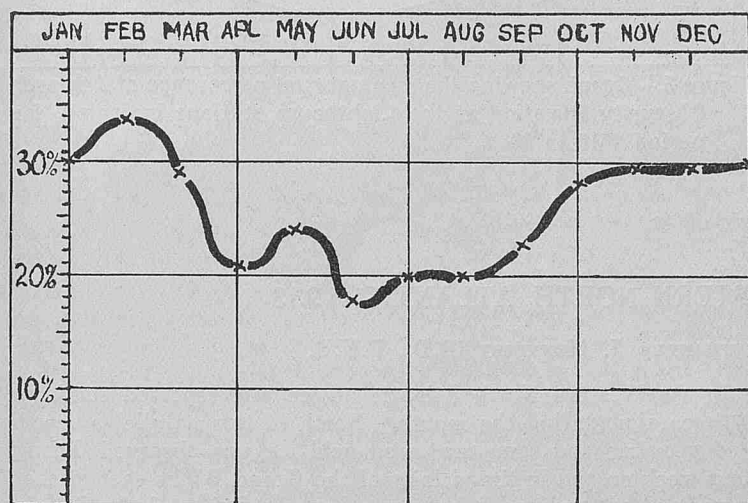


St. Bee's Head Lighthouse.

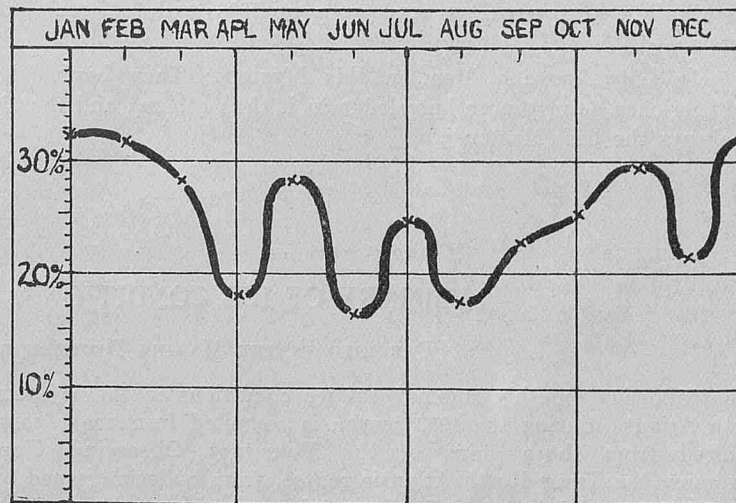
Figure 2.—Graphs showing the mean monthly percentage of Atmospheric Obscurity Duration at the above mentioned Light-house Stations.



Carnarvon Bay Lightvessel.



Morecambe Bay Lightvessel.



Selker Lightvessel.

Figure 3.—Graphs showing the mean monthly percentage of Atmospheric Obscurity Duration at the above mentioned Light-vessel Stations.

An examination of the graphs showing mean monthly percentage duration of obscurity (FIGURES 2 and 3) indicates a definite increase of thick weather during the month of May at all Stations. Otherwise the Lighthouse curves do not show any great irregularity, with the exception of St. Bees' Head, which rises during the mid-winter months to 11 per cent., but does not show such a marked increase during the month of May as the other Stations.

The curves of the two Northern Lightships, Morecambe Bay and Selker, follow St. Bees' Head in this respect, although of course with much higher values. It will be noticed that they also experience considerably more atmospheric obscurity than that recorded at Carnarvon Bay to the Southward, and it is inferred that this is due to their position at the "Head of Tide", in the Irish Sea, where contrasts of sea and air temperature are more pronounced than elsewhere, thus conducing to the production of fog and low visibility.

The writer having previously investigated Wind and Tidal height in the Irish Sea (THE MARINE OBSERVER, Volume III, page 137, and Volume V, page 210) a paragraph and chart are repeated from the last mentioned article in order to illustrate the above.

"The main tidal undulation from the Atlantic approaches the British Isles from the south-westward, and divides on reaching the south-western extreme of Ireland, one portion passing up to the Irish Sea, through St. George's Channel, and the other passing up the west and north coasts of Ireland and entering the Irish Sea by the North Channel. Finally these tide waves

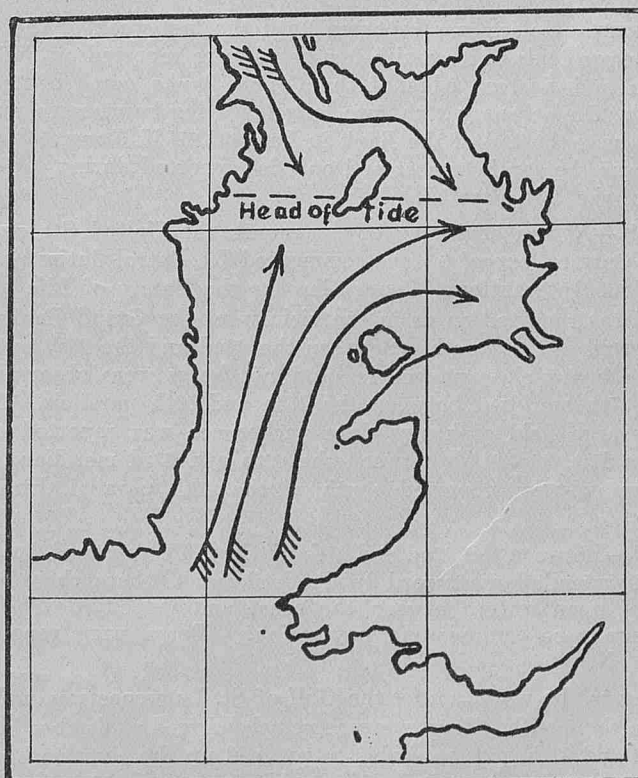


Figure 4.—Chart showing the direction of the principal flood lines of the tidal streams in the Irish Sea.

meet again in the neighbourhood of the Isle of Man. The direction of the principal flood lines of the tidal streams in the Irish Sea is shown by FIGURE 4''.

To sum up by an examination of the annual curve for Lighthouses it can be seen that the average atmospheric conditions at the Smalls of 10 per cent. low visibility show an improvement going North, and decrease to 6 per cent. at Bardsey Island, then to 4 per cent. at South Stack. A gradual deterioration then occurs, and values increase to 6 per cent. at Skerries and to 7 per cent. at St. Bees' Head.

We hope in later years to investigate the conditions of visibility in the Irish Sea, and it will be of great assistance if the masters of vessels constantly navigating these waters, including the North Channel and the St. George's Channel, will send to the Port Meteorological Office, Liverpool, carefully written remarks giving their experience of visibility and obscurity, so that these may be compared with the results obtained from the statistics extracted in the Marine Division in London, from the meteorological logs and records of foreign going observing ships.

As Captain WILLIAM DAMPIER wrote in 1698 with reference to coasters :—

"the only knowing Men on this Mystery: They having by experience gained more knowledge in it than others; and that is always the best Master".

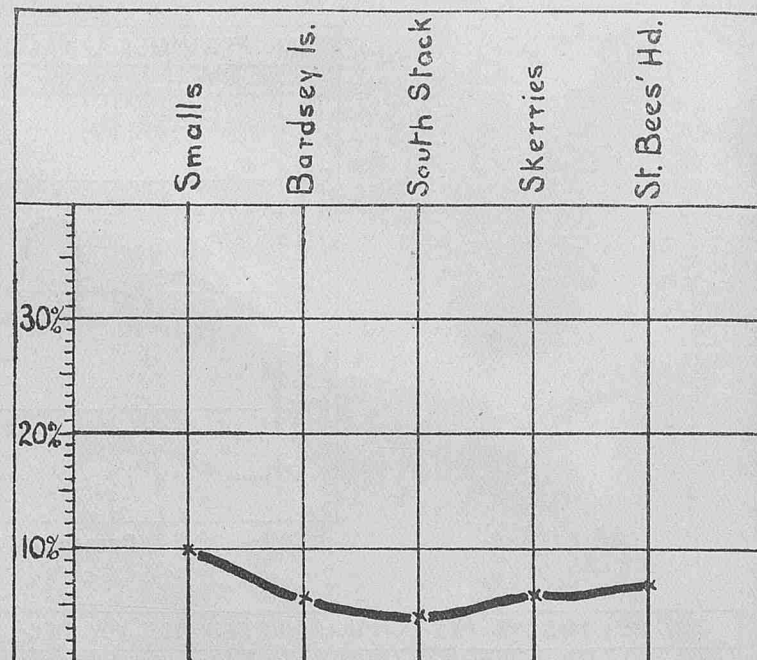


Figure 5.—Graph showing the mean annual percentage of Atmospheric Obscurity Duration at the Lighthouse stations indicated, for the period 1910 to 1932.

SUMMARY OF ICE CONDITIONS, WESTERN NORTH ATLANTIC, 1933.

PREPARED IN THE MARINE DIVISION BY COMMANDER J. HENNESSY, R.D., R.N.R.

The following monthly summary of ice conditions in the Western North Atlantic during the 1933 season is compiled from ice reports returned from those ships of the Voluntary Observing Fleet traversing the Trans North Atlantic routes, from bulletins issued by the International Ice Patrol Service, and from other sources.

January.—The only ice reported during the month was a few pieces of scattered field ice in Lat. $48^{\circ} 15' N.$ Long. $49^{\circ} 24' W.$ close to the North Eastern edge of the Grand Banks.

February.—No ice was reported until the last week of the month when heavy fields of ice and a few bergs were reported on the North Eastern and Eastern edge of the Grand Banks north of the 46th parallel. On February 27th, two long low lying bergs were reported on and near the tail of the Bank in Lat. $43^{\circ} 21' N.$ Long. $55^{\circ} 42' W.$, which was the southernmost and only ice reported during the month south of the 45th parallel.

March.—At the beginning of the month the United States Coast Guard Cutter *General Greene* commenced Ice Patrol duties provided for by the International Convention for the Safety of Life at Sea. No ice was reported on or in the vicinity of the Grand Banks prior to the 22nd of the month. Between the 22nd and the 25th extensive fields of heavy close packed ice and two bergs were observed west of the 47th meridian between the 45th and 50th parallels. On the 26th a large field of heavy close packed ice was reported on the Bank in Lat. $44^{\circ} 40' N.$ between the 60th and 63rd meridians. This was the only ice reported south of the 45th parallel during the month.

April.—Between the 22nd and 27th off the S.W. coasts of Greenland the ice extended northward to Frederikshaab where there was 18 miles of open water between the coast and ice edge. The storis was very open, unimpeding navigation. Bergs were reported in Lat. $58^{\circ} N.$

Owing to the warm spring the Gulf of St. Lawrence was navigable early in the month. Four overseas vessels arrived at Quebec between the 9th and 11th and were able to proceed up the river to Montreal on the 15th. Only once before in its history namely 12th April, 1902, has the port of Montreal been open to shipping so early in the year.

In the Western North Atlantic no ice was reported south of the 45th parallel during the month. North of this parallel a few bergs and growlers and some scattered field ice was observed during the first week on and in the vicinity of the Grand Banks east of the 52nd meridian, but westward between this meridian and the Newfoundland coast heavy fields of ice containing bergs and growlers were reported throughout the month.

May.—The Danish Meteorological Institute reported on the 12th "Ice edge 100 miles off Cape Farewell". Numerous bergs and heavy close packed ice were reported in Belle Isle Strait on the 12th.

In the Western North Atlantic, south of the 45th parallel no ice was reported throughout the month. Between the 45th and 46th parallels a few bergs were observed on the Grand Banks during the latter half of the month but north of the 46th parallel numerous bergs were reported especially in the vicinity of Cape Race. The southernmost ice reported during the month was a berg observed on May 20th in Lat. $45^{\circ} 18' N.$ Long. $52^{\circ} 03' W.$

Persistent gales from a Northerly direction driving fields of heavy pack ice south caused an impenetrable ice barrier to form along the east coast of Newfoundland which on the 15th of the month extended from the Labrador coast south to Conception Bay and persisted until the end of the month.

June.—On the 5th the Danish Meteorological Office reported that the ice in Davis Strait extended to Fiskernæsset and on the 7th the ice edge situated 60 miles off shore off Arsuk extended northward beyond visibility with two miles of open water along the coast. A few bergs were observed outside the storis. From the 17th to the end of the month in the vicinity of Cape Farewell the storis extended 50 miles off shore, consisting mainly of open ice but compact close in to shore.

Towards the end of the month, numerous bergs and heavy open field ice was reported within the Straits of Belle Isle and eastward on the shipping tracks to the 54th meridian.

A few bergs and growlers were reported on and in the vicinity of the Grand Banks north of the 45th parallel chiefly during the

first half of the month. The southernmost ice reported was a weathered berg observed on the 1st in Lat. $47^{\circ} 35' N.$ Long. $50^{\circ} 09' W.$

On June 20th, the International Ice Patrol service was discontinued for the season there being no ice likely to cause a menace to ships bound to or from United States ports.

July.—On the 10th the Danish Meteorological Office reported "Ice edge 50 miles off Cape Farewell, and 40 miles off shore in Julianshaab Bay.

Throughout the month ships navigating the Straits of Belle Isle reported numerous bergs and growlers within the Straits and eastward on both sides of the tracks to the 54th meridian.

No ice of any description on or in the vicinity of the Grand Banks was sighted during the month but a small piece of ice about 25 feet long and 12 feet wide was reported on the 16th by the S.S. *Rein* in Lat. $53^{\circ} 22' N.$ Long. $22^{\circ} 00' W.$ a phenomenal position in which to observe ice.

August.—Throughout the month bergs were observed by ships using the Belle Isle route both within the Straits and eastward on the tracks to the 50th meridian.

On August 26th a medium sized berg was reported on the North Eastern edge of the Grand Banks in Lat. $47^{\circ} 46' N.$ Long. $49^{\circ} 09' W.$, this was the only ice observed south of the 51st parallel during the month.

September.—No ice other than a few bergs observed within the Straits of Belle Isle was reported during the month.

October.—No ice of any description was reported during the month within the Gulf of St. Lawrence or on or near any of the North Atlantic steamship tracks.

November.—Owing to the abnormal ice conditions, navigation between Montreal and Quebec was officially declared closed on the 21st of the month. On the 28th close packed ice was reported everywhere between Quebec and Murray River, elsewhere within the Gulf open water.

No ice was reported in the Western North Atlantic on or near any of the steamship tracks during the month.

December.—On December 22nd the Canadian Signal Service reported "From Montreal to Middle Lake St. Peter river solid, eastward to Pointe des Monts heavy open ice everywhere. Ice probably exists down to east end of Antiscosti, Belle Isle Strait some slob ice.

No ice was reported during the month on or near any of the North Atlantic steamship tracks.

The chart shows the monthly limits within which reports of ice have been received by the Meteorological Office during the year 1933, also the monthly limits reached by ice over the period 1901-1933.

The International Ice Patrol.

Arising out of the loss of the *Titanic* through striking an iceberg off the Grand Banks in April, 1912, with great loss of life, an "International Convention for the Safety of Life at Sea" was held in London in 1914.

It invited the United States Government to undertake to continue the Ice Patrol service in the Western North Atlantic which they had inaugurated immediately after the *Titanic* disaster, the expense of which was to be borne by the nations concerned in specified proportions.

Under Article 36 of the "International Convention for the Safety of Life at Sea," 1929, the contracting Governments undertook to continue this service of ice patrol and a service for study and observation of ice conditions in the Western North Atlantic and under Article 37 the Government of the United States is invited to continue the management of these services.

Since 1913 the work has been entrusted to the United States Coast Guard, who in the spring of each year detail two or more Cutters for ice patrol duties. During the ice season a cutter is always cruising on or in the vicinity of the Grand Banks locating the ice, determining its set and drift and warning and advising approaching shipping. In addition the Patrol cutter renders assistance to vessels in distress, gives medical aid to crews of passing vessels if required,

and removes obstructions to navigation. The Patrol also obtains scientific observations for the furtherance of oceanographic and meteorological research in the region of the Grand Banks.

Surveys are also made of current and ice conditions in the Davis Strait, and with the accumulated data obtained by the Coast Guard Cutters since 1913 much has been learned of the movement and distribution of ice from its source to place of disintegration south of the Grand Banks.

North Atlantic Tracks.

The suggestion that all ships engaged in the Trans-North Atlantic Trade should follow separate routes when east bound to those used when west bound was first made by Commander F. M. MAURY, U.S.N., in 1855, but it was not until 1875 that his suggestion was adopted. The Cunard Company then laid down specified routes which all their ships were ordered to follow.

On the recommendation of the United States Hydrographic Office these routes were amended in 1891 and seven years later the Trans-North Atlantic Conference was formed consisting of the principal International Shipping Companies engaged in the Trans-North Atlantic trade. The Conference working in conjunction with the United States Coast Guard revise the tracks from time to time in accordance with Article 39 of the International Convention for the Safety of Life at Sea, 1929.

The Tracks are shown on Admiralty Route Charts published in two sections.

Chart No. 2058b showing lane routes South of Ireland and English Channel.

Chart No. 2058c showing lane routes North of Ireland.

The section of the routes running through the ice region in operation for the month are shown on the ice chart published with each Quarterly number and Monthly Supplements of The Marine Observer.

The particulars of the tracks are as follows:—

North Atlantic Lane Routes.

United States.

Track "A" (Extra Southern).

Westbound.

Will only be brought into operation when necessity arises.

Steer from Fastnet or Bishop Rock on Great Circle course but nothing South, **to cross the meridian of $47^{\circ} 00'$ West in Latitude $43^{\circ} 30'$ North**, thence by either rhumb line or Great Circle to Boston Light Vessel or to a position South of Nantucket Light Vessel.

Eastbound.

Will only be brought into operation when necessity arises.

From the position of $70^{\circ} 00'$ West and $40^{\circ} 10'$ North, or from Boston, steer by rhumb line **to cross the meridian of $47^{\circ} 00'$ West in Latitude $39^{\circ} 30'$ North**, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

Track "B" (Southern),

Westbound.

From April 11th to June 30th (both days inclusive).

Except when ice conditions necessitate the use of "A" Track.

Steer from Fastnet or Bishop Rock on Great Circle course, but nothing South, **to cross the meridian of $47^{\circ} 00'$ West in Latitude $41^{\circ} 30'$ North**, thence by either rhumb line or Great Circle to Boston Light Vessel, or to a position South of Nantucket Light Vessel.

Eastbound.

From April 11th to June 30th (both days inclusive).

Except when ice conditions necessitate the use of "A" Track.

From the position of $70^{\circ} 00'$ West and $40^{\circ} 10'$ North, or, from Boston, steer by rhumb line **to cross the meridian of $47^{\circ} 00'$ West in Latitude $40^{\circ} 30'$ North**, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

Track "C" (Northern).

Westbound.

From July 1st to April 10th (both days inclusive).

Except when ice conditions necessitate the use of "B" Track.

Steer from Fastnet or Bishop Rock on Great Circle course, but nothing South, to cross the meridian of 50° 00' West in Latitude 43° 00' North, thence by either rhumb line or Great Circle to Boston Light Vessel, or to a position South of Nantucket Light Vessel.

Eastbound.

From July 1st to April 10th (both days inclusive).

Except when ice conditions necessitate the use of "B" Track.

From the position of 70° 00' West in 40° 10' North, or from Boston, steer by rhumb line, to cross the meridian of 50° 00' West in Latitude 42° 00' North, and from this last position nothing North of the Great Circle to Fastnet or Bishop Rock.

General Instructions.

Vessels bound to or from United States ports calling at Halifax have the option of following either the Canadian or United States Seasonal Tracks to or from that port, passing 40 miles South of Sable Island Westbound and 60 miles South of Sable Island Eastbound when proceeding on U.S. Tracks and Canadian Track "D". When proceeding on Canadian Tracks "E" or "F" via Halifax, ships pass North of Sable Island both Westbound and Eastbound.

(Note.—General Instructions Canadian Tracks for vessels bound to or from the North of Ireland.)

Vessels bound direct to Portland (Maine) may follow the Canadian Seasonal Tracks.

When courses are changed at the intersections of meridians any time before or after noon, Commanders must note in their Logs both distances to and from the meridians that the ship has sailed from noon to noon, and not the distance from the position at noon the day before to the position at noon the day after the meridian is crossed.

The date on which Tracks change is to apply to the meridian of the Fastnet for Westbound steamers and the meridian of 70° 00' West for Eastbound vessels.

Communications on General Track matters between the British Lines will pass through the Cunard Line. The Holland America Line will communicate with the Continental Lines, excepting that, during the ice season, the Cunard Line will communicate direct with all Lines.

With regard to proposals for any changes in Tracks, owing to prevalence of ice, the Cunard and White Star Lines in Liverpool will confer and decide dates on which changes are to become operative, advising Lines by telegraph. Lines undertake to give immediate instructions to their steamers in accordance with such advices.

Canada.

Track "D".

From February 15th to April 10th (both days inclusive).

Westbound.

Steer from Fastnet, Inishtrahull, or Bishop Rock on Great Circle course, to cross the meridian of 50° West in Latitude 43° North, thence to Halifax or other port, passing not less than 40 miles South of Sable Island.

Eastbound.

Steer from Halifax or other port to pass 60 miles South of Sable Island to cross the meridian of 50° West in Latitude 42° North, thence on the Great Circle course to Fastnet, Inishtrahull, or Bishop Rock.

Track "E".

From April 11th to May 15th, or until the Cape Race Route Clear of Ice, and December 1st to February 14th.

Westbound.

Steer from Fastnet, Inishtrahull, or Bishop Rock on the Great Circle course, to the meridian of 50° West in 45° 55' North, thence to Halifax or the Gulf of St. Lawrence.

Note.—The Donaldson Line reserve the right to cross Longitude 45° West in Latitude 45° North on this track.

Eastbound.

Steer from Halifax or the Gulf of St. Lawrence to cross the meridian of 50° West in Latitude 45° 25' North, thence on the Great Circle course to the Fastnet, Inishtrahull or Bishop Rock.

Track "F".

From May 16th to the opening of Belle Isle Route, and to November 30th when not using the Belle Isle Route.

Westbound.

Steer from Fastnet, Inishtrahull, or Bishop Rock, on a course 10 miles North of the Great Circle track until approaching Cape Race, then steer a course to pass 10 miles South of Cape Race, thence to Halifax or the Gulf of St. Lawrence.

Eastbound.

Steer from Halifax or the Gulf of St. Lawrence to a position 25 miles South of Cape Race, thence on a course 10 miles South of the Great Circle track until approaching Fastnet, Inishtrahull, or Bishop Rock.

Track "G".

Belle Isle Route—From the opening of the Straits of Belle Isle to November 14th.

Westbound.

Steer from Fastnet, Inishtrahull, or Bishop Rock, on a course 10 miles North of the Great Circle track until approaching Belle Isle.

Eastbound.

Steer from Belle Isle on a course 10 miles South of the Great Circle track until approaching Fastnet, Inishtrahull, or Bishop Rock.

General Instructions.

Vessels bound to or from U.S. Ports from or to the North of Ireland have the option of following either the U.S. or the Canadian Seasonal Tracks "D", "E" and "F", remaining on Track "F" during the operative dates on Track "G".

On Tracks "E" and "F" vessels passing 40 miles South of Sable Island Westbound thence to position South of Nantucket and Eastbound from position 40° 10' North in 70° 00' West to position 60 miles South of Sable Island.

On Track "D" Westbound proceeding by rhumb line from position 43° 00' North in 50° 00' West to position South of Nantucket, and Eastbound from position 40° 10' North in 70° 00' West to position 42° 00' North in 50° West.

Commanders, on encountering ice, have permission to deviate from these tracks, and, after the end of October, to leave the Belle Isle for the more southerly route at their discretion, according to weather conditions. Should vessels on Track "C" bound to or from United States be deviated to Track "B" on account of ice, Canadian vessels will remain on Track "D" for the period prescribed, but will have the above option of deviating as necessary in the vicinity of ice areas.

The Lines have the option of continuing the use of the Belle Isle Route after November 14th should they wish to do so.

WEATHER FORECASTING IN LONDON, FOR THOSE AT SEA IN HOME WATERS.

BY R. CORLESS, O.B.E., M.A.

To a seaman, who is well acquainted with all aspects of the sky, wind and weather, it must still often appear rather incongruous that he should be advised to listen to and act on "Weather Shipping" bulletins containing forecasts of wind and visibility for the waters around the British Isles. He knows that these forecasts are prepared by mere landmen sitting in an office in London. As one of these landmen I can sympathise with his attitude, for I well know that seamen can forecast weather successfully by tapping the weather glass and noting the constant changes in weather, wind and sky. They may say "What is the use to us of these London forecasts?" No doubt on some occasions the immediate use of the Weather Shipping bulletins is small, but even the most weather-wise of all seamen knows that times arise when his own forecasts "go wrong". The weather in these latitudes is proverbially a fickle jade, but although local forecasts may fail, the method of forecasting by charts is much more successful. Sometimes a local forecast on which every confidence was placed is just the one that fails, and in any case it is, I hope, always useful as well as interesting to know what the chartman thinks about the weather situation. Occasionally the forecasts have, I understand, proved of substantial value to ship-owners in terms of hard cash.

By now seamen are acquainted, or can easily become acquainted, with the rudiments of the methods of weather forecasting by charts as practised in the Meteorological Office for a long time. They have only to read such books as *THE BAROMETER MANUAL FOR THE USE OF SEAMEN*, *WIRELESS AND WEATHER*, *THE MARINE OBSERVER*, etc., to give them a very good working idea of the method, which is now more than 60 years old. The method, though getting-on in life, shows no sign of ageing, and it is safe to say that it is never likely to be superseded, although it may be and probably will be improved in many important details. Indeed, judging from the improvements made in the application of the method since 1918, one is not likely to go far wrong in assuming that similar progress will go on, perhaps at an increasing rate, in the future.

In passing it may here be remarked that the time following the Great War was the occasion of the last considerable advance in methods of weather forecasting by charts. The Norwegians were, during the War, unable to obtain those weather reports from the nations at war, which would enable them to complete their weather charts. Consequently they expended their energy and money on the establishment and maintenance of a very close network of stations in their own country, and on the numerous islands along their coasts, and were thereby enabled to follow the changes of weather in depressions, anticyclones, etc., much more closely and exactly than had ever been possible before. In doing so they naturally drew on work which had been carried out and published previously in England, France, Germany and Austria in particular. When the War was over Norway was again able to obtain weather reports from other countries, but she found them inadequate to her new needs. Her meteorologists have worked hard to convert those of other countries in the world to adopt her methods, and they are doing so in a

remarkable series of papers mostly written quite simply and in the English language. Hence arose the rather frequent changes of code which must have proved irritating to observers at sea as well as to observers on land, culminating with the codes devised at Copenhagen in 1929, which came into force at sea on 1st May, 1930.

It would take too long to give even a brief sketch of the Norwegian methods, which are now used regularly in the Meteorological Office, London, not in replacement of, but in addition to the methods formerly in use. A very good and easily readable account of them was written by Mr. J. S. DINES of the Meteorological Office in *THE WEATHER MAP* which can be purchased from H.M. Stationery Office, Kingsway, London, W.C.2, price 3s. 2d. post free.

The main point I wish to make in this article is to emphasise the fact that as most of our weather and gales come from the Atlantic, we in the British Isles, are dependent, perhaps more than any other European country, except Iceland, on ships' weather reports from the Atlantic. These reports are invaluable to us; but unfortunately for the marine observer, their value is usually greatest when conditions for observing at sea are at their worst. If you seamen will permit me, I should like to say that the care and trouble you take in making accurate observations and in sending them out, is deeply appreciated by all in the Forecast Division. Like you, this division is at work day and night without a break, and we feel that this fact, as well as our common interest in the weather, forms a strong link between us.

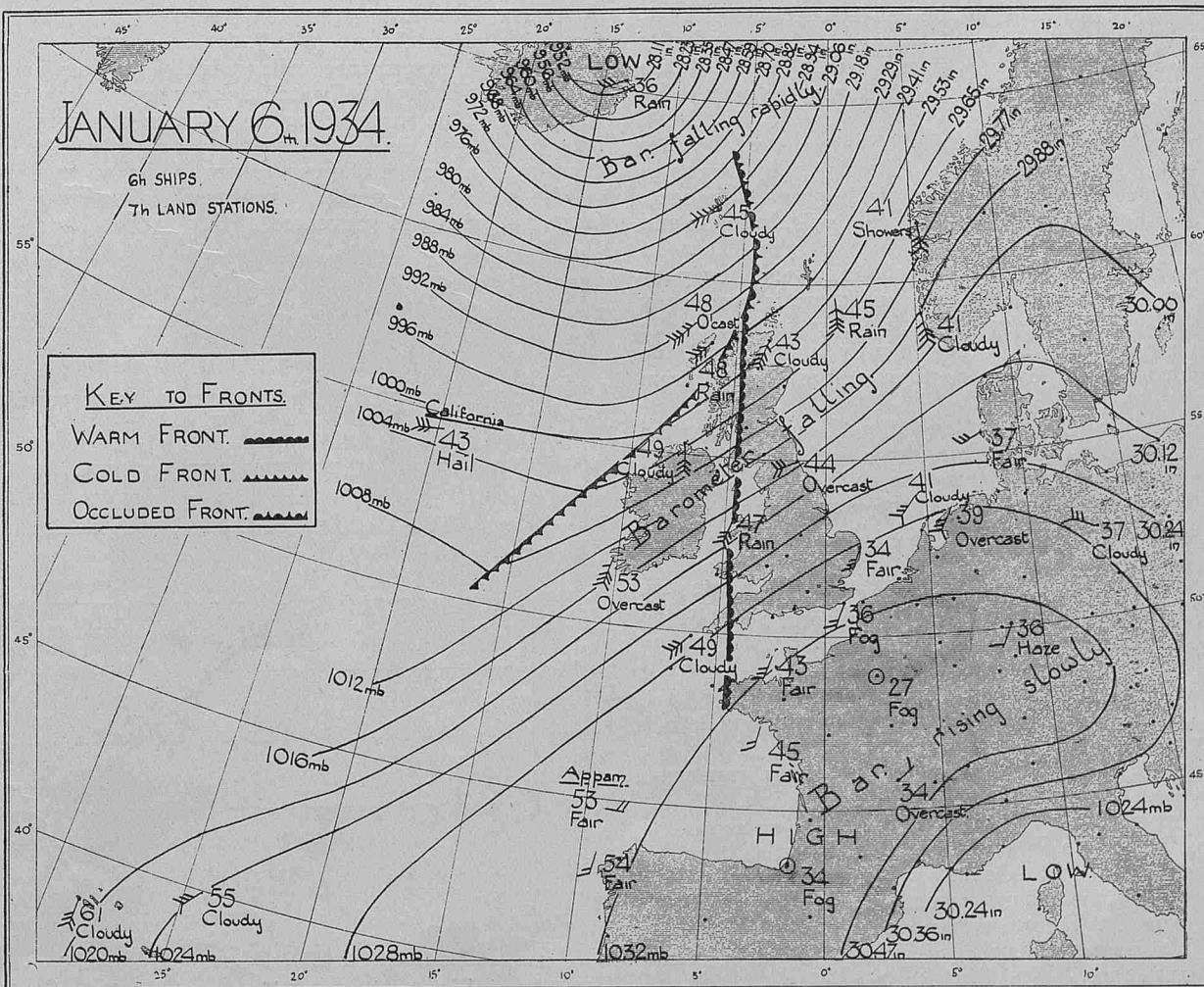
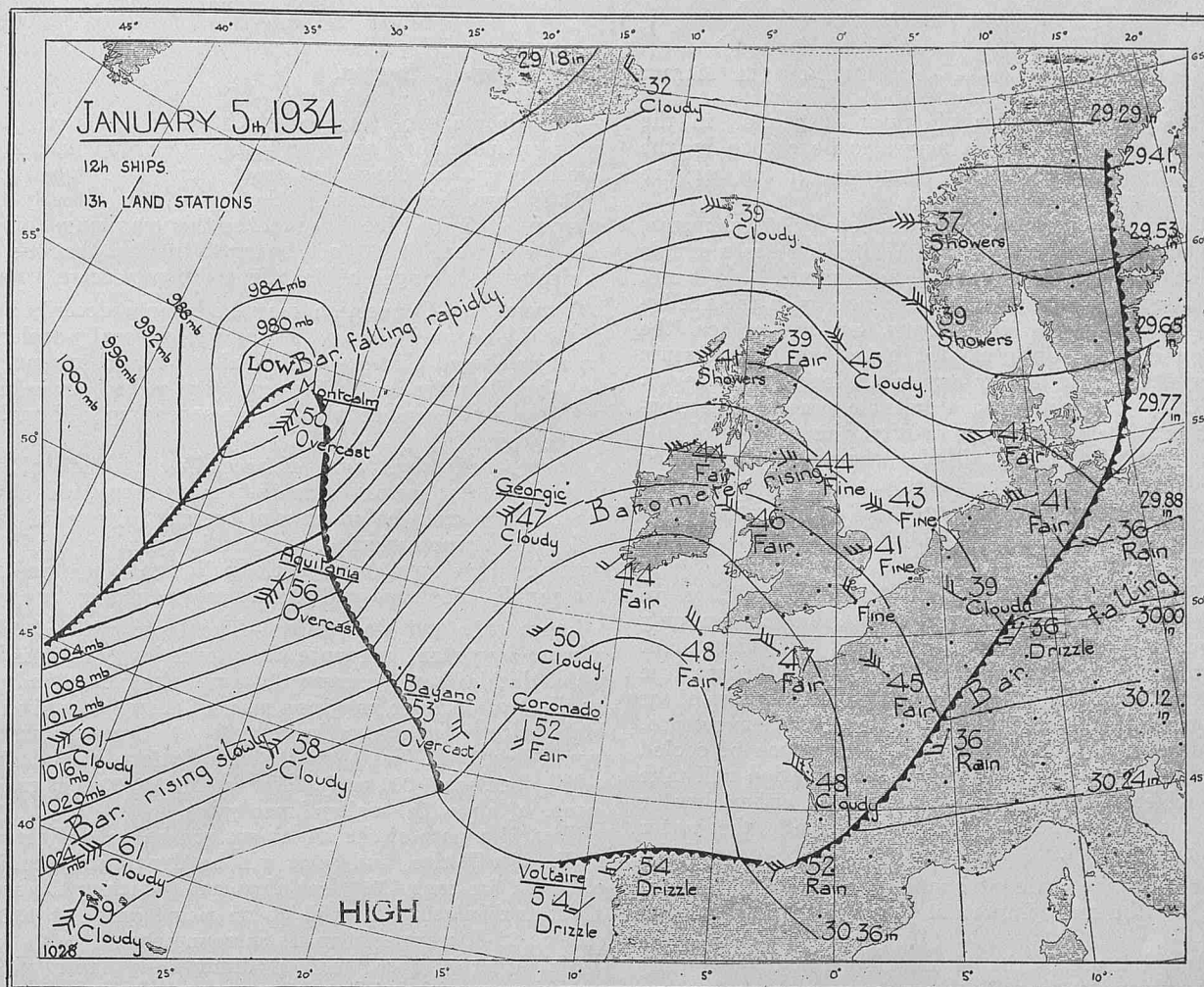
In conclusion, I should like to reproduce here three maps showing the development of a recent depression in the Atlantic, and the subsequent severe gales which were experienced on the Western and Northern coasts of the British Isles. These charts proclaim how vital ships' reports are for our work. I have ventured to show "warm fronts" and "cold fronts" on these charts, as well as the features with which you are familiar. Some of you may like to examine the charts in detail. The "fronts" are one of the products of the Norwegian work already alluded to. I cannot, as I have said, describe them at present, but I should like to leave with you four main ideas about fronts:—

(1) Fronts separate masses of air of different origins, temperatures, and air properties.

(2) The lines shown as fronts on the charts are only the **intersections at the surface** of frontal planes which may extend to considerable heights.

(3) Fronts move in the same direction as the wind following them. When, as often happens, a front lies athwart the wind, its motion is roughly parallel to itself in the direction of the wind.

(4) At a warm front, warm air is behind and cold air is before the front, while steady rain usually falls before the front. At a cold front, cold air in the rear bursts through into the warm air ahead, often with a heavy squall, and with hail and thunder, or at any rate a heavy shower.



FOG.

PREPARED IN THE MARINE DIVISION BY H. KEETON.

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

Fog is perhaps the most variable of the meteorological elements, and consequently very difficult to forecast. While there is a simple and definite relationship between atmospheric pressure and wind, there is a marked absence of *definite* rules to guide us in the prediction of fog. We know that when it is foggy, on land or sea, the pressure distribution is often anticyclonic; but when the pressure distribution is anticyclonic it is not by any means necessarily foggy. Fog requires something in addition to a suitable pressure distribution for its production. Temperature, humidity, the amount of salt or dust in the air, and wind force, all play their part, and often the balance is so delicate, that a very slight change in one of the conditions may be sufficient to produce fog or to disperse it. Some of the physical conditions and processes under which fog is formed are described below.

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

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

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

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

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

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

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

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

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

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

This decrease of temperature, due to decrease of pressure, has been calculated and amounts to $5\frac{1}{2}^{\circ}$ F. in 1,000 feet for *dry* air; it is less in moist air, dependent on the amount of moisture present.

It is rare, however, that the lapse rate actually existing in the atmosphere in any locality reaches this maximum (or adiabatic) rate of $5\frac{1}{2}^{\circ}$ F. for each 1,000 feet, owing to the fact that the air is generally subjected to changes of heat from other sources.

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

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

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

Lapse rate and Convection.—The lapse rate of temperature has a most important influence on convection, for it is the lapse rate which decides how far warmed air will rise before finding its level. As an illustration, if we imagine a mass of thoroughly mixed air 10,000 feet high, with a *maximum* lapse rate, its temperature at 10,000 feet would be 55° F. less than the temperature at the surface (that is, $5\frac{1}{2}^{\circ}$ F. for each 1,000 feet). Above this 10,000 feet mass, let there be layers of air with smaller lapse rates.

Now, if a part of the air at surface be only slightly warmed, say, 2° F., it will rise, and as it will be dynamically cooled at the rate of $5\frac{1}{2}^{\circ}$ F. for each 1,000 feet of ascent (which is the same rate as the air it is displacing), it will go on rising until, at 10,000 feet, it will still be 2° F. warmer than its surroundings.

Above 10,000 feet, with a diminishing lapse rate, the fall of temperature with height of the mass of air is smaller, say, $3\frac{1}{2}^{\circ}$ F. for each 1,000 feet. The warmed rising air will, however, still cool at the same rate as before ($5\frac{1}{2}^{\circ}$ F. for each 1,000 feet), so that the 2° difference of temperature will gradually get less and less, until the warmed air will eventually stop rising where its temperature coincides with that of the surrounding air mass, in this case 11,000 feet.

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

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

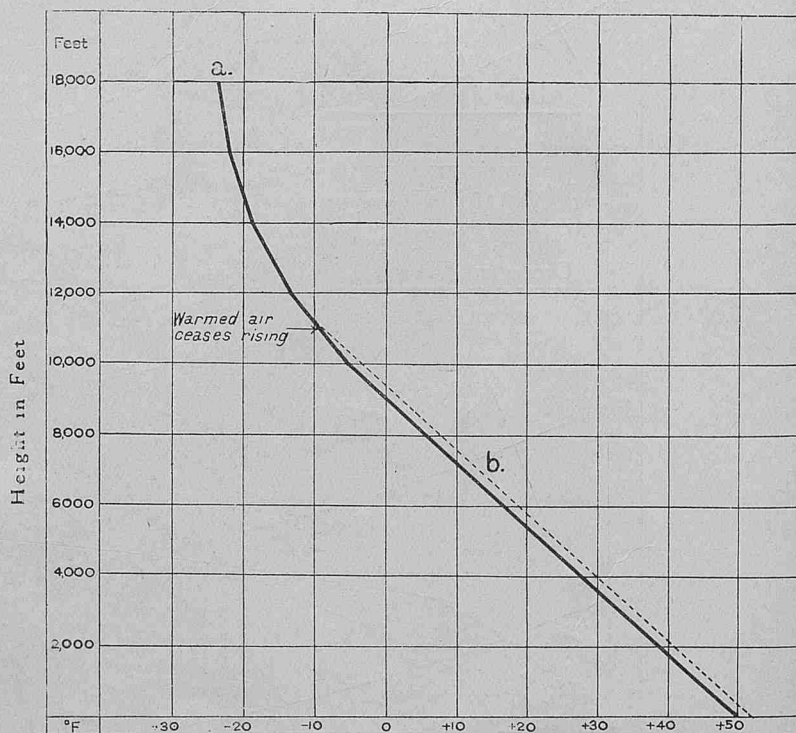


Fig. 1.—Scale of Temperature, Fahrenheit.

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

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

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

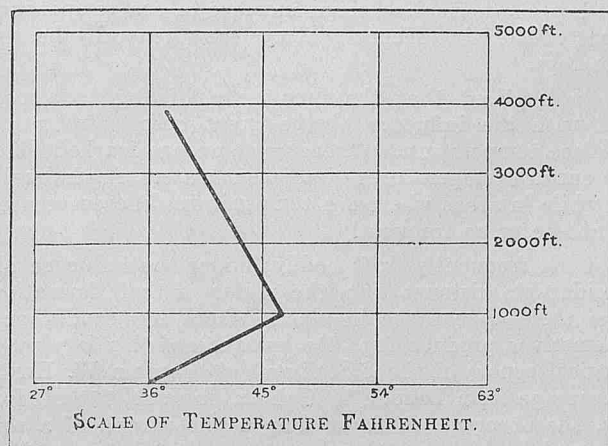


Fig. 2.

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

Formation of Sea Fogs.

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

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

An example of fog formed in this way is illustrated in FIGURE 3, and was investigated by Mr. G. I. TAYLOR when on board the Ice Patrol *Scotia* during 1913.

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

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

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

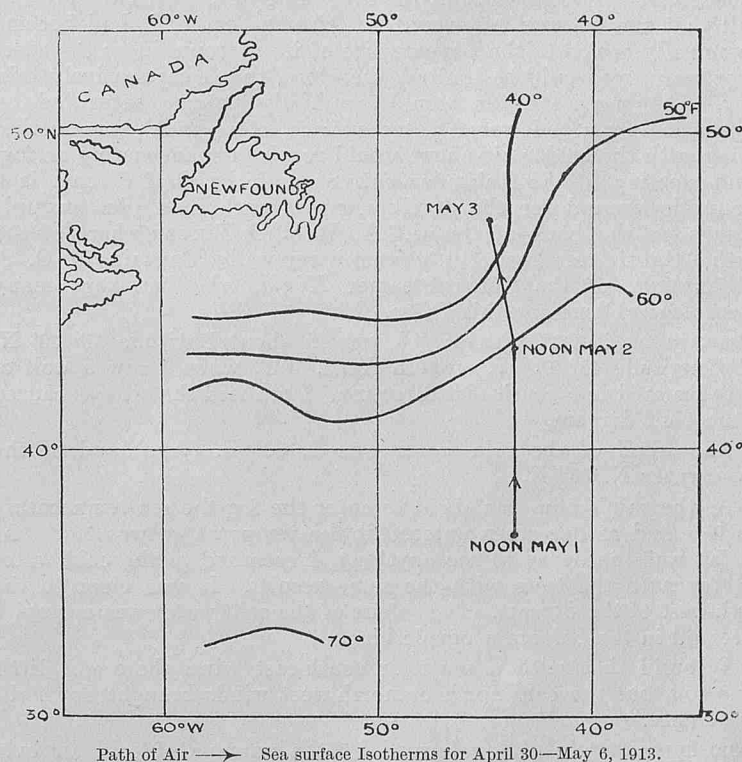


Fig. 3.—Probable path of Air previous to thick fog, May 3rd, 1913.

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

A similar experience occurred between 3.15 p.m. and 4.30 p.m. of the same day, the temperatures at 4 p.m. being: air, $50^{\circ} 1$; sea, $40^{\circ} 5$.

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

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

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

The probable explanation is that, in the instances when fogs are formed under these conditions, the lapse rate of the air current is so small that the warmed air would not rise far before it had become dynamically cooled to the temperature of its surroundings; the effect of the warming would be limited, therefore, to a comparatively thin layer. The surface layer would gradually become saturated by evaporation from the warm water surface, after which any further mixing with the colder air above would result in condensation as fog.

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

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

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

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

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

Another example of fog formed by the passage of cold air over warm water is given in 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.

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

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

It will be realized that the occurrence of fog is also closely associated with the influence of the great ocean stream currents on sea surface temperature. Wherever there are marked differences in the sea surface temperatures of adjacent waters, fog is likely to be frequent, while in areas where sea temperature differences are small, fog does not occur so frequently.

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

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

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

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

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

Formation of Land Fogs.

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

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

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

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

Fog in Coastal Waters.

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

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

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

Prediction of Fog.

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

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

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

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

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

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

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

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

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

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

THE JOHN MURRAY EXPEDITION.—I.

BY PROFESSOR J. STANLEY GARDINER, F.R.S.

THE expedition has now completed its work in the northern part of the Arabian Sea, where observations have been carried out at 90 Stations. Of these 18 were in the Red Sea and Straits of Bab-el-Mandeb, 20 in the Gulf of Aden and to the south-east of Sokotra, 27 along the south coast of Arabia and 25 in the Gulf of Oman. At 56 stations a *full* set of physical and chemical observations was carried out from the surface at various depths to the bottom, and dredges and trawls were run out in 37. The chemical analyses for salinity and acidity were made on board the *Mabahiss* while the ship was still in the vicinity of the Station, while phosphates, oxygen contents and nitrogen followed in subsequent days. The Mercantile Marine have also obtained surface water samples weekly and these together with some samples taken by the *Mabahiss* are now being analysed in Cairo, while others have been sent to England for subsequent work. In addition the Hughes-Admiralty Echo-Sounding Machine has procured an almost continuous record of the bottom depths, which have been checked by the Lucas-Sounding Machine which also gives small bottom-samples, larger samples being secured by the Priestman Grab.

Of course the *Mabahiss*, which is only 140 feet long, has had some misfortunes, although she has proved an excellent sea boat. In passing down the Red Sea in September she met heavy southerly winds and her pitching caused losses of bottom samplers and thermometers, the Lucas Machine being situated aft. There were also breakages of trawling warp, inevitable as the warp had been coiled for some years without being used, and a few nets were torn to pieces on the rocky bottom of the Red Sea. The refrigerating plant was difficult, nearly causing a vacancy in the mess, the "Chief" being badly gassed, but this was finally rectified by the kind services of an expert from the *Orontes* at Aden.

The depths in the Red Sea proved correct enough, maximum 1205 fms. At greater depths than about 82 fms., the depth of the sill near Great Hanish I., the Red Sea proved devoid of all life; its temperature below 82 fms. to the bottom was constant at 72° F., the salinity 40 per mille. A formation of heavy calcareous rocks *in situ* was discovered, and some evidence of vertical water movements was also obtained. In the Straits there were found three water strata: at the surface flowing outwards; between 35 and 85 fms

inwards and a hardly appreciable bottom current outwards; these currents are a marked contrast to the ascertained spring conditions which it is hoped to check on the return voyage.

The Gulf of Aden proved interesting as 10 ridges were found on the floor extending from the Arabian coast to the south-west. The "Socotra" Current determined largely on the water samples collected by the Mercantile Marine for the water in 1905, was found to be sweeping the bottom clean between Cape Guardafui and Socotra, dispersing in a complicated vertical rotation of the water masses of the Gulf.

Several parts of the Arabian Coast, the shore line of which is composed of high vertical cliffs up to 800 feet, were investigated, but no trace of any coral reefs was found, though submerged banks proved frequently to be covered by mammillated and branched masses of calcareous plants, which look almost structureless and which in colder seas (viz., off the British Isles and Norway) are often erroneously recorded on the charts as "crl." Between 50 fms. the sea-floor drops rapidly and is very irregular, the coastal slopes running out in a complicated system of submarine promontories. The water circulation was not determinable but off Sukra Bay a fall of 4.5° F. was found.

The Gulf of Oman was found to be underlaid by a submerged mountain chain running westwards from Karachi parallel to the Baluchistan coast. A second range was discovered trending more south-west to Socotra, its summits in places over 1600 fms above the sea-floor, this latter falling to a deep valley south-east of the same. This latter may well be a river valley of ancient days, submerged by the sinking (faulting), which produced the neighbouring coasts. Out-flowing currents flow from the surface to about 30 fms. and below 70 fms. with an inflowing mass of water between. Off Ras al Hadd the bottom deposits stank of sulphuretted hydrogen (rotten egg gas), in which no animal or plant life can survive, and this azoic area was found to extend under most of the Gulf below 50 fms. though devoid of this noxious smell.

The *Mabahiss* left Bombay in the middle of December to carry out her southern series of traverses between India and Ceylon and the African coast.

CURRENTS OF THE RED SEA AND THE PART OF THE INDIAN OCEAN NORTH OF AUSTRALIA.

PREPARED IN THE MARINE DIVISION BY E. W. BARLOW, B.Sc.

1.—Meteorological Conditions which affect the Currents, with Summary of Current Information previous to the present Charting.

Pressure and Winds of the Red Sea.—The Red Sea is almost outside the influence of the barometric depressions of temperate latitudes, which tend to follow the northern shore of the eastern Mediterranean. Occasionally the Gulf of Suez is affected by a depression passing in winter but not so greatly as to produce winds of gale force.

The winds of the Red Sea are governed by three chief factors:—

- (i) A very intense anticyclone over central Asia and N.E. Africa in winter, with an extension lying over Southern Arabia, which gives place to a great area of low pressure in summer. This is the pressure reversal which gives rise to the monsoons.
- (ii) An area of high pressure over the Azores and N.W. Africa, from which pressure steadily decreases eastwards.
- (iii) An area of low pressure over equatorial Africa in the northern winter.

The prevailing wind is northerly throughout the year in the northern part of the Red Sea. In the southern part the direction is more variable but there is a reversal of prevailing wind during the year, the wind being northerly in summer and southerly in winter. Thus the winds of the southern part of the Red Sea have the character of monsoons, and during the summer months the northerly wind blows throughout the whole length of the Red Sea.

Winds of the Red Sea, North of Latitude 20° N.—The wind blows mainly from N.N.W. throughout the year. The N.N.W. winds occasionally reach gale force in the Gulf of Suez and northern part of the Red Sea, especially in summer. For the greater part of the year the wind is more northerly between Latitudes 18° N. and 20° N., but in the summer months the N.N.W. direction is maintained there. From October to May winds from southerly directions sometimes blow, but are very rare in the summer months. The further south, the greater is the proportion of southerly wind.

Winds of the Red Sea, South of Latitude 20° N.—The prevailing wind direction is S.S.E. from October to April inclusive, these winds reaching gale force on one or two days a month, particularly from November to February. Occasional light or moderate winds are experienced from a northerly direction. Between these southerly winds and the northerly winds blowing north of Latitude 20° N. is an area of variable winds which seems to extend further south off the African coast than elsewhere. May is a transition month in the Red Sea, south of Latitude 20° N. In June the wind changes to N.N.W., retaining this direction until late in September; it does not reach gale force during this time.

Sea Temperatures.—These generally speaking increase towards the southern end of the Red Sea, but the highest mean sea surface temperatures in summer are found in Latitude 14° N. to 18° N. The maximum is 90° F. in Latitude 14° N. to 16° N. in September and the minimum 65° F. in the Gulf of Suez in January to March inclusive. August is the month of highest and February the month of lowest mean sea surface temperature over the Red Sea as a whole. The mean sea surface temperatures of the Indian Ocean were published monthly in the Marine Observer, Volume V, 1928. The figures for the Red Sea shown on these charts may be conveniently given in the form of a table.

Mean Sea Surface Temperature of the Red Sea.

(DEGREES FAHRENHEIT)

N. Latitude.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
28° — 30° ...	65	65	65	68	71	75	77	80	78	76	73	69
26° — 28° ...	72	71	72	73	75	77	80	82	80	79	77	74
24° — 26° ...	74	73	73	75	78	81	83	84	83	82	79	77
22° — 24° ...	76	75	75	77	80	82	84	86	85	84	82	79
20° — 22° ...	78	76	77	79	82	83	86	87	86	86	84	80
18° — 20° ...	79	78	79	81	84	85	86	87	88	87	85	81
16° — 18° ...	78	78	79	82	85	87	88	89	89	88	83	80
14° — 16° ...	78	77	79	81	85	88	89	89	90	87	81	79
10° — 14° ...	77	77	79	81	84	86	84	85	87	84	81	78

Currents of the Red Sea.—The following account of the existing knowledge of the currents of the Red Sea is general and does not include local currents near the coasts and islands. The currents are drift currents depending on the wind which varies with the monsoon blowing in the Arabian Sea. Thus during the N.E. Monsoon period, November to March, when the wind in the southern part of the Red Sea is S.S.E. the prevailing set of current is N.N.W. In the northern part of the Red Sea the current therefore flows in opposition to the N.N.W. wind. The drift of currents seldom reaches one knot. Sets in other directions are experienced, and in March between Latitude 20° N. and Perim, sets to the southward are often observed. In December and March, according to the Meteorological Charts of the Red Sea, easterly currents set towards the Avocet Rock. The current in the Straits of Bab-el-Mandeb is N.N.W. during the N.E. Monsoon period and may reach 30 or 40 miles a day. From June to September, the S.W. Monsoon period, the currents in the northern part of the Red Sea are variable but sometimes set to N.N.W. at rates up to 1 knot. The prevailing current in the southern part of the Red Sea is S.S.E., rarely more than 1 knot except in the Straits of Bab-el-Mandeb, where it may reach 1½ knots.

In the Red Sea and Gulf of Aden Pilot, eighth edition, 1932, it is stated that strong currents occasionally set across the Red Sea, and that the rate of these currents increases rapidly as outlying reefs and shoals are approached. It is also stated that the number of reports from vessels in which no mention is made of any cross current is generally about 40 per cent. of the total received. In the middle of the central channel, the drift of cross currents seldom exceeds 20 miles a day. The observation of cross currents is complicated by the excessive refraction which is frequent in the Red Sea, particularly if observations of position are made at times other than those of morning and evening twilight, when refraction is believed to be at a minimum. Errors of position due to excessive

refraction may introduce spurious cross currents or may exaggerate the strength of ones actually existing.

Winds of the Indian Ocean to the North-west of Australia.—The island continent of Australia has seasonal variations of mean pressure which, though less intense, are in other respects similar to those occurring in Asia which give rise to the Monsoons of the Indian Ocean. In the southern summer an area of low pressure is centred over the north-west coast of Australia, extending to the Malay Archipelago and eastwards into the Indian Ocean. This is most intense in January (FIGURE 1). In the southern winter Australia is covered by a high-pressure area which is really an extension of the anticyclone of the South Indian Ocean. This is most intense in July (FIGURE 2). The winds of northern and western Australia are therefore of the monsoon type.

When the S.W. Monsoon is blowing over the Arabian Sea and Bay of Bengal in the northern summer there is a clear run through for the air from the high-pressure area of the S.E. Trade Wind to the low-pressure area of Southern Asia and the S.E. Trade Wind passes directly into the S.W. Monsoon. Just in the same way there is during the southern summer a clear run through from the air flowing out of the high-pressure region of Asia to the low-pressure region of Australia. The N.E. Monsoon thus passes into the N.W. Monsoon of the equatorial regions of the Indian Ocean and of the Java Sea. At this season the winds over the ocean between Java and North-West Australia are somewhat variable but mainly between N.W. and S.W. In the southern winter there is a reversal of wind, the S.E. Trade Wind blowing over the ocean between Java and North-West Australia, though with less force than in the open ocean to the westward. The S.E. wind would not extend so far eastwards in the Indian Ocean if it were not for the presence of Australia, which causes the extension of the anticyclone eastwards, and in this sense the S.E. wind is a monsoon and is often so called on the coasts of Australia and in neighbouring waters.

On the north-west coast of Australia and in the ocean between this and the Malay Archipelago the alternation of wind is thus not between N.W. and S.E. but between some westerly direction and S.E. The true direction of the N.W. Monsoon is not experienced

south of Latitude 10° S. In the region Latitude 10° S. to 15° S., Longitude 110° E. to 120° E., the predominant wind in January is between N.W. and S.W. Further south, between Latitude 15° S. and 20° S., in the same longitude, near the Australian coast, the predominant wind in January is between W. and S. The meteorological tables published in Australia Pilot, Volume V, show how the seasonal alternation of wind varies along the north and north-west coasts of Australia. Thus at Burketown, Albert River, Gulf of Carpentaria, the alternation is from N. and N.E. in summer to S.E. in winter. At Port Darwin, the alternation is from N.W. and N. to S.E. and at Broome it is from W. and S.W. to S.E. and E.

In the open ocean N.W. of Australia the S.E. winds of winter are steadier than the westerly winds of summer and show a larger proportion of moderate winds (Beaufort 4-7). The S.E. winds predominate from April to November inclusive and therefore both as regards strength and duration should have the larger influence on the currents. Gales do not appear to be frequent and occur mainly in summer which is the rainy season (N.W. Monsoon). Small tropical cyclones, known as Willy-Willies, occur during this season, with violent and destructive winds. They apparently originate in the vicinity of Cambridge Gulf and travel south-westerly, the centre keeping well out to sea. About Latitude 20° S. they recurve and travel towards the coast which they usually cross between Condon and Fortescue, passing thence across the continent to the Great Australian Bight.

Currents, North-West Coast of Australia.—From the Admiralty Current Charts there appears to be a westerly flow of current between the parallels of 10° S. and 12° S. in April to October inclusive, while the S.E. wind is blowing. It is stated in the Australia Pilot, Volume 5, that this westerly current depends much on the direction and force of the wind, and that its strength seldom exceeds 1 to $1\frac{1}{2}$ knots. A current sets eastward between the the westerly current and the south shore of Java, forming part of a general easterly flow along the south coasts of Sumatra and Java. The current off the north-west coast of Australia generally sets with the wind, but is sometimes uncertain, both in strength and direction, being complicated by the strong tidal streams prevailing there.

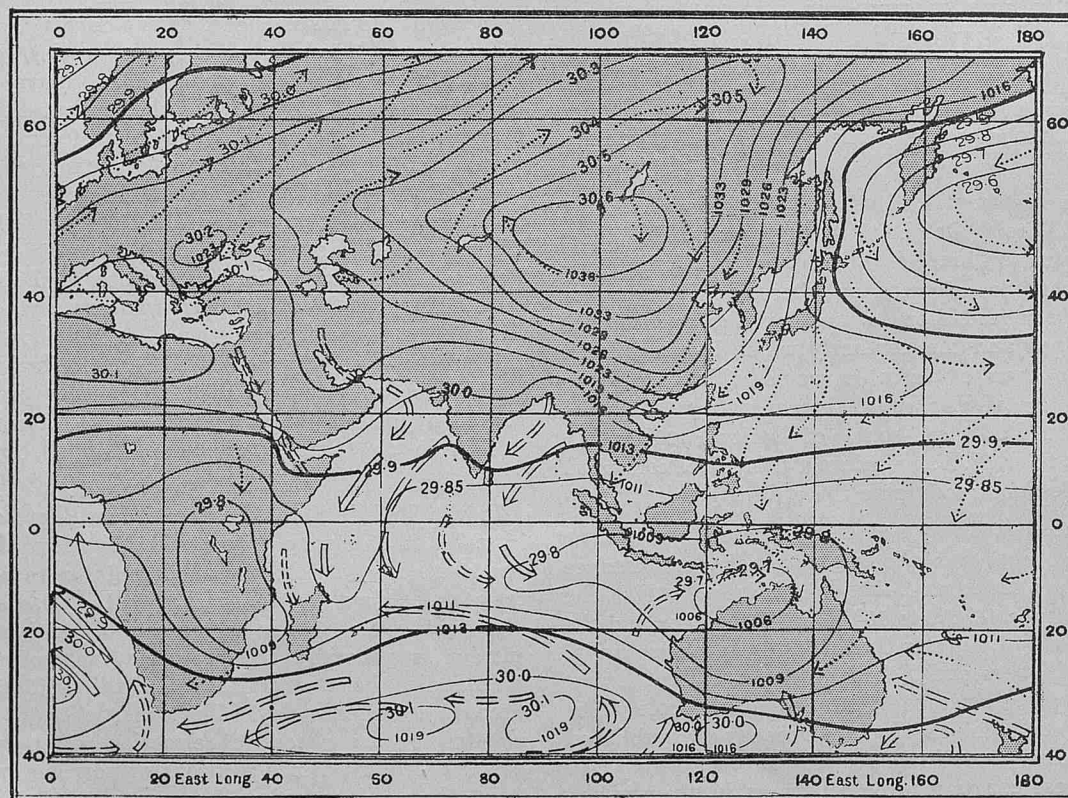


Figure 1.—Average Pressure and Wind—January.

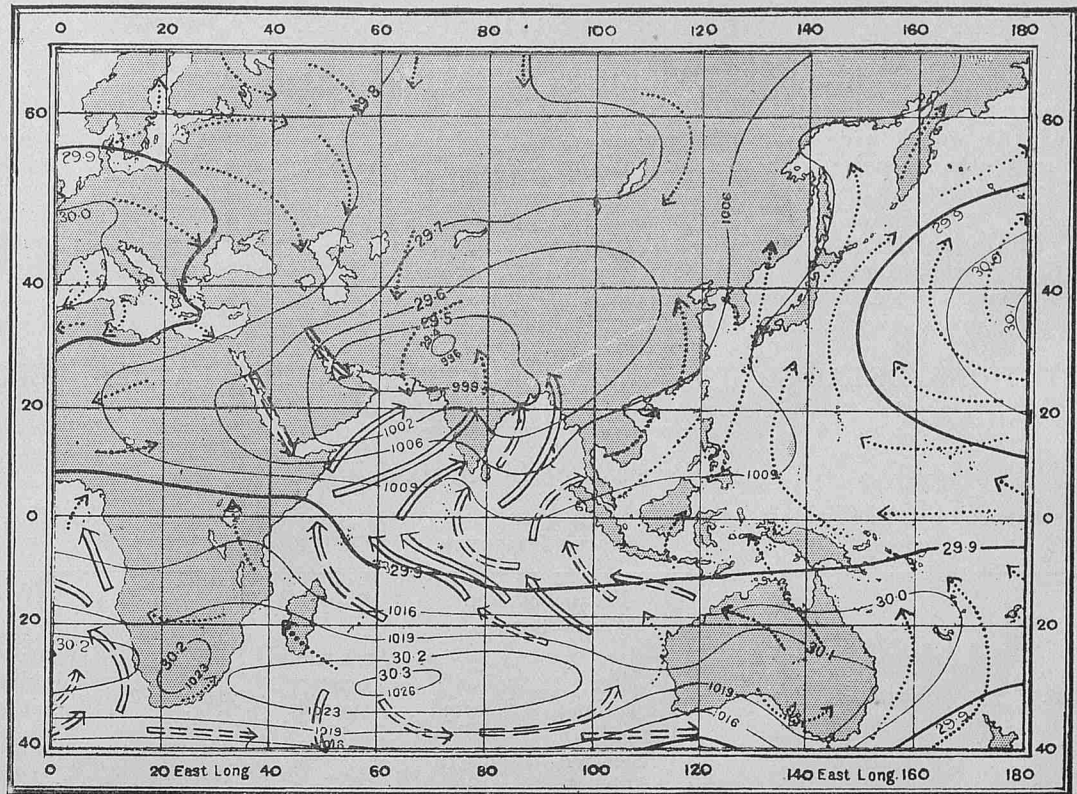


Figure 2.—Average Pressure and Wind—July.

SOUTHERN ICE REPORTS.

During the Year 1933.

April.

None received.

May.

None received.

June.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1933	3	56° 20' S.	80° 48' W.	Small growler	Estimated 4 feet high by 15 feet by 6 feet... ..	M.V. <i>Taranaki</i> .

Reports of Ice previous to April, May and June, 1933, will be found in the Marine Observer, Vol. X, No. 110, p. 62.

WIRELESS WEATHER SIGNALS.

I.—SHIPS' WIRELESS WEATHER SIGNALS.

A full description of the world wide system of voluntary "Selected Ships" routine weather reports with instructions was given on pp. 27-38 of the January number of this volume of THE MARINE OBSERVER.

The list which follows contains the latest information of stations to which "A Selected Ships" should report in accordance with those instructions, and stations detailed to intercept reports from "B Selected Ships" also in accordance with those instructions.

To decode these reports, and for ships other than "Selected Ships" to have information of the system of communication of "Selected Ships", all concerned are referred to the PAMPHLET, M.O. 329, concerning which special notice to the masters of British ships will be found on p. 30, paragraph (27), and p. 31, paragraph (34) of the January 1933 number of THE MARINE OBSERVER.

WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM "A SELECTED SHIPS."

Request for Information.

THE ATTENTION OF METEOROLOGICAL SERVICES IS INVITED TO THE INVITATION GIVEN ON PAGE 27 OF VOL. XI, NO. 113, JANUARY 1934
MARINE OBSERVER.

Ocean.	Station.	Position.	Call Sign.	Frequency and Wave Length.		Area and limits covered by Station.	Telegraphic address of Meteorological Centre.	Information required—Limit of Groups.	Notes.
				For Station to call up "Selected Ships."	For "Selected Ships" to report to Station.				
North Atlantic and North Sea.	Portishead.	Lat. 51° 28' 41" N. Long. 2° 47' 30" W.	GKU.	149 kc/s. (2013 metres).	143 kc/s. (2100 metres).	North Sea and Eastern North Atlantic East of Longitude 40° W. and North of Latitude 38° N., but not within 300 miles of station. (see Chart of the World.)	Weather London	Weather only, up to seven groups, preferably No. 3 Supplementary Groups.	Control system. "Selected Ships" chosen to report in given order notified by station daily at 2230, 0330, and 1030 G.M.T. Roll call thus—Weather London—call sign of chosen "Selected Ships" to report through GKU at schedule times on 2100 m.
	Chatham Mass.,	Lat. 41° 42' N. Long. 70° 00' W.	WCC.	142.9 kc/s. (2098 metres).		North Atlantic West of Longitude 40° W.	Observer Washington.	Weather only. First four groups of observations taken at 0000 and 1200 G.M.T. only required.	No control. All British "A Selected Ships" within area to address their 0000 and 1200 G.M.T. observations to Observer Washington and their 1800 G.M.T. observations to CQ in accordance with schedule.
	Sayville N.Y.	Lat. 40° 45' N. Long. 73° 06' W.	WSL.						
	Rockland.	Lat. 44° 09' N. Long. 69° 13' W.	WAG.						
	West Palm Beach.	Lat. 26° 42' N. Long. 80° 02' W.	WMR.						
	Palm Beach.	Lat. 26° 42' N. Long. 80° 02' W.	WOE.						
Mediterranean and Red Sea.									
South Atlantic.	Slangkop (Cape Town)	Lat. 34° 08' 46" S. Long. 18° 19' 18" E.	ZSC	—	143 kc/s. (2100 metres).	South Atlantic Westward of 25° E. and within a range of about 2,000 miles of station.	Met.	Weather only. Four universal groups and first group of No. 6 Supplementary groups.	No control. Only 0600 G.M.T. observation required. All British "A Selected Ships" within area should report, commencing at 0618 G.M.T.

**WIRELESS STATIONS DETAILED TO RECEIVE ROUTINE CODED WEATHER REPORTS FROM
"A SELECTED SHIPS."**

(Continued.)

Ocean.	Station.	Position.	Call Sign.	Frequency and Wave Length.		Area and limits covered by Station.	Telegraphic address of Meteorological Centre.	Information required—Limit of Groups.	Notes.
				For Station to call up "Selected Ships."	For "Selected Ships" to report to Station.				
Indian Ocean.	Jacobs (Durban).	Lat. 29° 55' 51" S. Long. 30° 58' 38" E.	ZSD	—	143 kc/s. (2100 metres).	Indian Ocean S. of 20°S. and Eastward of 25°E. and within a range of about 2,000 miles of station.	Met.	Weather only. Four universal groups and first group of No. 6 Supplementary groups.	No control. Only 0600 G.M.T. observations required. All British "A Selected Ships" within area should report, commencing at 0618 G.M.T.
	Bombay.	Lat. 19° 04' 55" N. Long. 72° 49' 54" E.	VWB	—	143 kc/s. (2100 metres).	Arabian Sea N. of line C. Comorin to Ras Fartak.	Weather.	Weather only. No. 6 Supplementary groups.	All British "A Selected Ships" are requested, when convenient, to report 0000 G.M.T. observations commencing at 0018 G.M.T. in addition to schedule times.
	Madras.	Lat. 12° 59' 17" N. Long. 80° 10' 56" E.	VWM	—	143 kc/s. (2100 metres).	Bay of Bengal N. of line C. Comorin to Achin Head.	Weather.	Weather only. No. 6 Supplementary groups.	All British "A Selected Ships" are requested, when convenient, to report 1200 G.M.T. observations commencing at 1218 G.M.T. in addition to schedule times.
	Colombo.	Lat. 6° 55' 14" N. Long. 79° 52' 46" E.	VPB	130 kc/s. (2300 metres).	143 kc/s. (2100 metres).	Indian Ocean South of a line Ras Fartak, C. Comorin and Achin Head, and within a range of about 1500 miles.	Obs.	Weather only. No. 6 Supplementary groups preferred.	No control—all British "A Selected Ships" within area should report in accordance with Schedule.
	Mombasa.	Lat. 4° 03' 11" S. Long. 39° 39' 51" E.	VPQ	—	125 kc/s. (2400 metres).	From Ras Hafun to Lat. 20° S. when westward of the Colombo area.	Weather Nairobi.	Weather only. No. 6 Supplementary groups.	No control—all British "A Selected Ships" within area should report 0600 G.M.T. observations.
	Perth.	Lat. 32° 01' 51" S. Long. 115° 49' 31" E.	VIP	125 kc/s. (2400 metres).	143 kc/s. (2100 metres).	Indian Ocean and Southern Ocean between Long. 105° and 135° E.; but not within 100 miles of the coast.	Weather.	Weather only. No. 6 Supplementary groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule. Reports not required for observation times not starred on Chart, p. 29, of the January 1934 number.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 11" E.	VPS.	8330 kc/s. (36 metres) or 500 kc/s. (600 metres).	143 kc/s.* (2100 metres).	China Sea and North Pacific to about 1,500 miles from station.	Royal Observatory.	Weather only, preferably No. 6 Supplementary Groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule. *Alternatively see particulars on p. 73 and use wave-length and times for "B Selected Ships."
South Pacific.	Sydney.	Lat. 33° 46' 00" S. Long. 151° 03' 09" E.	VIS	125 kc/s. (2400 metres).	143 kc/s. (2100 metres).	S. Pacific, Coral and Tasman Seas and Southern Ocean between Long. 135° and 160° E.; but not within 100 miles of the coast.	Weather.	Weather only. No. 6 Supplementary groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule. Reports not required for observation times not starred on Chart, p. 29, of the January 1934 number.
	New Zealand.	—	—	—	—	—	Weather Wellington.	Weather only, four universal groups.	The Meteorological Office Wellington, will be glad to receive routine reports from British Selected Ships within range of New Zealand W/T Stations through the normal commercial channels.

WIRELESS STATIONS DETAILED TO INTERCEPT ROUTINE CODED WEATHER REPORTS FROM "B SELECTED SHIPS."

In cases where routine weather reports made to CQ might not be received by the appropriate station within range, indicated in this list, they should be made to that station by call sign, but so that they may be readily intercepted by all ships 600 m. is used throughout.

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
North Atlantic.						
South Atlantic.	Salinas	Lat. 0° 35' 00" S. Long. 47° 18' 45" W.	PPL.	Meteoro Rio.	Weather only, including supplementary groups.	
	S. Luiz	Lat. 2° 31' 48" S. Long. 44° 16' 51" W.	PXM.			
	Fortaleza	Lat. 3° 46' 21" S. Long. 38° 32' 26" W.	PPC.			
	Natal	Lat. 5° 46' 41" S. Long. 35° 18' 24" W.	PXN.			
	F. Noronha	Lat. 3° 50' 24" S. Long. 32° 24' 48" W.	PXF.			
	Olinda	Lat. 8° 00' 35" S. Long. 34° 51' 00" W.	PP0.			
	Amaralina	Lat. 13° 00' 12" S. Long. 38° 30' 45" W.	PPA.			
	Abrolhos	Lat. 17° 57' 30" S. Long. 38° 41' 05" W.	PXH.			
	Victoria	Lat. 20° 10' 00" S. Long. 40° 17' 46" W.	PPT.			
	Rio	Lat. 22° 53' 42" S. Long. 43° 13' 24" W.	PPR.			
	Santos	Lat. 23° 56' 27" S. Long. 46° 19' 28" W.	PPS.			
	Florianopolis.	Lat. 27° 36' 00" S. Long. 48° 30' 18" W.	PPF.			
	Juncão	Lat. 32° 04' 00" S. Long. 52° 07' 00" W.	PPJ.			
Indian Ocean.	Jacobs (Durban).	Lat. 29° 55' 51" S. Long. 30° 58' 38" E.	ZSD	Met.	Weather only, 4 universal groups and first group of No. 6 Supplementary groups.	
	Algoa Bay (Port Elizabeth).	Lat. 33° 57' 16" S. Long. 25° 35' 30" E.	ZSQ	Met.		
	Calcutta.	Lat. 22° 33' 31" N. Long. 88° 20' 16" E.	VWC.	Weather.	Weather only up to 6 groups, No. 6 Supplementary Groups preferred.	
	Rangoon.	Lat. 16° 45' 57" N. Long. 96° 11' 51" E.	VTR.			
	Madras.	Lat. 12° 59' 17" N. Long. 80° 10' 56" E.	VWM.			
	Bombay.	Lat. 19° 04' 55" N. Long. 72° 49' 54" E.	VWB.			
	Karachi.	Lat. 24° 51' 05" N. Long. 67° 02' 32" E.	VWK.			
	Matara.	Lat. 6° 01' 07" N. Long. 80° 35' 39" E.	GZP.			
	Mombasa.	Lat. 4° 03' 11" S. Long. 39° 39' 51" E.	VPQ	Weather Nairobi.		
	Dar-es-Salaam.	Lat. 6° 50' 38" S. Long. 39° 17' 24" E.	ZBZ	Weather Nairobi.		
	Mauritius.	Lat. 20° 23' S. Long. 57° 35' E.	VRS.	Observatory Mauritius.		Weather 4 universal groups and first of No. 6 Supplementary Groups.
	Geraldton.	Lat. 28° 47' 15" S. Long. 114° 36' 24" E.	VIN	Weather.		Weather only, including No. 6 Supplementary Groups.
	Esperance.	Lat. 32° 01' 51" S. Long. 121° 53' 34" E.	VIE			

WIRELESS STATIONS DETAILED TO INTERCEPT ROUTINE CODED WEATHER REPORTS FROM "B SELECTED SHIPS."

(Continued.)

In cases where routine weather reports made to CQ might not be received by the appropriate station within range, indicated in this list, they should be made to that station by call sign, but so that they may be readily intercepted by all ships 600 m. is used throughout.

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 11" E.	VPS.	Royal Observatory.	Weather only, preferably No. 6 Supplementary Groups.	
South Pacific.	Auckland.	Lat. 36° 50' 36" S. Long. 174° 46' 08" E.	ZLD.	Weather Wellington.	Weather only, four universal groups.	The Meteorological Office, Wellington, will be glad to receive routine reports from British Selected Ships within range of New Zealand W/T Stations through the normal commercial channels.
	Wellington.	Lat. 41° 16' 26" S. Long. 174° 45' 55" E.	ZLW.			
	Awarua.	Lat. 46° 30' 27" S. Long. 168° 22' 21" E.	ZLB.			
	Chatham Island.	Lat. 43° 57' 02" S. Long. 176° 31' 04" W.	ZLC.			
	Rarotonga.	Lat. 21° 11' 54" S. Long. 159° 48' 51" W.	ZKR.			
	Apia.	Lat. 13° 15' 17" S. Long. 170° 49' 42" W.	ZMA.			
	Thursday I.	Lat. 10° 35' 14" S. Long. 142° 12' 43" E.	VII	Weather	Weather only, including No. 6 Supplementary Groups.	
	Townsville	Lat. 19° 16' 09" S. Long. 146° 49' 47" E.	VIT			
	Brisbane	Lat. 27° 25' 34" S. Long. 153° 07' 19" E.	VIB			
	Melbourne	Lat. 37° 46' 56" S. Long. 144° 52' 09" E.	VIM			
	Adelaide	Lat. 34° 51' 14" S. Long. 138° 31' 55" E.	VIA			
	Talcahuano	Lat. 36° 41' 27" S. Long. 73° 06' 19" W.	CCT	Meteo, Santiago.	Weather only, including supplementary groups.	
	Llanquihue	Lat. 41° 08' 00" S. Long. 73° 02' 00" W.	CCW			
	Juan Fernandez.	Lat. 33° 38' 09" S. Long. 78° 47' 50" W.	CCJ			
	Magallanes	Lat. 53° 10' 00" S. Long. 70° 54' 00" W.	CCN			

II.—WIRELESS WEATHER SIGNALS.

Bulletins.

It is necessary to make careful distinction between wireless weather reports and weather forecasts.

A wireless weather report is a statement, in plain language or code, of the observed conditions prevailing at a place at a given time.

A weather forecast is a statement, usually in plain language, of weather which may be expected at a place or over an area in the near future.

For forecasts issued to shipping by wireless it is usual to publish full descriptions giving abbreviated names of areas with prescribed limits and the length of period; if such published description is not given, the place, or area and the period to which the forecasts apply are included in the message.

BRITISH ISLES.

“WEATHER SHIPPING” BULLETIN.

C.W. Issues.

W/T Station, **Rugby**. Latitude $52^{\circ} 21' 59''$ N. Longitude $1^{\circ} 11' 12''$ W. Call Sign **G.B.R.**

Wave length 18,750 metres C.W. (16 kc/s.).

Times of transmission 0910 G.M.T. and 2133 G.M.T.

The message issued at 0910 G.M.T. contains 0700 G.M.T. observations. The message issued at 2133 G.M.T. contains 1800 G.M.T. observations.

During the time of S.O.S. lookout, from 0915 to 0918 G.M.T. there will be a pause in the transmission of the signal.

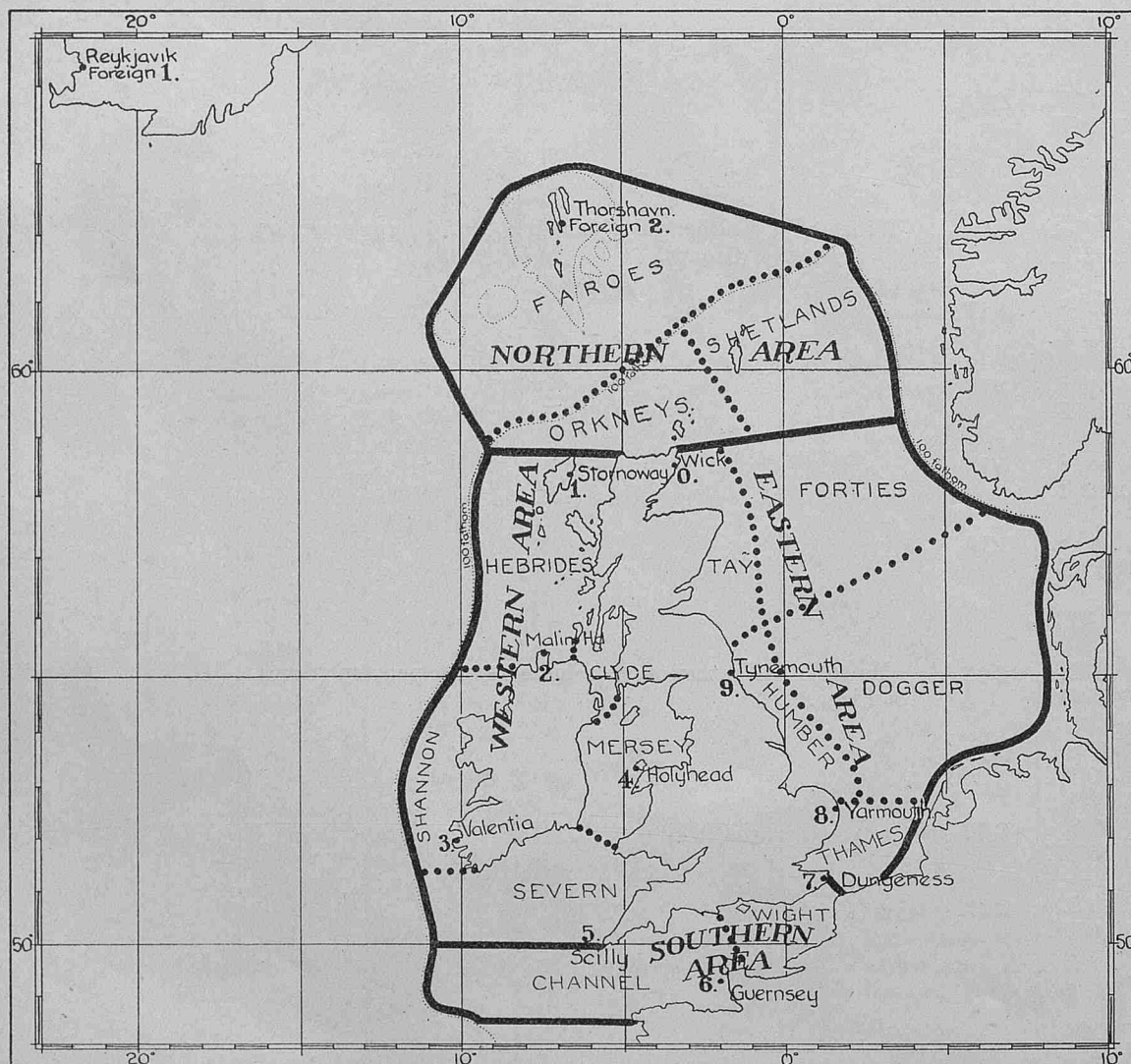
These messages are preceded by the words “Weather Shipping” and consist of seven parts. Part II is in code, the remaining parts in plain language.

Part I is a brief general statement which will generally provide information of the atmospheric pressure systems which influence the weather in the region dealt with by this Bulletin.

Part II is a weather report in code giving actual observations at ten British coast stations and two foreign stations.

For full information for decoding see next page, also the Pamphlet, M.O. 329, “**DECODE FOR USE WITH THE INTERNATIONAL CODE FOR WIRELESS WEATHER MESSAGES FROM SHIPS**”, obtainable from H.M. Stationery Office, price 3d.

Chart showing Stations, Forecast Areas and Districts.



WESTERN AREA.

The sea and coasts eastward of the 100 fathom line from the latitude of Cape Wrath to Scilly.

DISTRICTS.

HEBRIDES—That part of Western which lies N. and W. of Bloody Foreland, Rathlin I. and Islay.

SHANNON—West coast of Ireland from Bloody Foreland to the Fastnet.

SEVERN—South coast of Ireland. Bristol Channel and approaches.

MERSEY—The Irish Sea and approaches.

CLYDE—The North Channel and approaches to Clyde.

SOUTHERN AREA.

The English Channel from S. Foreland to the 100 fathom line.

DISTRICTS.

CHANNEL—West of St. Albans.

WIGHT—East of St. Albans.

EASTERN AREA.

The North Sea southward of line Ducans. by Head to Utsire to the Straits of Dover.

DISTRICTS.

THAMES—Thames estuary and its approaches.

HUMBER—East coast from Haisborough to Longstone.

TAY—East coast of Scotland, including Moray Firth.

FORTIES—Eastward to 100 fathom line and N. of Longstone to Naze.

DOGGER—Eastward to coast of Denmark and S. of line Longstone to Naze.

NORTHERN AREA.

Northward of latitude of Cape Wrath and of line Ducans by Head to Utsire, to the bank of soundings north of the Faroes in the west, and to north east extremity of the 100 fathom line in the east. Westward of the 100 fathom line to Bill Baileys Bank.

DISTRICTS.

ORKNEYS—Orkneys and north-westward to the 100 fathom line.

SHETLANDS—Shetlands and eastward to the 100 fathom line.

FAROEES—That part of the Northern Area to the northward of the 100 fathom line.

Parts III, IV, V and VI are forecasts of wind and visibility for the 12 hours following the time of shore observations for the areas shown upon the Chart on p. 74.

Part VII commencing "Outlook" is a brief general statement of weather expected after the period of the forecasts.

NOTE.—In order to avoid ambiguity between the words Ireland and Iceland the latter word is always repeated whenever it occurs in Part I.

Explanation of Chart.

The numbers alongside the names of the stations indicate their code number (in the event of any station being substituted, the name of the substitute will be given in the message in place of this figure until such time as correction has been adequately made in Notices to Mariners and in THE MARINE OBSERVER).

The boundaries of the areas are defined by the plain black lines and the coast line.

These areas are sub-divided into districts, named after islands, rivers or banks within them, so that they may be readily memorised.

For instance the district in the neighbourhood of the Long Forties is termed "Forties".

The boundaries of these districts should only be taken as an approximate indication of their extent.

These districts are for the purpose of giving information of different weather within an area, without unduly lengthening the wording of a message. When similar weather is expected all over an area, these district names will not be used.

DESCRIPTION OF STATION REPORTS GIVEN IN PART II OF THE BULLETIN, AND INSTRUCTIONS FOR DECODING.

These reports only contain an identifying number of the stations from which they originate, and just those elements which are most essential for the purpose of the mariner, viz., the true direction of the wind, and its force, the barometer and how it has recently changed, the visibility to seaward, and the weather.

The observations are made at fixed times, viz., 0700 G.M.T. and 1800 G.M.T.

Instructions for Decoding.

These reports are made by means of the code tables of the International Code for wireless weather messages from ships, in five figure groups which are paired, each pair of groups giving a complete report for a station.

To decode these stations' reports the tables given in M.O. 329 are required (DECODE FOR USE WITH THE INTERNATIONAL CODE FOR WIRELESS WEATHER MESSAGES FROM SHIPS, obtainable from H.M. Stationery Office, price 3d.).

The Key Letters of the International Ships Wireless Weather Telegraphy Code are fully described on page 35 of the January, 1934, number and in M.O. 329.

The following is a brief description of the Key Letters used for the station reports in this bulletin.

First Group of Pair:—I_N ABBV meaning:—

I_N = Station. British stations from 1 to 9 and 0, and foreign stations 1 and 2, prefixed by the word "foreign" (see Chartlet), also page 18 of M.O. 329.

A = Barometric tendency.

BB = Barometric pressure.

V = Visibility. Caution is necessary in the use of these visibility reports owing to the conditions of view to seaward at some stations.

Second Group of Pair is arranged, in accordance with International agreement, similar to the third group of Selected Ships reports, i.e.

D D F w w

meaning:—

DD = Wind Direction.

F = Wind force.

ww = Weather.

In all cases when a figure cannot be given, a hyphen — — is given to preserve the order.

Sample Message.

(28th December, 1930).

Call Sign:—CQ CQ CQ GBR GBR GBR (repeated twice).

Weather Shipping.

General Statement.—Deep depression north of Faroes moving slowly northeast stop Intense depression north-west of Ireland will probably move east-north-east.

Station Reports.

10877	20301	28856	09360	30868	20402	47935	17760	57996
18902	66117	16401	75127	20602	85106	18502	96977	16360
00898	18601	Foreign	12847	08102	22726	22660		

Forecast.

Western Area. Hebrides wind moderate to strong south easterly or variable visibility moderate to good Shannon wind south westerly veering fresh to strong visibility good Clyde Mersey Severn southerly gale visibility moderate to good.

Southern Area. Southerly gale whole gale at times visibility moderate to good.

Eastern Area. Visibility moderate to good stop Forties wind southwest strong to gale backing and moderating then increasing remainder Eastern Area wind southerly increasing to gale whole gale in places.

Northern Area. Visibility moderate to good stop Faroes Orkneys wind southwest to west strong to gale then moderating and veering northwest Shetlands wind southwest strong to gale probably backing and moderating then increasing.

Outlook strong winds or gales.

I.C.W. and Spark Issues.

Certain portions of the "Weather Shipping" Bulletin described above are broadcast by coast W/T stations on I.C.W. or spark as follows:—

For the Western Area.

Vaentia. Lat. 51° 56' N., Long. 10° 21' W. (approx.), call sign GCK, wavelength 600 metres spark. At 0948 G.M.T. and 2048 G.M.T.

Seaforth. Lat. 53° 28' N., Long. 3° 01' W. (approx.), call sign GLV, wavelength 600 metres I.C.W. At 0930 G.M.T. and at 2030 G.M.T.

Commencing **Western Area** followed by ten groups of figures which indicate observations made at the five stations numbered 1 to 5 in the "Weather Shipping" Bulletin followed by the word **Forecast** after which the 12-hour forecast for the Western Area will be given.

For the Southern Area.

Niton. Lat. 50° 35' N., Long. 1° 17' W. (approx.), call sign GNI, wavelength 600 metres I.C.W. At 0930 G.M.T. and at 2030 G.M.T.

Commencing **Southern Area** followed by six groups of figures which indicate observations made at the three stations numbered 5, 6 and 7 in the "Weather Shipping" Bulletin, followed by the word **Forecast**, after which the 12-hour forecast for the Southern Area is given.

For the Eastern Area.

Cullercoats. Lat. 55° 02' N., Long. 1° 26' W. (approx.), call sign **GCC**, wavelength 600 metres I.C.W. At 0948 G.M.T. and at 2048 G.M.T.

Commencing **Eastern Area**, followed by eight groups of figures which indicate observations made at the four stations numbered 7, 8, 9 and 0 in the "Weather Shipping" Bulletin, followed by the word **Forecast**, after which the 12-hour forecast for the Eastern Area is given.

Wireless Telephony (R/T) Issues.

Certain portions of the "Weather Shipping" Bulletin are broadcast from the BRITISH BROADCASTING CORPORATION'S Station at Daventry by word of mouth as follows:—

Daventry (National). Latitude 52° 15' N., Longitude 1° 08' W. (approx.), wavelength 1500 metres (R/T.) At 1030 and 2300 G.M.T. on weekdays and 1030 and 2100 G.M.T. on Sundays.

This station broadcasts **Parts I, III, IV, V, VI and VII**, of the "Weather Shipping" Bulletin.

When British Summer time is in operation these issues are made one hour earlier by G.M.T. so that the hours and minutes given by B.S.T. remain the same as in winter when G.M.T. is used.

As changes in the time of these issues through the BRITISH BROADCASTING CORPORATION'S Station at Daventry are occasionally necessary at short notice, mariners are referred to the "Radio Times", the official organ of the BRITISH BROADCASTING CORPORATION which is published weekly, for notice of the exact times of issue of this message; these are also given in the daily press.

It should be noted that the times given in the "Radio Times" are G.M.T. only when summer time is not in operation, while all times for Wireless Weather Telegraphy in THE MARINE OBSERVER are G.M.T.

The masters and officers of merchant ships and skippers of fishing craft, who when in port in the British Isles, desire information of the probability of weather expected over the land, and particularly rainfall, for the purpose of making arrangements for working cargo etc., should listen in for the forecasts for land areas, which are made by word of mouth through this station. For times, see "Radio Times" or daily newspapers.

WIRELESS GALE WARNINGS.

I.C.W. and spark issues.

Gale warnings are broadcast on a wave of 500 kc/s (600 m.), from the following W/T stations:—

Station.	Call Sig.	Lat. (approx.)	Long. (approx.)	Station.	Call Sig.	Lat. (approx.)	Long. (approx.)
Wick	GKR	58° 26' N.	3° 06' W.	Lands End	GLD	50° 07' N.	5° 40' W.
Humber	GKZ	53° 20' N.	0° 17' E.	Valentia	GCK	51° 56' N.	10° 21' W.
Niton	GNI	50° 35' N.	1° 17' W.	Malin Head	GMH	55° 22' N.	7° 20' W.

The warnings are broadcast from the station or stations appropriate to the area within which the gale is expected immediately upon receipt at the station, and also, when this time is outside the periods of single operator watch, at 18 minutes past the first hour, within the next such period. The date and time of origin is given in each warning.

Warnings are preceded by the W/T safety signal **— — —** (TTT) repeated at short intervals ten times on full power. The warning is broadcast one minute later.

Example—"Gale Warning Thursday 1230 G.M.T. Easterly Gale south of line Spurn head to Galway and in Dogger district."

Gale Warnings will only be broadcast when winds of gale force (force 8 of the Beaufort Scale) or above are expected; when a "whole gale" (force 10 or above) is expected this will be stated.

Wireless Telephony (R/T) Issues.

Gale warnings will be broadcast as necessary by Radio Telephony, by the BRITISH BROADCASTING CORPORATION'S station at Daventry (National), on the wavelength of 1500 metres as follows:—

Weekdays.	Sundays.
1030 G.M.T. at the end of the "Weather Shipping" Bulletin	1030 G.M.T.
1300 G.M.T. } immediately after the Time Signal...	1630 G.M.T.
1645 G.M.T. }	
1800 G.M.T. } preceding the general (land) Weather Forecast.	
2100* G.M.T. }	
2300 G.M.T. at the end of the "Weather Shipping" Bulletin	2100 G.M.T.

Whenever the Meteorological Office telegraphs that gale warning signals should be hoisted on any coast, a notification is broadcast at the next of the above-mentioned times. A statement is appended to the morning and evening "Weather Shipping" Bulletin stating what gale warnings are then in operation.

*This time is subject to slight alteration from time to time. Notice of any changes will be broadcast with both the "Weather Shipping" Bulletins of the previous day and with the morning "Weather Shipping" Bulletin of the day on which any alteration is necessary.

When British Summer Time is in operation these issues are made one hour earlier by G.M.T. so that the hours and minutes given by B.S.T. remain the same as in winter when G.M.T. is used.

The warnings will be made in the following manner by word of mouth:—

"The Meteorological Office issued the following gale warning to shipping at 1430 G.M.T. to-day:—'Secondary depression off S.W. Ireland moving North-eastward, Southerly gales expected South of line from Eamouth to Spurn Head.'"

These R/T gale warnings are simply a repetition of the W/T gale warnings at fixed times convenient to the B.B.C.

III.—WIRELESS TIME SIGNALS.

C.W. Issues.

Rugby W/T station, Lat. 52° 21' 59" N., Long. 1° 11' 12" W., call sign **GBR**, broadcasts Time Signals on a wavelength of 18,750 metres (C.W.) at 1000 and 1800 G.M.T.:—

System Used.—Modified rhythmic type as recommended by the International Time Commission of 1925, consisting of a series of 306 signals emitted in 300 seconds of Mean Time, the concluding signal being the exact hour.

In each series, Signals Nos. 1, 62, 123, 184, 245 and 306 are single dashes (—) of 0.4 sec. duration and commence at the exact minute. Each dash is followed by 60 dots (·) of 0.1 sec. duration.

The commencement of successive signals, whether dot or dash, are equally spaced at intervals of 60/61 parts of one second of Mean Time, i.e.:—

G.M.T.	Signal.
h. m. s.	
9 or 17 55 00	1st signal a dash (—) followed by 60 dots (····· etc.).
„ 56 00	62nd do. do. do.
„ 57 00	123rd do. do. do.
„ 58 00	184th do. do. do.
„ 59 00	245th do. do. do.
10 or 18 00 00	306th signal, a dash (—).

This type of time signal will enable chronometer comparisons of extreme accuracy to be obtained, the method employed being to count the number of intervals from the first dash (—) until coincidence occurs between one of the rhythmic signals and the beat of the chronometer. (There being two such coincidences, $29\frac{1}{2}$ or $30\frac{1}{2}$ seconds apart, every minute.)

It is not necessary actually to count the signals.

Write down:—

(1) The chronometer time of the tick (whole or half second) immediately preceding the *first* dash.

(2) The chronometer times of coincidences (seconds only need be written down).

The difference between these (the "Elapse Time") increased by 0.5 sec. when it is not a whole number, gives the Rhythmic "Interval Number" from which the corresponding correction can be obtained.

NOTE.—An article entitled "Greenwich Time" describing how these signals are made, of great interest to navigators, will be found on pp. 159-167, Vol. V, No. 56.

Wireless Telephony (R/T) Issues.

The Time Signals broadcast by the BRITISH BROADCASTING CORPORATION through their Station at **Daventry (National)**, latitude $52^{\circ} 15' N.$, longitude $1^{\circ} 08' W.$, wavelength 1500 metres, are useful for rating chronometers at sea in ships which are fitted for R/T reception but have not Wireless Telegraphy on board.

These Time Signals are made at the following times:—

Weekdays.	Sundays.
1030 G.M.T.	1030 G.M.T.
1300 "	1630 "
1645 "	2100 "
1800 "	
2100 "	
2330 "	

When British Summer Time is in operation these issues are made one hour earlier by G.M.T., so that the hours and minutes given by B.S.T. remain the same as in Winter when G.M.T. is used.

The time Signals consist of the automatic transmission by the Standard Clock at Greenwich Observatory, of six dots, representing successive seconds. The final dot is the Time Signal. The amount of lag is less than 0.01 seconds.

Any Time Signal may be suppressed, when necessary, or it may be superimposed on programmes, but the Signals will be loud enough to be easily discernible. The time signals at 1030 and 1800 will, however, only be suppressed in exceptional circumstances.

As changes in the times of the BRITISH BROADCASTING CORPORATION issues may be made at shorter notice than can be given by THE MARINE OBSERVER, Mariners are therefore referred to "The Radio Times," the official organ of the BRITISH BROADCASTING CORPORATION, published weekly, for exact times of issue.

SPECIAL SERVICE BY PAYMENT.

Additional Wireless Telegraphic and Land Line Services which are performed for shipping, with charges.

The following list indicates the information which may be obtained on request, at any time, night or day.

Weather Forecasts.

Special weather forecasts can be made at the Meteorological Office for a period of 24 hours for areas within the region contained between the parallels of $70^{\circ} N.$ and $35^{\circ} N.$ and between the meridians of $12^{\circ} W.$ and the coast of the Continent of Europe.

Procedure for Ships at Sea.—Request weather forecast through the nearest coast W/T. station in Great Britain or Ireland, specifying required date and area, and giving ship's name.

Charge.—7s. 6d.

Procedure for Shipowners and Masters of Ships in port about to sail.—Telephone to Meteorological Office (Telephone No. Holborn 3434, Extension 174) or send **reply paid** telegram to Weather, Phone, London (allowing 10 to 20 words as necessary for reply), requesting weather forecast and specifying date and area for which required, and address to which to be sent.

Charges—None, if the information is required immediately and the reply paid telegram covers the telegraphic charges.

If the information is required for a specified day in advance, or for a number of days, a registration fee of 6d. per week (minimum fee 6d.) in addition to cost of telegrams. In this case application for the forecasts may be made by letter.

Procedure for Salvage Officers and others requiring warning of gales or winds from specified directions, or particular kinds of weather.—Write to the Meteorological Office, London, stating the position or locality and the warnings required, with the period.

Charge.—2s. 6d. for each message, plus telegraphic charges.

NOTE.—For Home waters the Areas and Districts used in the British "Weather Shipping" Bulletin may be used with advantage to indicate the localities for which forecasts are required.

Weather Reports.

Information of the actual local weather conditions prevailing at any of the following stations may be obtained:—

Aberdeen.	Hoylake.	Southend.
*Bangor, Co. Down.	Inchkeith.	Spurn Head.
Barry Island.	Kildonan.	†St. Ann's Head.
Beachy Head.	Lizard.	St. Catherines Point.
*Broughness.	*Mumbles.	*Stornoway.
Cape Wrath.	Needles.	*Torr Head.
†Dover Pier.	*Rame Head.	†Tynemouth.
Dunnet Head.	†Portpatrick.	†Wick.
*Holyhead.	Prawle Point.	

These stations cannot give information about barometric pressure. Reports from these stations include information as to the state of the sea.

Procedure for Ships at Sea.—Request through nearest W/T. coast station in Great Britain or Ireland, specifying the name of the station for which observed weather conditions are required.

Charge.—7s. 6d.

GERMANY.

II.—WEATHER SHIPPING BULLETIN.

North Sea.

I.C.W. Issues.

Norddeich W/T station approximate Latitude $53^{\circ} 36' N.$, Longitude $7^{\circ} 09' E.$

Call sign—**DAN.**

Wavelength—750 m. I.C.W.

Times of Transmission—1020 and 2130 G.M.T.

The message issued at 1020 is based on 0700 G.M.T. observations. The message issued at 2130 is based on 1800 G.M.T. observations.

The messages are preceded by the words "Seewetter Nordsee" and consist of two parts.

Part I is a weather report in code giving actual observations at the stations hereunder.

Station No.	German Station.	Position.	Station No.	Foreign Station.	Position.
0	Borkum Riff Lt.-V.	53° 46' N., 6° 04' E.	0	Helder ...	52° 58' N., 4° 45' E.
1	Heligoland ...	54° 11' N., 7° 54' E.	1	Hanstholm ...	57° 05' N., 8° 35' E.
2	Elbe Lt.-V. No. 1 ...	54° 01' N., 8° 13' E.	2	Krakenes ...	62° 02' N., 4° 59' E.
3	Amrum Bank Lt.-V.	54° 33' N., 7° 53' E.	3	Aberdeen ...	57° 10' N., 2° 06' W.

The foreign stations' observations are preceded by the word "Ausland" (Foreign). The Key and Code used is exactly the same as that used for the British "Weather Shipping" Bulletin see page 75.

Part II contains a brief statement of weather conditions followed by a forecast for the following 24 hours in German, covering the whole sea area off East and North Frisian coasts including Ostfriesland (between Borkum Riff Lt.-V., Elbe entrance and Heligoland) and Nordfriesland (Elbe entrance northward to Ellenbogen, Sylt).

Western, Middle and Eastern Baltic.

I.C.W. Issues.

Rügen W/T station, approximate Latitude 54° 35' N., Longitude 13° 37' E.

Call sign—DAS.

Wavelength—715 m. I.C.W.

Times of transmission—1030 and 2150 G.M.T.

The message issued at 1030 G.M.T. is based on 0700 G.M.T. observations. The message issued at 2150 G.M.T. is based on 1800 G.M.T. observations.

The messages are preceded by the words "Seewetter Rügen" and consist of two parts.

Part I is a weather report in code giving actual observations at the stations hereunder.

Station No.	German Station.	Position.	Station No.	Foreign Station.	Position.
4	Bulk ...	54° 27' N., 10° 12' E.	4	Skagen ...	54° 42' N., 10° 33' E.
5	Fehmarnbelt Lt.-V.	54° 36' N., 11° 09' E.	5	Copenhagen ...	55° 42' N., 12° 37' E.
6	Adlergrund Lt.-V....	54° 50' N., 14° 22' E.	6	Visby ...	57° 39' N., 18° 18' E.
7	Arkona ...	54° 41' N., 13° 26' E.	7	Memel ...	55° 42' N., 21° 10' E.
8	Leba ...	54° 46' N., 17° 33' E.			
9	Brusterort ...	54° 58' N., 19° 59' E.			

The foreign stations' observations are preceded by the word "Ausland" (Foreign).

Key and Code as above.

Part II contains a brief statement of weather conditions followed by a forecast for the following 24 hours in German, covering the area from Warnemunde to Leba.

Eastern Baltic.

I.C.W. Issue.

Pillau W/T station, approximate Latitude 54° 39' N., Longitude 19° 56' E.

Call sign—DBP.

Wavelength—740 m. I.C.W.

Times of transmission—1130 and 2210 G.M.T. based on 0700 and 1800 G.M.T. observations respectively.

The messages are preceded by the words "Seewetter Pillau" and consist of two parts.

Part I is a weather report in code giving actual observations at the stations hereunder.

Station No.	German Station.	Position.	Station No.	Foreign Station.	Position.
7	Arkona ...	54° 41' N., 13° 26' E.	6	Visby ...	57° 39' N., 18° 18' E.
8	Leba ...	54° 46' N., 17° 33' E.	7	Memel ...	54° 42' N., 21° 10' E.
9	Brusterort ...	54° 58' N., 19° 59' E.			

The foreign stations' observations are preceded by the word "Ausland" (Foreign).

Key and Code as above.

Part II contains a brief statement of weather conditions followed by a forecast for the following 24 hours in German, covering the area from Danzig Bay to Memel.

WIRELESS GALE WARNINGS.

I.C.W. Issues.

Gale Warnings are broadcast in German, preceded by the word "Funksturm", giving the nature of the atmospheric distribution with direction and force of wind for the regions specified by the stations indicated below.

W/T Station.	Call Sign.	Position.		Wavelength.	Time of Transmission.	Region.
		Latitude N.	Longitude E.			
Norddeich...	DAN	53° 36'	7° 09'	600 m. I.C.W. 750 m. I.C.W.	On receipt 0520, 1020* 1630, 2130*	North Sea.
Kiel...	DBK	54° 24'	10° 11'	600 m. I.C.W. 680 m. I.C.W.	On receipt 0540, 1120 1700, 2210	Western Baltic.
Rügen	DAS	54° 35'	13° 37'	600 m. I.C.W. 715 m. I.C.W.	On receipt 0530, 1030* 1650, 2150*	Baltic— Fleensburg to Memel.
Pillau	DBP	54° 39'	19° 56'	600 m. I.C.W. 740 m. I.C.W.	On receipt 0550, 1130* 1710, 2210*	Eastern Baltic.

* After Weather Bulletin.

IV.—WIRELESS ICE WARNINGS.

C.W. and I.C.W. Issue.

Norddeich W/T Station, call sign **DAN**, broadcasts, when necessary, except Sundays, information of ice conditions along the German coasts in the North Sea and Baltic in a local code.

The message is transmitted at 0950 G.M.T. on a wavelength of 2400m. C.W.

Rügen W/T Station, call sign **DAS**, broadcasts ice warnings similar to above at 1030 G.M.T. on a wavelength of 715 m. I.C.W.

SWEDEN.

II.—WEATHER SHIPPING BULLETIN.

North Sea and Baltic.

C.W. Issues.

Karlsburg W/T Station, approximate Latitude 58° 29' N., Longitude 14° 29' E.

Call sign—SAJ.

Wavelength—4267m. C.W.

Times of transmission—1050 and 2200 G.M.T.

The message issued at 1050 is based on 0700 G.M.T. observations.

The message issued at 2200 is based on 1800 G.M.T. observations.

The messages are preceded by the words "Weather Report" and consist of five parts.

Part I is a weather report in code giving actual observations at the stations hereunder:—

List of Observation Stations.

<i>Index Number.</i>	<i>Station.</i>	<i>Position (approx.)</i>	
		<i>Latitude N.</i>	<i>Longitude E.</i>
1	Kalmar	56°39'	16°22'
2	Bjurö klubb	64°28'	21°34'
3	Holmögadd	63°35'	20°45'
4	Bremö	62°13'	17°44'
5	Orskär	60°31'	18°22'
6	Sandhamn	59°17'	18°55'
7	Visby	57°39'	18°18'
8	Skanör	55°24'	12°49'
9	Kullen	56°18'	12°27'
0	Vinga	57°38'	11°36'
1	Hammershus	55°19'	14°47'
2	Hanstholm	57°07'	8°36'
3	Utsire	59°18'	4°53'
4	Kinn	61°34'	4°47'

The key and code used is exactly the same as that used for the British "Weather Shipping" Bulletin, see page 69.

Part II, en clair (English).

A statement of weather conditions in N. and N.W. Europe, and adjacent seas.

Part III, en clair (English).

Weather forecasts for 12 hours for the following areas:—

- 1 Eastern part of the North Sea (E. of Longitude 5° E.).
- 2 Sweden, West Coast (Skagerrak, Kattegat and the Sound).
- 3 Baltic (Southern Baltic; South Skane, Bleking and Oland; Northern Baltic; East Gotaland, Svealand and Gotland).
- 4 Gulf of Bothnia (Bothnia Sea; Bothnia Bay).

Part IV, en clair (English).

Gale warnings for areas, 1, 2, 3 and 4 (above) for particulars, see below.

WIRELESS GALE WARNINGS.

Baltic.

C.W. Issues.

Karlsborg W/T station broadcasts warnings, *en clair*, English, of gales for the areas given in Part III of the Weather Shipping Bulletin.

The warnings commence with the words "Gale Warnings" and are valid for the ensuing 24 hours. They form Part IV of the weather bulletins broadcast by Karlsborg W/T at 1050 and 2200 G.M.T., explained above.

IV.—WIRELESS ICE WARNINGS.

Swedish Ice Breaker.

C.W., I.C.W. and R/T Issues.

The Swedish Government ice breakers broadcast information in English on a wavelength of 600 metres, giving their position, proposed area for ice breaking and rendering assistance during the ensuing 12 hours. Important local information for mariners will also be broadcast.

The messages are broadcast daily, during the time the vessels are employed on ice-breaking service.

The message will be repeated by wireless telephony on a wavelength of 600 metres R/T, in Swedish and English immediately after the transmission on I.C.W. The repetition will be preceded by the words "Fran svenska statens isbrytarfartyg" (from the Swedish State ice breaking vessel).

Ice breaker "Ymer," call sign **SBPN**, at 0800 and 1045 G.M.T. on weekdays and 1210 G.M.T. on Sundays and holidays.

Ice breaker "Atle," call sign **SBLN**, at 0815 and 1100 G.M.T. on weekdays and 1225 G.M.T. on Sundays and holidays.

NORWAY.

II.—WIRELESS GALE WARNINGS.

I.C.W. and R/T Issues.

The following stations broadcast gale warnings for the coast of Norway:—

Station.	Call Sign.	Position.		Wavelength.	Times of transmission G.M.T.	Region.
		Latitude N.	Longitude E.			
Flekkeroy	LGY	58°04'	8°00'	600m. I.C.W.	1025, 1620, 2120	S. of Kristiansand.
Utsire ...	LGK	59°18'	4°55'	600m. I.C.W.	1200, 1800	Lindesnes to Hellisøy Lt. Ho.
Alesund ...	LGA	62°28'	6°10'	600m. I.C.W.	1150	Sonefjord to Rorvik.
Röst ...	LGR	67°30'	12°05'	600m. R/T	1200, 2030	Lofoten, Helgeland, Salten.
Tromsøy ...	LMT	69°39'	18°58'	1100m. C.W. 1100m. R/T	1025, 1545, 2015	Northern Norway, Rorvik to Grense Jakobselva.
Vardöy ... (1st Jan. to 31st May.)	LGV	70°22'	31°07'	510m. R/T	1200, 1800 (Sundays 1800)	Finnmark.

DENMARK.

IV.—WIRELESS ICE WARNINGS.

Danish Waterways.

I.C.W. Issues.

The following W/T stations broadcast a summary of ice conditions in Danish waterways, *en clair* (English). Wavelength 600 metres, I.C.W.

Blaavand W/T station, approximate Latitude 55° 33' N., Longitude 8° 05' E., call sign **OXB**, at 0100 and 1300 G.M.T.

Copenhagen W/T station, approximate Latitude 55° 41' N., Longitude 12° 37' E., call sign **OXA** at 1100 and 2300 G.M.T.

LATVIA.

IV.—WIRELESS ICE WARNINGS.

Wireless Telephony (R/T Issues).

The broadcasting station at Riga, Latitude 56° 57' N., Longitude 24° 07' E., call sign **YLZ**, broadcasts in winter, on a wavelength of 524.6 metres R/T, ice reports at 0650, 1035 and 2000 G.M.T. The reports contain information concerning ice and navigation conditions for the Latvian coast. They are broadcast in the Latvian, ENGLISH and German languages.

ESTONIA.

IV.—WIRELESS ICE WARNINGS.

C.W. Issue.

Tallinn W/T Station, approximate Latitude 58° 56' N., Longitude 23° 32' E., call sign **ESA** broadcasts, on the first appearance of ice, information of ice conditions in Estonian waters in a local code.

The message is transmitted at 0940 G.M.T. on a wavelength of 3508m. C.W.

FINLAND.

II.—WIRELESS GALE WARNINGS.

I.C.W. and R/T Issues.

The following stations broadcast Gale Warnings when necessary *en clair* in **English** at the times and wave lengths given below, the message commencing with the International Safety Signal "TTT Gale Warning".

Station.	Call Sign.	Position.		Wavelength.	Times of Transmission G.M.T.
		Latitude N.	Longitude E.		
Viborg ...	OHP	60° 43'	28° 45'	600m. I.C.W.	1230 and 2030
Hango ...	{ OHD OFK	59° 50'	22° 57'	750m. R/T	1235 and 2035
Vaasa ...	OHX	63° 07'	21° 37'	600m. I.C.W.	1210 and 1755
				750m. R/T	1205 and 1750
				600m. I.C.W.	1225 and 1800
				750m. R/T	1220 and 1755

Example of message—"TTT Gale Warning. Southwest gale expected up to about next morning between Aland and Helsingfors."

IV.—WIRELESS ICE WARNINGS.

C.W. Issues.

Helsingfors W/T Station approximate Latitude 60° 08' N., Longitude 25° 03' E., call sign **OHA** broadcasts, when necessary, information of ice conditions for the coasts of Finland in a local code.

The messages are transmitted at 1030 and 1420 G.M.T. on a wavelength of 3750m. C.W.

HOLLAND

II.—WIRELESS GALE WARNINGS.

North Sea.

I.C.W. Issues.

Scheveningen W/T station, Latitude 52° 06' N., Longitude 4° 16' E. (approx.), call sign **PCH**, makes gale warnings on receipt and following the end of the next compulsory 3 minutes silent period, both in Dutch and English, and also at 1230 and 2030 G.M.T. Wavelength used is 600 metres (I.C.W.).

IV.—WIRELESS ICE WARNINGS.

I.C.W. Issues.

Scheveningen W/T station, call sign **PCH**, broadcasts, when necessary, information of ice conditions in certain Dutch harbours and approaches, daily as follows:—

at 1230 and 2030 G.M.T. after the Storm Warning (if issued). Wavelength 600 metres (I.C.W.).

The ice report is broadcast in a local code and will contain the ice conditions for the following harbours:—

Delfzijl (Ems).	Helder (Zuider Zee).
Harlingen (Zuider Zee).	Rotterdam (Waterway).
Amsterdam (North Sea Canal).	Dordrecht (North).
Zaandam (Voorzaan).	Dordrecht (Mallegat).

The report commences with the words "Ijsbericht, Ice report."

The broadcast of the ice reports will begin when navigation is closed to small steamers and seagoing motor vessels at any of the harbours mentioned in the list, and will cease when navigation is re-opened.

FRANCE.

II.—WIRELESS GALE WARNINGS.

The following W/T stations broadcast gale warnings concerning the areas "Manche," "Bretagne," "Ocean," and "Gascogne":—

Cherbourg - Rouges Terres ... Approximate Latitude 49° 37' N., Longitude 1° 36' W., call sign **FUC**.

Brest-Mengam ... Approximate Latitude 48° 21' N., Longitude 4° 35' W., call sign **FUE**.

Lorient-Pen-Mané ... Approximate Latitude 47° 44' N., Longitude 3° 21' W., call sign **FUN**.

Rochefort-Soubise ... Approximate Latitude 45° 56' N., Longitude 0° 59' W., call sign **FES**.

The following W/T stations broadcast storm warnings concerning the areas "Roussillon," "Provence," "Rhône," and "Corse":—

Porquerolles ... Approximate Latitude 42° 59' N., Longitude 6° 12' E., call sign **FUQ**.

Ajaccio-Aspretto ... Approximate Latitude 41° 56' N., Longitude 8° 46' E., call sign **FUI**.

The W/T stations transmit the warning on the 600 metre wave length as soon as it is received. The International Safety Signal — — — (TTT) is first sent out, followed by D.E. and station call sign. This transmission commences towards the end of one of the international three-minute silent periods and the nature of the warning is sent immediately after the end of the silent period. The message is repeated after several minutes.

When the time of sending falls outside a single operator watch on board ship the message is repeated at the commencement of the succeeding watch.

C.W. Issues.

Eiffel Tower W/T Station, call sign **FLE**, broadcasts wireless gale warnings on a wavelength of 7,200 m. C.W.

The warnings are broadcast if the forecasts indicate that the wind force is likely to exceed force 7 on the Beaufort scale.

The signals refer to the following French coastal areas:—

Manche, Bretagne, Océan, Gascogne, Roussillon, Rhône, Provence, Corse.

The limits of the areas mentioned above are as follows:—

"Manche"	...	Belgian frontier to and including Carteret.
"Bretagne"	...	From and including Cherbourg to estuary of Loire.
"Océan"	...	From and including Lorient to the Gironde.
"Gascogne"	...	From and including Ile de Ré to Spanish frontier.
"Roussillon"	...	From Spanish frontier to and including Cette.
"Rhône"	...	From and including Cette to Camarat.
"Provence"	...	From and including Camarat to Italian frontier.
"Corse"	...	All the coasts of Corsica.

Form of Message.

The warnings are sent *en clair* in French, and are valid for 24 hours from the time indicated in the message.

They commence with the name of the day of the week, the time from which the validity of the warning is reckoned, the name of area threatened followed by the word "Tempête" and the probable direction from which the gale may be expected.

Example.

"Jeudi 15 heures Manche tempête, Nord-Ouest (N.W.)."

Explanation.

From Tuesday until 1500 to-morrow a gale (Force 7 or over Beaufort) and from a direction between North and West will threaten all parts of the coast between the Belgian frontier and Carteret.

PORTUGAL.

II.—WIRELESS WEATHER BULLETINS.

Containing meteorological conditions at Madeira and Azores.

Spark and R/T Issues.

Monsanto W/T Station, approximate Latitude $38^{\circ} 44' N.$, Longitude $9^{\circ} 11' W.$, call sign **CTV**, broadcasts a meteorological report *en clair*, in Portuguese and English, at 1130 and 2300 G.M.T. on a wavelength of 1,000 metres (Spark) and at 1155 and 2325 G.M.T. on a wavelength of 600 metres (R/T), giving:—

Observations of wind and swell, also a forecast for the next 24 hours of wind and swell for the coast of Portugal. The coast is divided as follows:—

Zona Norte ... From River Minho to Cape Mondego.
Zona Centro ... From Cape Mondego to Cape St. Vincent.
Zona Sul ... Cape of Algarve (southern coast).

The messages are based upon observations of 0700 and 1800 G.M.T. respectively.

MOROCCO.

II.—WIRELESS GALE WARNINGS.

Spark Issues.

Casablanca — Chetaba W/T Station, approximate Latitude $33^{\circ} 37' N.$, Longitude $7^{\circ} 37' W.$, call sign **CNP**, broadcasts gale warnings when necessary on 600 m. spark. They are broadcast *en clair* in French and repeated at the commencement of the following watch for single operators. The area affected is given in the message.

The message is preceded by the International Safety Signal **TTT) — — —**.

AZORES.

II.—WIRELESS WEATHER BULLETIN.

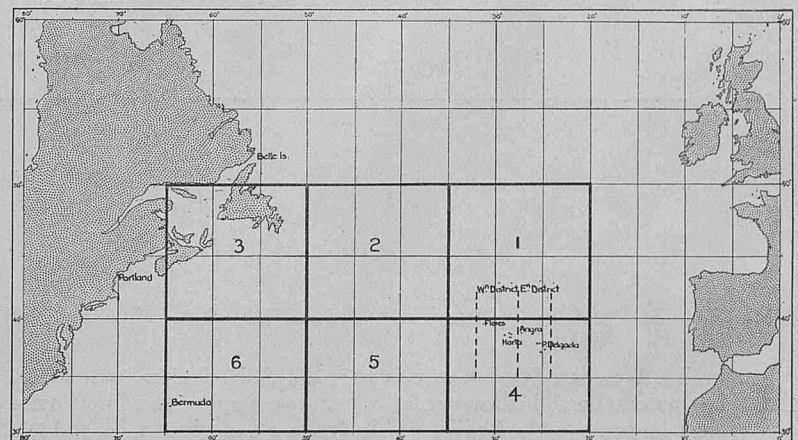
C.W. and Spark Issues.

Horta W/T Station, Latitude $38^{\circ} 32' N.$, Longitude $28^{\circ} 38' W.$ (approx.), call sign **CTH—**

Wavelength 600 m. spark. Time of transmission 2000 G.M.T.
Wavelength 2400 m. C.W. Time of transmission 2030 G.M.T.

This weather bulletin is sent *en clair* in Portuguese and repeated in English, the time of observation upon which the forecasts are based being stated in the message.

The zones referred to are indicated in the chart below.



PERSONNEL.

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

Commander Sir Edgar T. Britten, Kt., R.D., R.N.R.

HIS MAJESTY THE KING was graciously pleased on New Year's Day, 1934, to confer a knighthood upon Captain E. T. BRITTEN of R.M.S. *Berengaria*.

Captain E. F. Gilbert.

Captain E. F. GILBERT of R.M.S. *Windsor Castle* has retired from active service afloat.

Trained in H.M. School Ship *Conway* 1885 to 1887 he served his time in Messrs. Williamson Milligan & Company's Barque *Redgauntlet*.

He was second mate of the Barque *British Army* and mate of the ship *Roderick Dhu*. Joining the Castle Line in March, 1896, Captain GILBERT was appointed to his first command S.S. *Carlisle Castle* in January, 1916, since when he has commanded a number of the Union Castle Company's ships.

Captain W. Mason, D.S.C.

Captain WILLIAM MASON, commander of the M.V. *Port Dunedin*, has retired from active service afloat after 47 years sea service.

Captain MASON commenced his sea career in 1887 and after nine years service in sail joined the Red Cross Line of steamers employed in the South American trade, in which service he rose to command. He later transferred to the Indra Line, running to the Far East and to the associated Tyser Line employed in the Australasian trade.

In 1914 the Commonwealth Dominion Line was formed by the amalgamation of the Indra, Tyser, Star and Port Lines, since when he has commanded several vessels of their fleet, including the *Port Adelaide*, *Port Curtis*, *Port Lincoln*, *Port Pirie*, *Port Hardy*, *Port Campbell* and *Port Dunedin*.

Captain MASON was awarded the Distinguished Service Cross for his gallant action against an enemy submarine on August 7th, 1917, when in command of the *Port Curtis*, during which he was badly wounded.

Commander B. J. Ohlson, D.S.O., R.D., R.N.R.

Captain BASIL J. OHLSON, senior commander in the Peninsular and Oriental Steam Navigation Company's Fleet and lately in command of the R.M.S. *Strathnaver*, has retired from active service afloat.

A native of Hull, Captain OHLSON served his time in the sailing ships of Messrs. Devitt and Moore, and on its completion in 1896 entered the P. and O. Company's service as fifth officer of the steamer *Parramatta*. In 1919 he was appointed to command the R.M.S. *Himalaya*, since then has had charge of the *Baradine*, *Balranald*, *Moldavia*, *Assaye*, *Mongolia*, *Ranchi*, *Maloja*, *Viceroy of India* and *Strathnaver*.

For his services as an R.N.R. Officer during the war Captain OHLSON was decorated with the Distinguished Service Order; he also holds the Order of St. Vladimir of Russia.

We wish these officers health and happiness in their retirement and thank them for their work as members of the Corps of Voluntary Marine Observers.

OBITUARY.

THE death of Captain F. W. KERSHAW, O.B.E., in February last is noted with regret.

FREDERICK WILLIAM KERSHAW was born at Chiswick on 14th June, 1868. He commenced his career at sea as an apprentice in Messrs. Devitt and Moore's fine old sailing ship training service in June, 1883, serving in the ships *La Hague*, *St. Vincent* and *Derwent*.

La Hague will be remembered with admiration by old timers as a fine wooden ship. A painting of her by the late Mr. JACK SPURLING appeared in "Blue Peter" in recent years.

After service in a number of steamers as third, second and Chief mate in the China coast trade, he joined the service of the Orient Steam Navigation Company on 1st March, 1892, joining his first ship in the Orient Line, R.M.S. *Orient* on May 13th, 1892.

His first appointment in command was on 28th August, 1899, when he took charge of R.M.S. *Ophir* for one voyage, being transferred in December, 1899, to S.S. *Orient*, in which ship he did much trooping during the South African War, in which service he made a name as a disciplinarian who effectively checked and prevented troubles which sometimes occur after men have had long active service in the field.

On 29th December, 1901, he resumed command of the *Ophir*, remaining in her until April, 1906, when he retired from the Orient Company's service to take up the post of Harbour Master of the lower reaches of the Thames.

He was promoted to the rank of Lieutenant-Commander in the Royal Naval Reserve and placed on the retired list in 1909.

Throughout the Great War he was Chief Officer of the Thames examination service, and was awarded the Order of the British Empire.

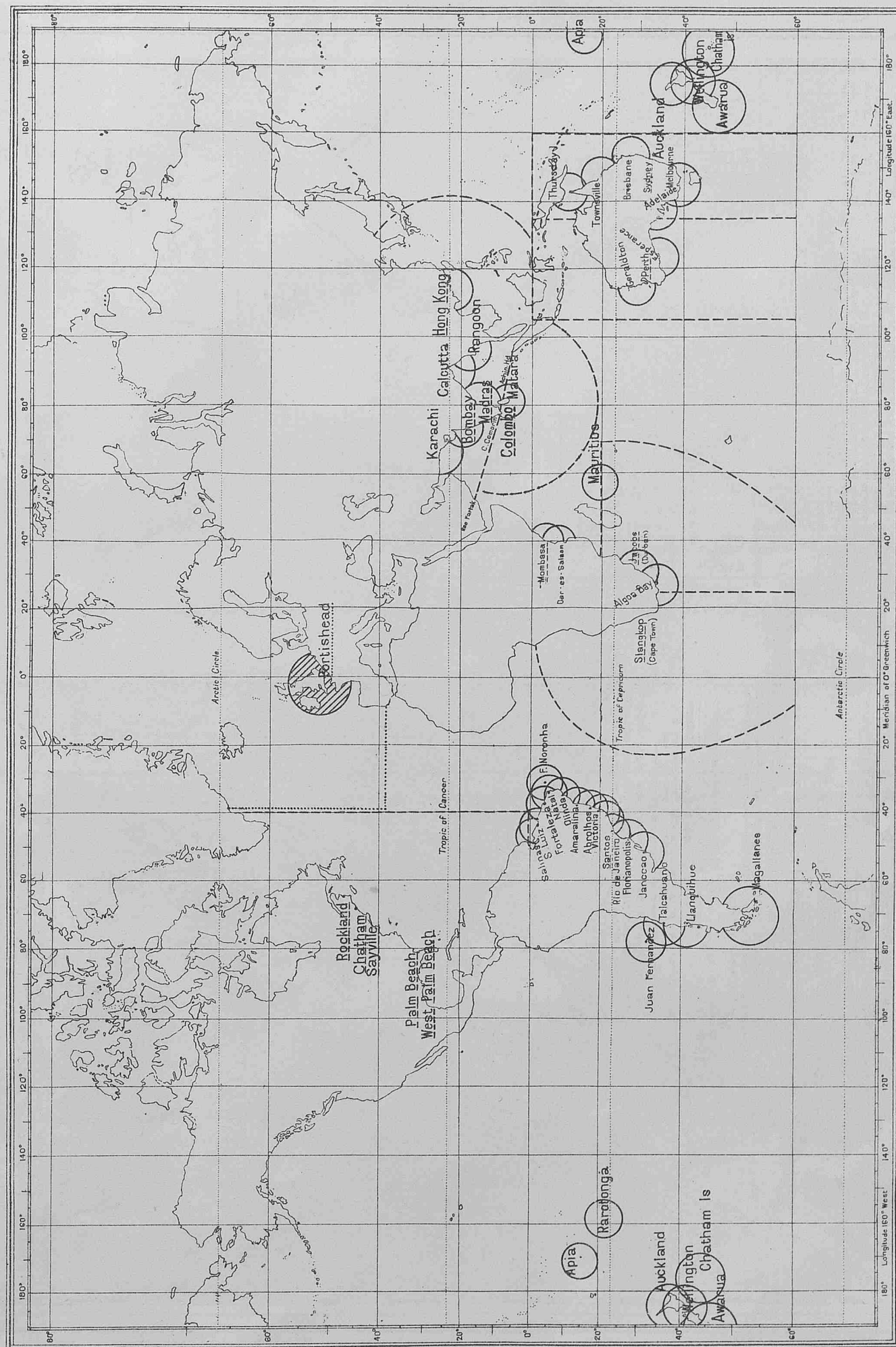
Upon reaching the age of 60, in August, 1928, he retired from the post of Harbour Master.

He was a Younger Brother of Trinity House, and was one of the founders of the Honourable Company of Master Mariners, a man imbued with the desire to improve the service he adorned.

During his service at sea, he was a member of the corps of marine observers for 12 years, and the ships under his command returned no less than 20 meteorological logs. As an officer he was himself responsible for eight meteorological logs classed "Excellent."

CHART OF THE WORLD.

Stations for Reception of Routine Wireless Weather Reports from "Selected Ships."



The dotted line indicates the area in which British "A Selected Ships" report under control to Portishead.

A pecked line indicates the reporting area round stations in other countries to which British "Selected Ships" should report. The names of such stations being underlined with a pecked line

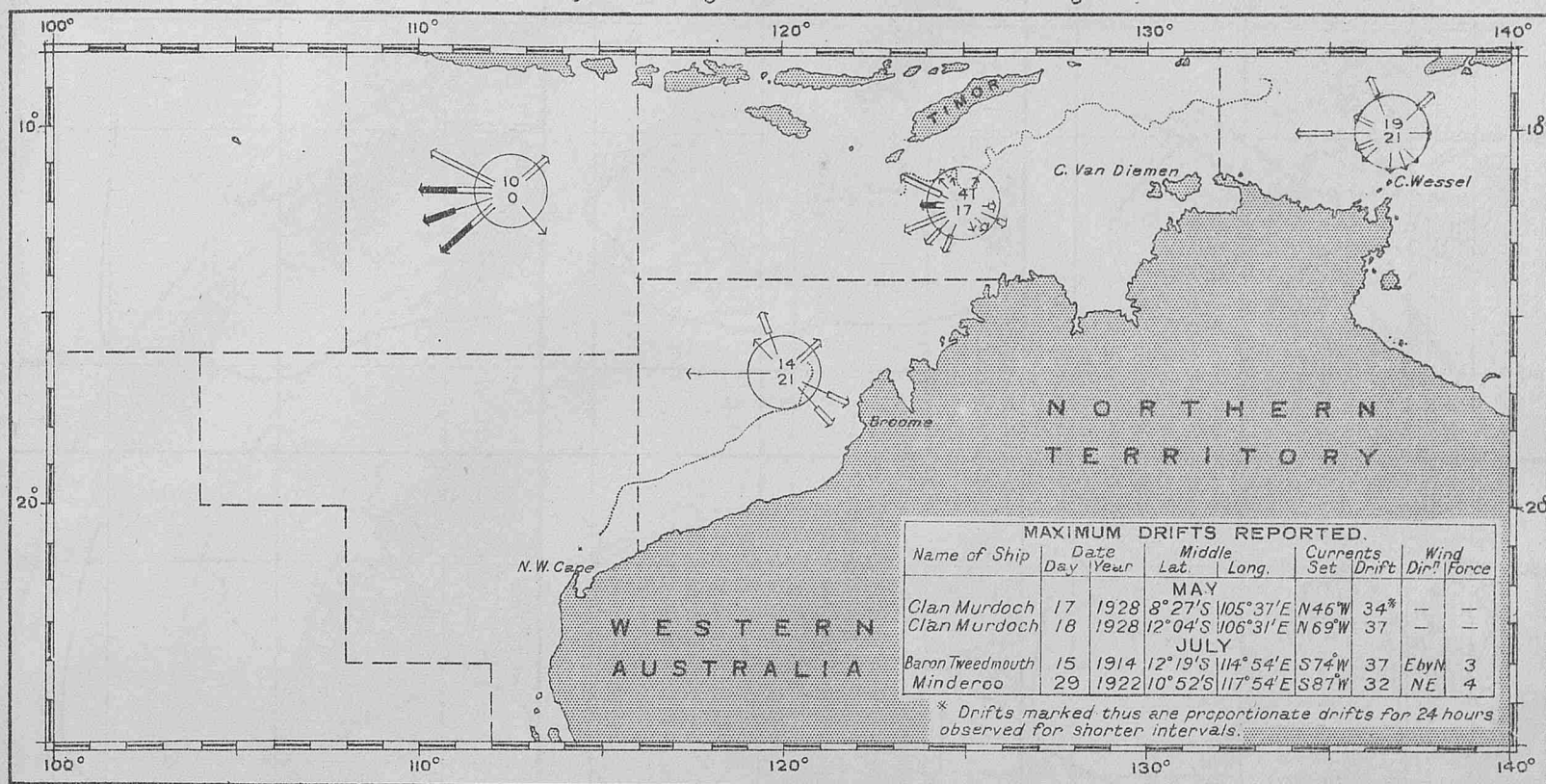
The small shaded areas round stations detailed to receive reports from "A Selected Ships" indicate where these ships should not report on account of congestion.

The full circles indicate the areas round islands and coast stations which are detailed to intercept "B". Selected Ships "reports made to G.Q. on 600 metres.



CURRENTS IN THE PORTION OF THE INDIAN OCEAN NORTH OF AUSTRALIA. MAY JUNE. and JULY.

Observations of ships regularly observing for the British Meteorological Office, 1910-1933.



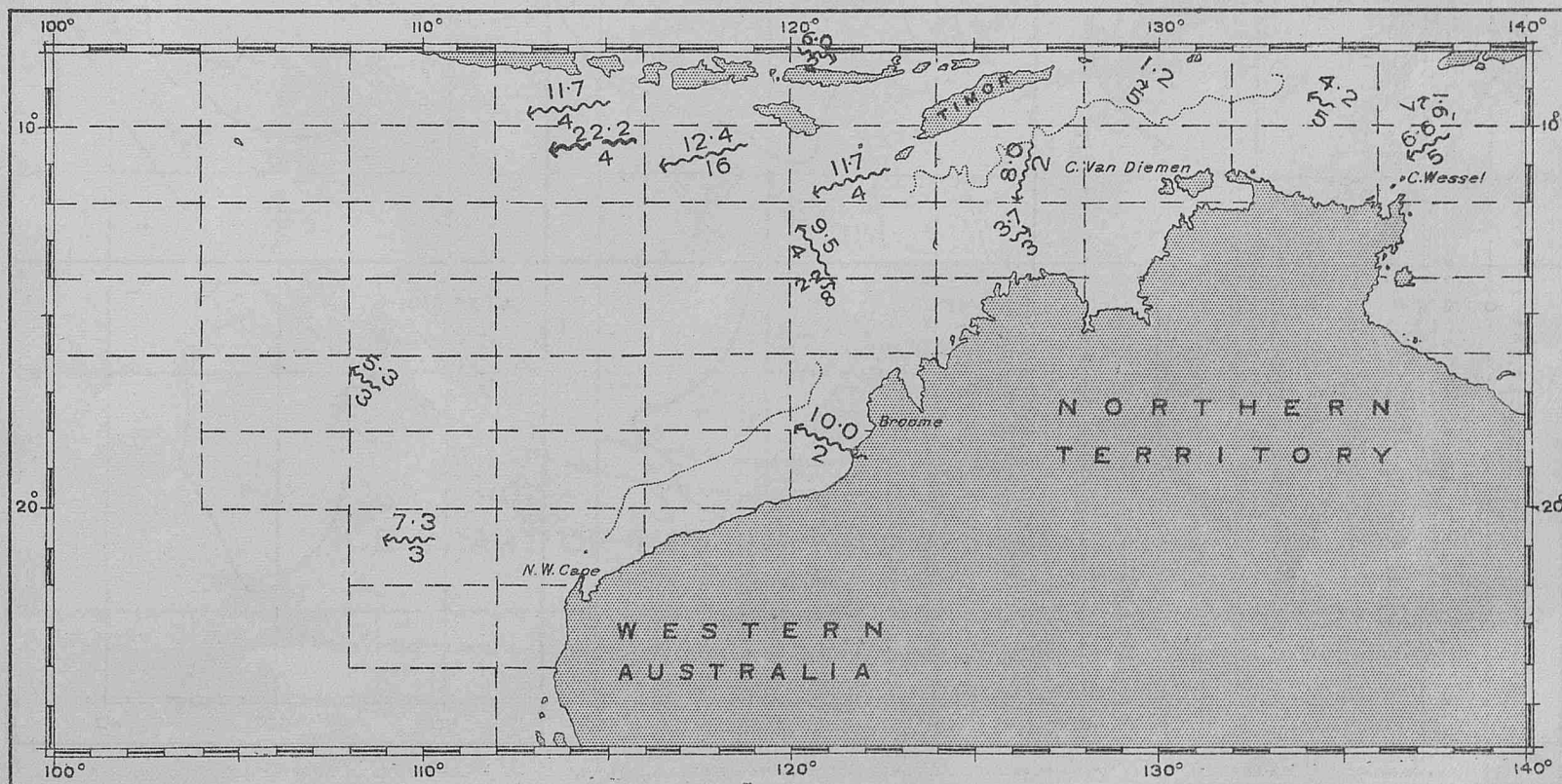
EXPLANATION OF CURRENT ROSES.

The current roses are drawn from observations within the pecked lines. Arrows flow with the current, length represents frequency, thickness strength,:-

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

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

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



EXPLANATION OF CURRENT ARROWS.

The arrows flow with the current and represent the resultant of currents observed within the pecked lines. The centre of each arrow lies in the mean position of observation. The figures above the arrows give the velocity of current in miles per day; the figures below the arrows the number of observations. In cases where the arrows drawn to scale are inconveniently long the symbol ~~~~~ is substituted.

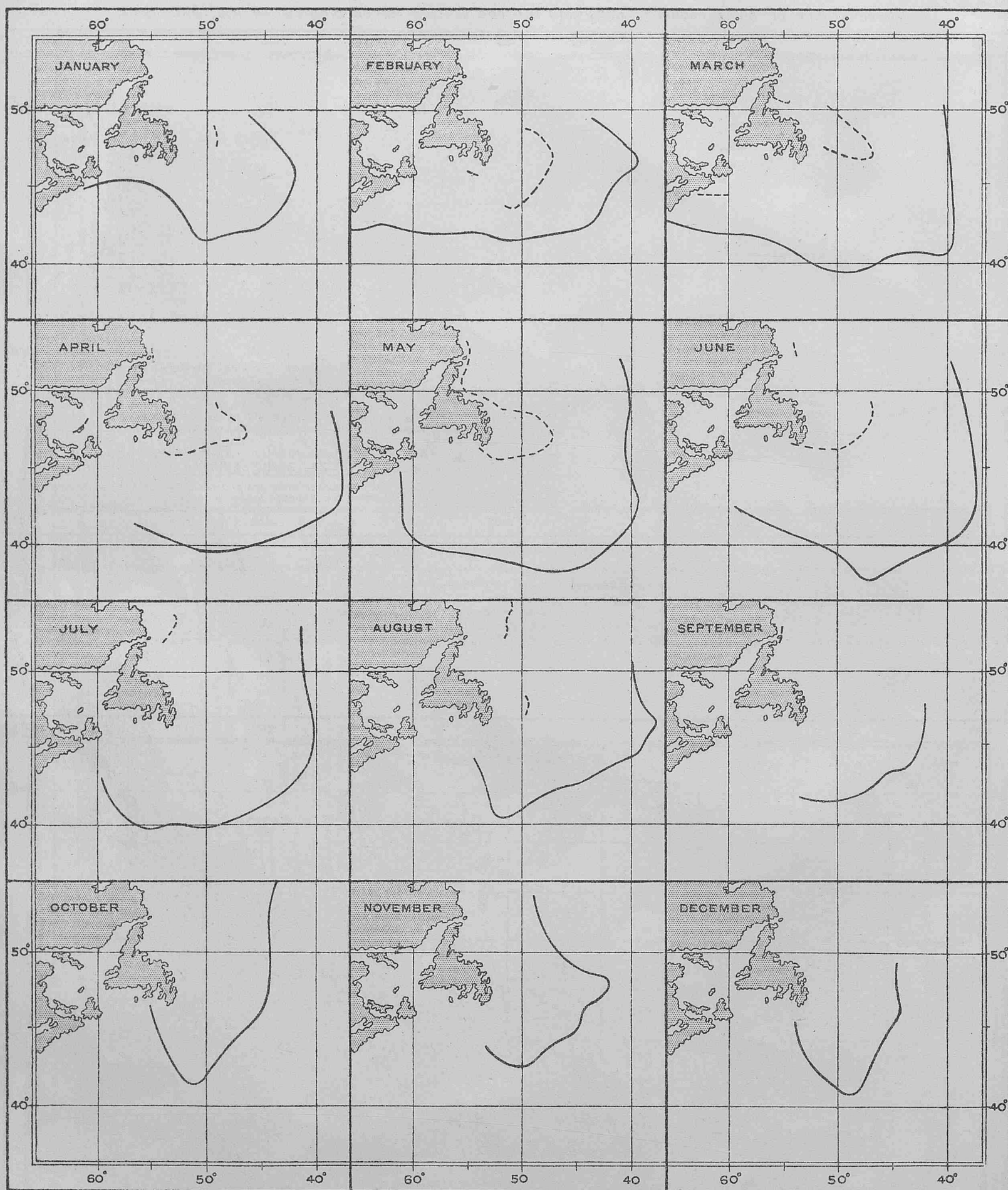
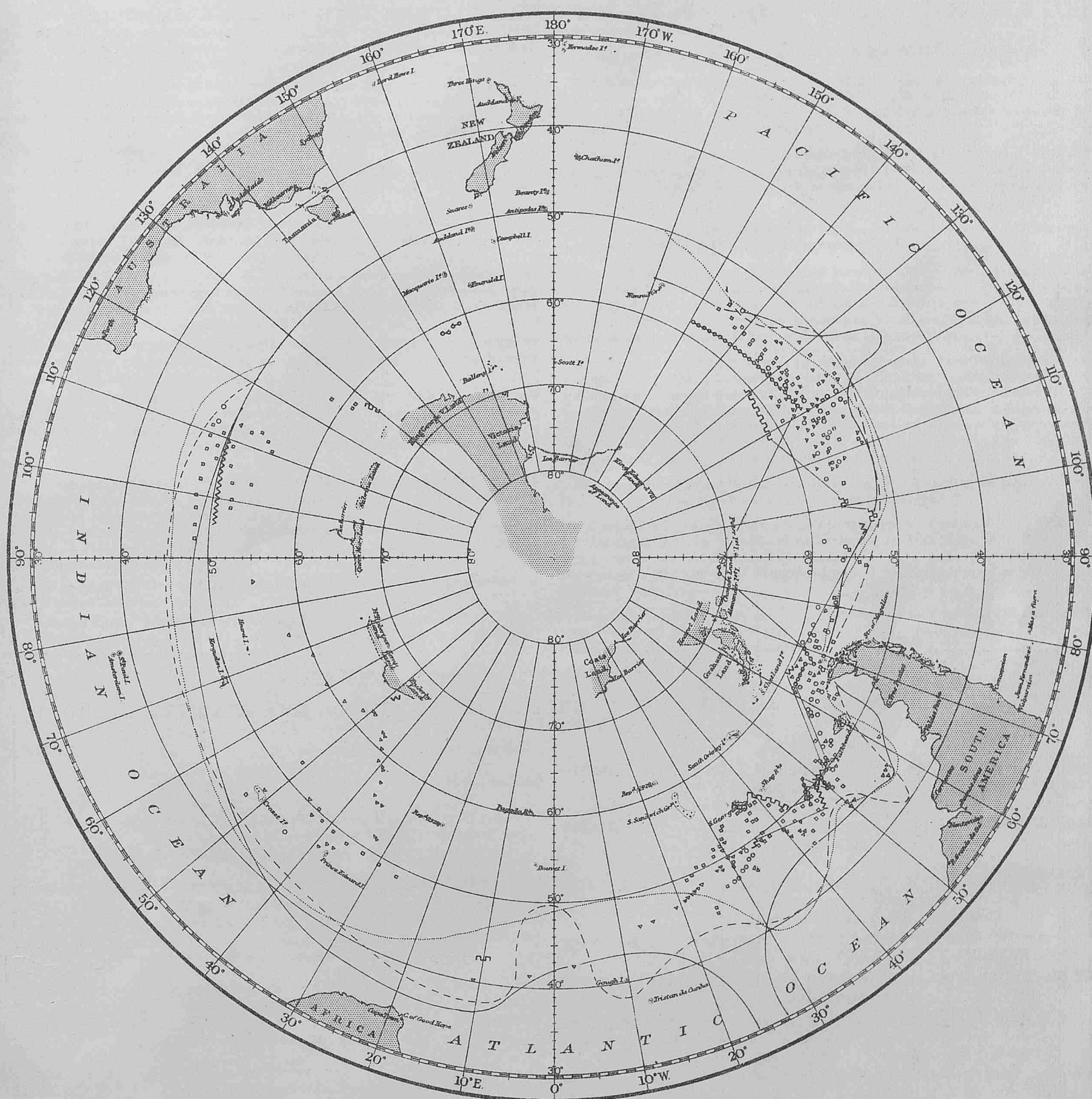


Chart C.—LIMITS OF ICE, WESTERN NORTH ATLANTIC.

Limit from 1901 to 1933 shown thus —————

Limit for 1933 shown thus - - - - -



ICE CHART OF THE SOUTHERN HEMISPHERE, APRIL MAY and JUNE.

EXPLANATION.

The symbols used to distinguish the ice of each of the three months are as follows:—

Bergs, 1902-1933.

Position of northernmost pack
ice actually observed 1885-1933.

Extreme limit of
all ice, 1772-1933.

April
May
June

△
□
○

~~~~~  
~~~~~  
~~~~~

~~~~~  
~~~~~  
~~~~~

Note— The symbols for pack ice are joined by hair line where desirable.

The coast line of the Antarctic continent as shown on this chart is not completely corrected to accord with the latest survey information. It is intended in a later volume of *The Marine Observer*, after the Admiralty Ice chart of the Southern Hemisphere N° 1241 has been revised to again publish this chart in *The Marine Observer* with coast lines as complete as possible and to bring the ice information up to date annually.

MARINE METEOROLOGY.

Co-operation of Shipowners, Masters and Mates.

Captains and Officers of ships registered in Great Britain and Northern Ireland, who wish to co-operate regularly with the Meteorological Office should apply to the appropriate Port Meteorological Officer or Agent, a list of whom, with addresses, is given below.

In accordance with the International Convention for Safety of Life at Sea, the Meteorological Office arranges for certain "Selected Ships" to take meteorological observations at specified hours, and to transmit such observations by wireless telegraphy, for the benefit of other ships and the various meteorological services.

Arrangements are also made for a limited number of ships to keep meteorological logs in certain trades for the purpose of completing the meteorological survey of the oceans.

Ships performing these voluntary duties are known as Observing Ships; the whole as the Voluntary Observing Fleet; and the commanders and officers of these ships as the Corps of Voluntary Marine Observers.

At present the observing fleet is limited to a number not exceeding 360 observing ships. The number of British "Selected Ships" is determined upon the British proportion of world tonnage, on the assumption that there should be a total of 1,000 "Selected Ships" of all nations.

The observing fleet list indicating which are "Selected Ships," with the names of commanders, officers, and other particulars, is published in THE MARINE OBSERVER and kept up to date monthly.

A general description of marine meteorological work, including the particulars desired from intending marine observers, is given in Chapter I of THE MARINE OBSERVER'S HANDBOOK, 5th Edition, which is supplied to all observing ships, and may also be obtained from H.M. Stationery Office, direct, or through any bookseller, price 2s. 6d.

THE QUARTERLY MARINE OBSERVER or MONTHLY SUPPLEMENT is sent regularly to the captain of every observing ship, for the information and guidance of his observing officers, and in the case of "Selected Ships," the wireless operators also. The Captains of observing ships are also supplied on request with charts, and atlases according to trade, if available as meteorological equipment.

Ships keeping the Meteorological Log, Form 915, are lent a complete set of official tested instruments.

"Selected Ships," other than meteorological log keeping ships, keep the Ships' Meteorological Record, Form 911. All "Selected Ships" also keep the Ships' Wireless Weather Register, Form 138.

No observing ship is detailed as a "Selected Ship" unless she has on board a reliable mercurial barometer.

Official tested instruments are lent to "Selected Ships" when necessary.

The commanders of observing ships keeping the meteorological log are requested to return it (accompanied by Form 138 in the case of "Selected Ships") through the appropriate Port Meteorological Officer or Agent at intervals of not more than five months.

Commanders of observing ships keeping Forms 911 are requested to return them (accompanied by Form 138 in the case of "Selected Ships") by post direct to the Meteorological Office, London, at the end of each voyage, or at intervals of not more than two months.

These forms have the address and "On His Majesty's Service" printed upon them, and should be folded for posting accordingly.

The Port Meteorological Officers and Merchant Navy Agents inspect official instruments in Meteorological log ships half-yearly, and in "Selected Ships" quarterly, when possible; and they will replace defective gear. These officers will also check the accuracy of barometers in observing ships, but marine observers should themselves frequently check by comparison.

The work of the British observing fleet, that of the observing fleets of other nations party to the Convention for Safety of Life at Sea, together with Weather Shipping Bulletins and Gale and Hurricane Warnings conforming to the International Convention for Safety of Life at Sea, provide the necessary information for shipping. Thus a world wide service for all shipping, at the minimum cost to national funds, is provided. Shipowners are asked to facilitate this voluntary work which is done by the commanders and officers of their ships.

Shipowners will greatly assist by facilitating the forwarding of postal matter from the Air Ministry addressed to the Captains of ships.

All ships fitted with W/T are advised to procure the DECODE for use with the International Code for Wireless Weather Messages from Ships, M.O. Pubn. 329, which can be obtained from H.M. Stationery Office, price 3d. This gives a description of the system of communication of "Selected Ships," as well as the DECODE.

For guidance in the practical use of wireless weather intelligence, WIRELESS AND WEATHER AN AID TO NAVIGATION may be obtained from H.M. Stationery Office, through any bookseller, price 5s.

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

LONDON ... Captain L. A. BROOKE SMITH, R.D., R.N.R.,
Marine Superintendent.
Commander J. HENNESSY, R.D., R.N.R., Senior
Nautical Assistant.
Room 324, Adastral House, Kingsway, W.C.2.
(Telephone No.: Holborn 3434 Extension 421).
Nearest station Temple, District Railway.

THAMES ... Lieut. Commander C. H. WILLIAMS, R.N.R., Port
Meteorological Officer, P.L.A. Building, King
George V Dock (south side), London, E.16.
(Telephone No.: Albert Dock 2659. Telegraphic
Address: Barometric Aldock, London).

MERSEY ... Commander M. CRESSWELL, R.N.R., Port
Meteorological Officer, Dock Office, Liverpool.
(Telephone No.: Bank 8959. Telegraphic
Address: Meteorite, Liverpool).

Agents.

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

Agents (contd.).

CLYDE .. Mr. ROBERT CLEARY, Master Mariner, The
Clutha Stevedoring Co., Ltd., Princes Dock,
Glasgow. (Telephone No.: 513 Ibrox).

FORTH ... Captain C. G. BONNER, V.C., D.S.C., Leith Salvage
and Towage Co., Ltd., 2, Commercial Street,
Leith.

HONG KONG, Lieut. Commander E. H. C. BRANSON, R.N.,
China. Chart Depot, H.M. Dockyard.
(Telephone No.: 108 Dockyard).

HUMBER ... Captain A. M. BROWN, Ellerman Wilson Line
Office, Hull. (Telephone No.: Central 16180).

SOUTHAMPTON Captain Sir BENJAMIN CHAVE, K.B.E. Room 35
Royal Mail Buildings.

SYDNEY, Commander G. D. WILLIAMS, D.S.O., R.D., R.N.R.
New South Wales. Captain G. B. MERCER.
Customs House. (Telephone No.: B6421).

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

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.	Date.	Position.		Description.
	Latitude.	Longitude.			Latitude.	Longitude.	
NORTH SEA.				Floating wreckage, probably small sailing boat, white painted mast and other part about 6 ft. above water. Dangerous to navigation. Dark red conical buoy about 4 ft. in diameter. Figure 6 on top surrounded by letters "ELEGAR"; dangerous to navigation.	Mediterranean—contd.		
1.3.34	52°17'N.	3°15'E.	3.3.34		32°59'N.	28°32'E.	Large log; dangerous to navigation. Red conical buoy, with remnants of a red, white and blue flag on staff.
18.3.34	51°50'N.	2°50'E.	8.3.34		36°29'N.	13°17'E.	
MEDITERRANEAN.			Conical buoy, surmounted tripod and diamond, black and white horizontal stripes.	NORTH ATLANTIC.			
3.3.34	301° 14 miles from Cani rocks.			1.3.34	36°59'N.	74°55'W.	Broken spar projecting about 5 ft. out of water apparently attached to submerged wreckage. Three floating objects apparently red spar buoys. Log about 18 ft. long and 3 ft. in diameter. Large object just awash.
				1.3.34	37°27'N.	74°37'W.	
				6.3.34	25°22'N.	85°08'W.	
				6.3.34	29°27'N.	69°38'W.	

CHART OF THE WESTERN NORTH ATLANTIC.

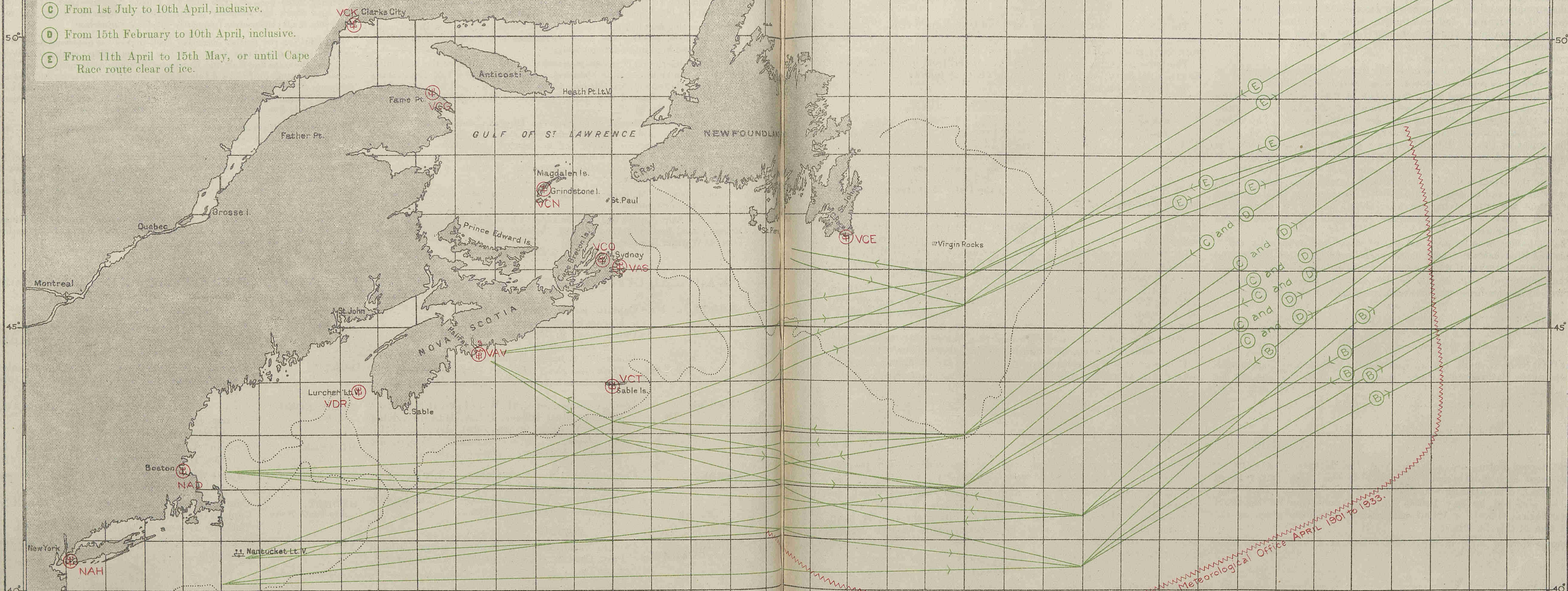
Showing the North Atlantic Lane Routes in force during APRIL as laid down by the Trans-Atlantic Track Convention. If at any time, owing to abnormal ice conditions, any alteration to the usual tracks is considered advisable by the track convention, particulars will be published on this chart. For full information concerning the North Atlantic Lane Routes see pages 57 and 58 of this number.

The periodic boundary within which ice has been observed is shown and a list of phenomenal positions of ice observed in the North Atlantic during APRIL is given. Ice sighted between MARCH 1st and 22nd, 1934 is indicated by symbol in the position reported, the figure giving the day of the month in March. Information regarding ice conditions in Greenland waters and the Gulf of St. Lawrence will be published when available. Coastal wireless stations, with their call signs, which transmit ice signals are indicated by the symbol (⊕).

Ice symbols used on the chart: — Iceberg, — growler, w w w Field or other flat ice.

LANE ROUTES IN FORCE DURING APRIL.

- (B) From 11th April to 30th June, inclusive.
- (C) From 1st July to 10th April, inclusive.
- (D) From 15th February to 10th April, inclusive.
- (E) From 11th April to 15th May, or until Cape Race route clear of ice.



PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position. Lat. Long.	Remarks.
April 6, 1909	S.S. Trafalgar ...	35°54' N. 31°47' W.	2 pieces 18 in. in diameter.
" 11, 1914	S.S. Erodiade ...	32°55' N. 62°11' W.	Apparently river ice about the size of a lifeboat.
" 24, 1916	S.S. Communipaw ...	46°05' N. 36°48' W.	4 ft. high 50 ft. wide, and 100 ft. long.
" 4, 1921	S.S. Hollandia ...	43°35' N. 35°57' W.	Large berg.
" 16, 1926	Trawler Orizaba ...	61°03' N. 10°30' W.	Floating ice, about 40 ft. long, and 3 ft. high.
" 7, 1930	S.S. La Cresenta ...	42°24' N. 34°22' W.	Small berg, about 20 ft. diameter.

Boundary within which ice has been reported to the Meteorological Office APRIL 1901 to 1933.

NOTICES TO MARINE OBSERVERS.

Extract from United States Hydrographic Bulletin.

INTERNATIONAL ICE OBSERVATION AND ICE PATROL SERVICES.

For the purpose of carrying on the International Ice Observation Service and the Ice Patrol Service provided for by the International Convention for the Safety of Life at Sea, London, 1929, the United States Coast Guard vessels *General Greene*, *Pontchartrain*, and *Mendota* have been detailed. The *General Greene* will leave Boston when advisable, proceeding to the vicinity of the Grand Banks to locate the ice fields and positions of the icebergs; keeping in touch with the situation; making such observations as practicable on the quantities of ice, its kind, extent, and drift; and obtain any other information that may seem to be of value.

The object of the Ice Observation Service is primarily to ascertain the location and progressive movement of the limiting lines of the regions in which icebergs and field ice exist in the vicinity of the Grand Banks and the dissemination of the information so ascertained for the guidance and warning of navigators, and coordinately with these primary duties, in making oceanographical and meteorological observations as will form a contribution toward the knowledge of the causes why the limiting lines assume their observed locations.

Mariners are requested to report to the *General Greene* any field ice or icebergs sighted or reported sighted. Her call letters are NRLS.

When the ice has moved southward so as to make a constant patrol necessary the United States Coast Guard cutters *Pontchartrain* and *Mendota* will begin the International Ice Patrol Service. These two vessels will alternate on this duty as long as necessary.

The object of the Ice Patrol Service is to keep in touch with the icebergs and field ice nearest to the North Atlantic Lane Routes. It will be the duty of the observation vessel and the patrol vessels to determine the extent of the ice, particularly its southerly, easterly, and westerly limits, and to keep in touch with it, in order that radio messages may be sent out daily, giving the whereabouts of the ice, particularly the ice that may be in the immediate vicinity of the regular North Atlantic Lane Routes.

The ice having been located, the patrol vessel will send daily radiograms and broadcasts as stated below, each broadcast being transmitted twice, with an interval of 2 minutes. Each broadcast will be preceded by the general call "CQ" on 500 kc (600 m wave length) immediately followed by the ice broadcast on the frequencies specified, as follows:

G.M.T. (Civil)	Time	75th meridian	Frequency (In kilocycles)	Type of wave
0100	8:00 p.m.		175	A1
1100	6:00 a.m.		425	A1
1800	8:00 a.m.		175	A1
2300	6:00 p.m.		425	A1

At 0000 (G.M.T., civil), 7 p.m., 75th meridian time, a radiogram will be sent to the Hydrographic Office, Washington, D.C., defining the ice

danger zone, its southern limits, or other definite ice news, while other messages will be sent during the night if any later information is obtained by the patrol vessel. The address of the Hydrographic Office is "Hydrographic, Washington, D.C."

Ice information will be given by radio at any time to any ship with which the patrol vessel can communicate. Such information will be furnished as regular radio traffic (without charge) on commercial traffic frequencies (wave lengths).

Ice information broadcasts will be given in as plain, concise English as practicable and will state in the following order:

- Position of patrol vessel.
- Location and description of ice.
- Other data.

The Ice Patrol vessel's general radio call letters are NIDK. This is a special call for the vessel actually on patrol, and should not be confused with the regular radio call letters assigned to the individual vessels.

The radio messages from the patrol vessel and from other sources will be given publicity by the Hydrographic Office as follows:

(a) By radio broadcast from—

Station	G.M.T. (Civil)	75th meridian standard time	Frequency (in kilocycles)	Type of wave
Washington.....	1700 0200	12:00 noon 9:00 p.m.	113	A1
Boston	1600 2200	11:00 a.m. 5:00 p.m.	102	A1
New York	1530 2130	10:30 a.m. 4:30 p.m.	102	A1
Norfolk	0900 1600 2100	4:00 a.m. 11:00 a.m. 4:00 p.m.	122	A1

(b) All reports of ice are published in the Daily Memorandum and the weekly Hydrographic Bulletin.

The work of the United States Coast Guard cutters engaged on Ice Patrol duty will be greatly facilitated if the principal trans-Atlantic steamships report the following data by radio to the patrol vessels:

(a) Icebergs or obstructions sighted, giving date, time (G.M.T., civil), latitude, longitude, set, and drift; and, in case it is an iceberg, the temperature of the water at the time should be included.

(b) Surface temperature of the sea water every 4 hours when between latitudes 39° and 49° N. and between longitudes 43° W. and 56° W., when bound either east or west, giving time of observation (G.M.T., civil), the latitude, longitude, course, and speed.

These data will facilitate the drawing of a temperature curve which will be useful in locating the branches of the Labrador Current.

It is requested that radio operators desist, as far as practicable, from operating at the above times in order to lessen radio interference.

ICE REPORTS (FORM 912).

Ice Report Forms are supplied with the MARINE OBSERVER or Supplement each month to all regular observing ships employed in the Trans North Atlantic and Southern Ocean trades. They may also be obtained by any British ship on application to the Port Meteorological Officers or Agents, addresses of whom are given on the front page of this Ice Chart

Commanders of ships in these trades are asked to have this form

completed and returned without delay at the end of each passage. A nil return is desired should no ice be sighted.

Selected Ships on the Trade Routes of the Southern Ocean are requested to add to their routine Wireless Weather reports information of floating ice seen or reported within the last 24 hours so that this information may be disseminated to the utmost advantage of all concerned.

LATE NOTICES

FLEET LIST. VOLUNTARY OBSERVING SHIPS.

The following is a complete list of British observing ships regularly carrying out voluntary services of marine meteorology with the guidance of the Marine Division of the Meteorological Office.

The names of the Captains and observing officers of observing ships, and the Senior Wireless Operators of Selected Ships are given, as ascertained from the last written return received.

Meteorological Logs, Records, and W/T Weather Registers received between the dates specified at the head of the seventh column are acknowledged by Form number, with commencing and ending dates of period covered by the returns; the date when the last return was received being given in the eighth column.

The Captains of observing ships are requested to take this acknowledgment in cordial thanks and grateful recognition to them and their observing officers and wireless operators for the returns made and the voluntary service rendered in all parts of the world.

The classification of meteorological logs and Selected Ships' records and registers will be notified to the Captains by post card Form 1343. Only in exceptional cases will individual letters be sent to the Captains of observing ships.

The Port Meteorological Officers and Merchant Navy Agents at the ports are advised as necessary, and they will, as necessary, communicate such advice verbally by personal call upon the Captain.

Excellent Awards will be made at the end of the financial year. The names of the Captains and Principal Observing officers gaining these awards will be published in a special list in the Marine Observer.

It is requested that prior notification of changes of service, probable periods of lay up, transfer of Captains, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to the appropriate Port Meteorological Officer or Merchant Navy Agent.

Ships not making the appropriate written returns within a reasonable period will be removed from the list, steps taken to recover any instruments lent, and the free issue of the Marine Observer discontinued.

The number of voluntary observing ships is limited to a maximum total of 366.

The number of Selected Ships detailed to carry out the voluntary service provided for in Clause (C) of Article 35 of the Convention for Safety of Life at Sea, Merchant Shipping (Safety and Load Line Conventions) Act, 1932, is determined by the British proportion of the world's tonnage; and is at present 292.

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

Explanation of Abbreviations.

The number appearing before the name of an observing ship in this list is her number for the time being as a British Selected Ship.

†† indicates fitted with wireless telegraphic apparatus for long range, long wave, continuous wave transmission and reception.

*† indicates fitted with wireless telegraphic apparatus for transmission and reception; fitted for reception only of long range, long wave, continuous wave.

** indicates fitted with wireless telegraphic apparatus for transmission and reception: but not fitted for long range, long wave, continuous wave transmission or reception.

M.V. = Motor Vessel.

S.T. = Steam Trawler.

Ships having no such letters after their names are steamships.

M.L. = Equipped with a complete set of tested instruments lent by the Meteorological Office for keeping the meteorological log.

M. = Ships' own mercurial barometer, found to be sufficiently accurate and reliable for the purpose of observation for making wireless weather reports.

S. = Partly or wholly equipped with tested instruments lent by the Meteorological Office for the purpose of carrying out the duties of a Selected Ship, when detailed to do so.

A. = Ships' own aneroid.

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
122 †† <i>Accra</i> , M.V. ...	J. C. Shooter ...	R. B. Ellis ...	G. Arrowsmith...	M.-S.	Elder Dempster	Fms. 911 & 138 13.12.33 to 22.1.34	25.1.34
055 *† <i>Actor</i> ...	T. Chapman ...	E. Pearce, C. P. Vaughan, G. Penston.	W. Bassam ...	M.	Harrison ...	" " 10.10.33 to 31.12.33	11.1.34
123 †† <i>Adda</i> , M.V. ...	J. H. Lawson ...	A. J. L. Edwards, W. McCormick, E. Moore.	N. J. Leitch ...	M.-S.	Elder Dempster	" " 2.11.33 to 5.2.34	12.2.34
273 *† <i>Adrastus</i> ...	W. A. Turner ...	J. P. Makepeace, R. Blakey, F. E. Jackson.	S. R. Purkiss ...	M.L.	A. Holt ...	Fm. 915 29.3.33 to 2.9.33	10.10.33
129 †† <i>Adriatic</i> ...	C. P. Freeman, R.D., Commr., R.N.R.	...	...	S.	White Star ...	...	...
090 *† <i>Aeneas</i> ...	J. Hatfield ...	F. H. Barley, G. Edge, E. A. Gepp.	I. E. Jones ...	"	" ...	Fms. 911 & 138 6.11.33 to 27.11.33	8.1.34
166 *† <i>Agamemnon</i> , M.V.	W. Beswick, D.S.C., Commr., R.N.R.	T. R. Phillips, H. Nicholas, J. A. Nunn.	A. C. Nevin ...	"	"	" " 23.11.33 to 18.12.33	22.1.34
<i>Aidan</i> ...	F. C. P. Harris ...	H. O. Williams, L. A. Sayers, C. W. Swethurst.	...	M.L.	Booth ...	Fm. 915 24.11.32 to 16.7.33	28.7.33
065 †† <i>Akaroa</i> ...	W. G. Summers ...	G. H. Heywood, H. R. Dunnet, J. L. Stolls.	H. A. McGaskill	M.-S.	Shaw Savill ...	" 7.10.33 to 14.1.34	19.1.34
<i>Alban</i> ...	L. Evans ...	F. R. Holman, R. Parry, F. M. Lyons.	...	M.L.	Booth ...	" 4.10.33 to 22.12.33	1.1.34
<i>Alcantara</i> , M.V.	E. Clarke, R.D., Commr., R.N.R.	...	...	S.	Royal Mail ...	...	...
178 *† <i>Alipore</i> ...	E. F. Hannan, R.D. Commr., R.N.R.	J. L. Dunkley, W. T. C. Lethbridge, K. P. Naire.	R. S. Evans ...	M.	P. & O. ...	Fms. 911 & 138 29.4.33 to 7.8.33	28.8.33
175 †† <i>Almanzora</i> ...	T. J. C. Buret ...	A. E. H. Randle, R. H. Poppleton, G. M. Fletcher.	J. B. Butler ...	S.	Royal Mail ...	" " 3.12.33 to 15.1.34	18.1.34

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
012 †† <i>Almeda Star</i> ...	H. C. Howard ...	R. T. Hales, D. R. Rassall, R. McIlwraith.	R. N. Austin ...	M.	Blue Star ...	Fms. 911 & 138 27.11.33 to 9.1.34	13.1.34
022 †† <i>Alynbank</i> ...	D. Gillies ...	S. Morris, A. Hunter, E. Binfield.	... ..	M.L.	A. Weir ...	Fm. 915 ... 23.4.33 to 10.10.33	13.12.33
103 †† <i>Amarapoor</i> ...	W. C. C. Plage ...	J. D. Graham ...	... ..	S.	Henderson ...	Fm. 911 ... 2.12.33 to 14.2.34	16.2.34
029 †† <i>Andalucia Star</i> ...	R. Vernon ...	G. G. McPherson, R. M. Thorne, M. B. M. Tallack.	F. E. Ash ...	M.	Blue Star ...	Fms. 911 & 138 6.11.33 to 21.2.34	23.2.34
209 †† <i>Aorangi</i> , M.V. ...	J. F. Spring-Brown ...	E. M. Anderson, D. H. Richards, S. H. Crawford.	C. F. G. Taylor ...	M.L.	Canadian-Australasian.	Fm. 915 ... 20.7.33 to 1.12.33	6.1.34
120 †† <i>Apapa</i> , M.V. ...	A. Faith ...	C. V. Evans, R. Mercer ...	J. Rea ...	M.-S.	Elder Dempster ...	Fms. 911 & 138 16.11.33 to 18.2.34	22.2.34
029 †† <i>Appam</i> ...	J. M. Draper ...	W. M. M. Hutchings, R. K. Palmer, B. C. Haigh.	F. Slater ...	S.	" ...	" " 29.11.33 to 6.3.34	7.3.34
017 †† <i>Aquitania</i> ...	R. B. Irving, O.B.E., R.D., Capt., R.N.R.	C. B. Osborne, L. R. Sharp, E. A. Divers.	A. H. Farman ...	"	Cunard ...	" " 4.1.34 to 6.2.34	5.3.34
115 †† <i>Arandora Star</i> ...	E. W. Moulton ...	R. E. Freaker, E. Huntley Smith, J. L. Anderson.	H. G. Warren ...	M.-S.	Blue Star ...	" " 19.12.33 to 5.1.34	11.1.34
114 †† <i>Ariguani</i> ...	J. H. H. Soudamore, D.S.C., R.D., Commr., R.N.R.	C. H. Hodder, W. E. Grant, T. Crane.	E. M. Evans ...	S.	Elders & Fyffes	" " 14.11.33 to 11.2.34	16.2.34
144 †† <i>Arlanza</i> ...	F. R. Miles, R.D., Capt., R.N.R.	G. D. Bonner, M. J. Morton, R. G. Wooley.	G. Hunt ...	"	Royal Mail ...	" " 8.11.33 to 10.2.34	14.2.34
091 †† <i>Armada Castle</i> ...	A. O. Morgan ...	C. Lloyd, W. R. Andrews, G. W. Lloyd.	E. P. Haslam ...	"	Union Castle ...	" " 9.12.33 to 28.1.34	31.1.34
127 †† <i>Arracan</i> ...	N. Wiles ...	J. A. C. MacCall ...	... ..	"	Henderson ...	" " 7.8.33 to 26.11.33	29.11.33
095 †† <i>Arundel Castle</i> ...	G. J. Whitfield ...	L. G. May, P. G. McIver ...	W. A. Brown ...	"	Union Castle ...	" " 16.12.33 to 4.2.34	6.2.34
280 †† <i>Astronomer</i> ...	J. Richards ...	W. P. Baker, W. L. Sawee ...	H. A. Croft ...	M.	Harrison ...	" " 4.9.33 to 1.12.33	29.12.33
062 †† <i>Asturias</i> , M.V. ...	B. Shillitoe, R.D., Commr., R.N.R.	L. C. King, C. C. Prosser, J. Rous.	J. T. Williams ...	S.	Royal Mail ...	" " 19.11.33 to 26.2.34	28.2.34
061 †† <i>Atlantis</i> ...	A. Purvis ...	... ..	T. Bradfield ...	M.-S.	Harrison ...	" " 20.12.33 to 5.1.34	8.1.34
281 †† <i>Auditor</i> ...	G. R. Windsor ...	L. F. Harriman, A. H. Thompson, W. A. Pemberton.	— Sharland ...	M.	" ...	" " 20.9.33 to 8.12.33	16.12.33
212 †† <i>Australia</i> ...	W. Scutt ...	L. W. Smith, H. Cameron, F. M. Jenvey.	C. Cunningham ...	"	British India ...	" " 13.6.33 to 26.10.33	31.10.33
133 †† <i>Avelona Star</i> ...	G. E. Hopper ...	J. Coldwell ...	... ..	M.-S.	Blue Star ...	" " 17.12.33 to 31.1.34	5.2.34
124 †† <i>Avila Star</i> ...	R. J. Thomas ...	F. N. Johnson, W. Hall, E. Lowndes.	B. King ...	M.	" ...	Fms. 911 & 138 17.12.33 to 31.1.34	5.2.34
068 †† <i>Balmoral Castle</i> ...	J. Attwood ...	J. Wilson, A. C. G. Price, H. Bunn.	J. Sharp ...	S.	Union Castle ...	" " 11.11.33 to 4.3.34	6.3.34
179 †† <i>Balranald</i> ...	H. Williams ...	E. J. Spurling, J. C. Davies, C. S. Pirie.	J. R. C. Johnston ...	M.	P. & O. Branch	" " 4.10.33 to 2.1.34	9.1.34
248 †† <i>Banffshire</i> ...	A. W. P. Gibb ...	R. F. Buckley, F. H. Petherbridge, J. O. H. Kirkwood.	W. M. Ewing ...	"	Turnbull Martin	" " 14.10.33 to 27.1.34	5.2.34
180 †† <i>Baradine</i> ...	W. D. C. Smith ...	R. G. Wood, G. W. Wood, A. E. Clay.	E. Howard ...	"	P. & O. Branch ...	" " 27.11.33 to 22.2.34	28.2.34
037 †† <i>Baronesa</i> ...	S. Christie ...	J. R. Faulkner, J. G. Freeman, C. Lyndon.	R. Bell ...	"	Houlder ...	" " 1.10.33 to 13.12.33	21.12.33
181 †† <i>Barrabool</i> ...	J. H. Biggs ...	J. D. Strike, A. Gething T. Watkins.	R. Rowley ...	"	P. & O. Branch ...	" " 20.9.33 to 17.12.33	29.12.33
070 †† <i>Bayano</i> ...	A. W. Legge ...	J. Cameron, W. Dodd.	R. E. Blizzard ...	S.	Elders & Fyffes	" " 6.12.33 to 16.2.34	21.2.34
183 †† <i>Bendigo</i> ...	F. N. Wyatt ...	H. P. Mallet, H. T. Rigden, D. West.	J. Kimminmouth ...	M.-S.	P. & O. Branch ...	" " 29.11.33 to 1.2.34	2.2.34
237 †† <i>Berengaria</i> ...	Sir E. T. Britten, R.D., Capt., R.N.R.	R. H. C. Crawford, J. V. Locke, S. St. G. Toyne.	J. N. Cragg ...	S.	Cunard ...	" " 8.12.33 to 20.2.34	22.2.34
145 †† <i>Berwickshire</i> ...	E. H. Evans ...	E. Coulthart, J. C. Robertson, E. J. Brittain.	F. Smith ...	"	Turnbull Martin ...	Fms. 911 & 138 15.11.33 to 18.12.33	23.12.33
<i>Birchbank</i> ...	E. M. Skelly ...	J. Stewart, L. Warner, J. Mountain.	... ..	M.L.	A. Weir ...	Fm. 915 23.12.32 to 13.8.33	12.9.33
007 †† <i>Bradfyne</i> ...	J. O'Neill ...	P. Evans, F. W. Burn, O. E. Brown.	C. K. Castle ...	S.	Reardon Smith	Fm. 911 23.5.33 to 26.10.33	21.11.33
<i>Brighton</i> ...	A. Hill ...	E. Balcombe, E. Hill ...	S. Wood ...	"	Southern Rly. ...	Telegraphic Report ... 3.2.34	3.2.34
057 †† <i>Britannic</i> , M.V. ...	P. R. Vaughan ...	A. J. Fisher, O. V. Lucas, R. Conway.	J. B. Stone ...	"	White Star ...	Fms. 911 & 138 4.12.33 to 21.1.34	23.1.34
269 †† <i>British Admiral</i> ...	F. I. Taylor ...	W. Steele, J. Aitken ...	C. A. Johnston ...	M.	British Tankers ...	Fms. 911 & 138 12.12.33 to 20.1.34	12.2.34
038 †† <i>British Corporal</i> ...	R. O. Putt ...	W. Hill, H. E. Dick ...	J. E. Peachy ...	"	" ...	" " 14.11.33 to 21.2.34	7.3.34
<i>British Enterprise</i> ...	H. S. McMichael ...	J. T. Hamlyn ...	... ..	"	" ...	Fm. 911 27.10.33 to 5.3.34	7.3.34
249 †† <i>Buteshire</i> ...	C. A. I. Laird ...	J. D. Elvish, P. McMillan, P. H. Hill.	E. B. Place ...	S.	Turnbull Martin	Fms. 911 & 138 13.10.33 to 15.1.34	19.2.34
031 †† <i>Caledonia</i> ...	D. W. Bone ...	R. Blake, T. K. McMillan, D. Barclay.	J. M. Macdonald ...	S.	Anchor ...	" " 19.11.33 to 4.3.34	7.3.34
139 †† <i>California</i> ...	R. W. Smart ...	J. F. Adams, R. L. Robertson, S. Robertson.	W. Thompson ...	"	" ...	Fm. 912 11.2.34 to 4.3.34	7.3.34
<i>Cambria</i> ...	E. B. Turner ...	V. A. Phillips ...	J. Pritchard ...	"	L.M. & S. Rly. ...	Fms. 911 & 138 18.12.33 to 7.1.34	10.1.34
<i>Cambridge</i> ...	R. Williams ...	W. Redwood, T. E. Davies, V. Canton.	P. Fleming ...	M.L.	Federal ...	Telegraphic Report ... 23.2.34	23.2.34
266 †† <i>Cameronia</i> ...	W. Gemmel ...	D. Blair, E. Stormont, L. Taylor.	J. Fleming ...	S.	Anchor ...	Fms. 911 & 138 3.12.33 to 28.1.34	20.2.34
086 †† <i>Camito</i> ...	S. Browne ...	J. C. Morgan, A. E. Leech, G. M. Roberts.	L. H. Fudge ...	"	Elders & Fyffes ...	Fm. 912 28.1.34 to 18.2.34	20.2.34
259 †† <i>Canonesa</i> ...	W. H. Brodie ...	H. L. Sherwell, F. F. Flint, E. J. L. Stone.	C. J. Woolway ...	M.	Houlder ...	Fms. 911 & 138 9.11.33 to 3.3.34	5.3.34
117 †† <i>Cape of Good Hope</i> ...	T. A. Jacobson ...	D. W. Taylor, A. Peacock ...	F. Groves ...	S.	Lyle S.S. Co. ...	Fm. 911 2.1.34 to 13.2.34	17.2.34
190 †† <i>Carinthia</i> ...	P. A. Murchie, O.B.E., R.D., Commr., R.N.R.	J. Chapman, H. Hudson, G. S. Hutchison.	J. Harvey ...	"	Cunard ...	Fms. 911 & 138 28.10.33 to 13.1.34	23.1.34
092 †† <i>Carnarvon Castle</i> , M.V. ...	C. E. Stuart, R.D., Capt., R.N.R.	G. L. Clarke, D. D. Mackenzie.	J. Hodgson ...	"	Union Castle ...	" " 22.1.34 to 29.1.34	7.2.34
155 †† <i>Carthage</i> ...	H. M. Jack ...	C. T. Richardson, H. J. Cholerton, H. J. Mann.	A. Macbeth ...	M.-S.	P. & O. ...	" " 19.11.33 to 7.1.34	9.1.34
184 †† <i>Cathay</i> ...	H. Elliot Smith, R.D., Lt.-Commr., R.N.R.	A. J. McHattie, E. Cowell, G. L. Farnfield.	H. Dawson ...	"	" ...	" " 30.10.33 to 31.1.34	17.2.34
011 †† <i>Ceramic</i> ...	W. J. Saunders ...	R. G. Roberts, J. Farrell ...	W. M. Ross ...	S.	White Star ...	" " 18.11.33 to 24.12.33	5.2.34
191 †† <i>Chindwin</i> ...	G. Paterson ...	D. Frame, C. C. Weir, J. G. Aitken.	A. C. Headley ...	"	Henderson ...	" " 1.9.33 to 12.12.33	28.12.33
067 †† <i>Chinese Prince</i> ...	W. Irvine ...	B. J. Jenkins, I. P. Ellis, J. Hennessy.	D. T. Roberts ...	M.L.	Furness Withy ...	" " 23.10.33 to 4.1.34	13.1.34
192 †† <i>Chitral</i> ...	O. Siggers ...	G. L. Bateman, F. D. Shaw, J. Stansfield.	S. Norwood ...	M.-S.	P. & O. ...	Fm. 915 20.10.33 to 16.1.34	7.3.34
051 †† <i>City of Auckland</i> ...	W. Rowlands ...	A. G. Freeman, J. W. Cubbon, B. Walker.	P. J. McKeon ...	S.	Ellerman ...	Fms. 911 & 138 1.10.33 to 4.1.34	9.1.34
<i>City of Barcelona</i> ...	W. Hill ...	J. McK. Amot, H. Richman, G. Roase.	... ..	M.	" ...	" " 23.7.33 to 2.10.33	30.10.33
						Fm. 911 ... 1.11.33 to 20.1.34	5.2.34

FLEET LIST

111

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
265 *† City of Baroda	H. Percival ...	E. Jenkins, R. E. Harmaford, J. C. Barnes.	J. McMurran ...	S.	Ellerman...	Fms. 911 & 138 24.12.33 to 22.2.34	26.2.34
158 *† City of Cairo ...	E. G. Hoppins ...	L. Herman ...	...	M.	"	Fm. 911 29.10.33 to 23.1.34	5.2.34
013 *† City of Cambridge	R. E. Teague ...	J. T. Keith ...	...	S.	"	" 24.10.33 to 13.12.33	20.12.33
City of Canton ...	H. Lloyd ...	J. H. Willox, R. L. Stewart, L. Boundy.	...	M.	"	" 31.12.33 to 21.1.34	12.2.34
157 *† City of Delhi ...	J. Wyper ...	P. R. Winship, W. N. Piercy, F. H. Revel.	P. T. Dwane ...	S.	"	Fms. 911 & 138 13.9.33 to 24.1.34	30.1.34
City of Dieppe	S. C. Gardner ...	J. Hudson, J. P. A. Arthur, N. F. Ayres.	...	M.L.	"	Fm. 915 13.5.33 to 24.10.33	6.11.33
City of Evansville	W. Keadley ...	F. W. Woods ...	...	M.	"	Fm. 911 14.11.33 to 1.2.34	6.2.34
220 †† City of Exeter ...	D. M. Bremner ...	J. I. Andrew, J. W. Wother- spoon, E. A. Davidson.	W. E. Sandon ...	S.	"	Fms. 911 & 138 19.11.33 to 14.1.34	26.1.34
089 *† City of Hereford	C. V. Avery ...	F. A. Waters, J. W. Nesbitt, R. S. Webber.	J. Murray ...	M.	"	" 6.7.33 to 20.9.33	25.9.33
028 †† City of London ...	J. G. Brown ...	B. E. Hooper, J. G. G. Fyfe, W. H. Charlton.	L. J. Hadler ...	S.	"	" 20.12.33 to 17.2.34	22.2.34
256 *† City of Lyons ...	H. Johnston ...	R. S. Cowan, A. Potter, W. J. Reynolds.	...	M.	"	Fm. 911 24.11.33 to 16.1.34	21.2.34
066 †† City of Nagpur...	N. McNeil, O.B.E.	H. A. Hazel, W. Kerr, W. V. Highton.	J. H. Jones ...	S.	"	Fms. 911 & 138 24.10.33 to 21.12.33	30.12.33
074 †† City of Paris ...	D. H. Lloyd ...	A. Hamilton, A. Macfie, — Stewart.	A. Forbes ...	"	"	" 26.11.33 to 20.2.34	28.2.34
City of Perth ...	D. H. Metcalf ...	A. M. Westlake, J. Owen, R. F. Henry.	...	M.L.	"	Fm. 915 14.4.33 to 8.9.33	9.10.33
271 *† City of Roubaix	W. Gray ...	C. Collard, W. H. Dalton, J. H. Owen.	J. W. Alexander ...	M.	"	Fms. 911 & 138 27.11.33 to 22.1.34	2.3.34
272 *† City of Singapore	T. Cooper ...	I. R. Pulford, D. G. Lister, W. A. Hannah.	J. W. Carroll ...	"	"	" 31.10.33 to 10.1.34	13.1.34
035 *† City of Sydney ...	F. McKay ...	J. Kinley, R. W. May, R. A. Jones.	A. L. Pulford ...	"	"	" 4.12.33 to 15.2.34	20.2.34
167 *† City of Tokio ...	H. G. Booth ...	C. F. Clarke ...	W. Connell ...	S.	"	Fms. 911 & 138 5.10.33 to 1.2.34	28.2.34
125 *† City of Windsor	T. G. Hammersley ...	A. P. Sydney, E. H. Lynes, J. T. Wills.	E. L. Hume ...	"	"	" 13.11.33 to 27.2.34	7.3.34
160 *† City of Winnipeg	R. J. Ricketts ...	F. Tibbett, G. Longfield, D. W. Penberthy.	F. H. Portess ...	"	"	" 2.11.33 to 18.2.34	7.3.34
City of Yokohama	J. A. Singleton ...	H. E. Roberts ...	...	"	"	Fm. 911 27.11.33 to 19.12.33	15.1.34
050 *† Clan Macalister	R. M. Robertson ...	H. G. Spalton ...	...	M.	Clan	"	"
Clan Macalister	F. J. Stenson, R.D., A.D.C., Capt., R.N.R.	H. Duncan ...	E. Hervey ...	S.	"	Fms. 911 & 138 21.10.33 to 20.1.34	29.1.34
241 *† Clan Macbeth	H. Andrews ...	H. Whitehead, A. V. Howard, P. N. Colepeper.	G. L. Brown ...	"	"	" 25.3.33 to 23.10.33	30.10.33
222 *† Clan Macdougall	R. F. Redford ...	T. W. Ellis, D. F. Sutton, G. Snelgrove.	A. Robson ...	"	"	" 10.7.33 to 9.11.33	21.11.33
287 *† Clan Macfarlane	W. J. Hughes ...	J. H. Wright, J. R. Moss.	A. G. Olson ...	"	"	" 23.10.33 to 1.1.34	6.1.34
118 *† Clan Macindoe	H. E. G. Scott-Smith, O.B.E., R.D., Lt.-Commr., R.N.R.	J. B. Sparkes, T. N. Soane, C. R. Wheat.	W. C. Munro ...	"	"	" 5.12.33 to 29.12.33	12.2.34
233 *† Clan Mackellar...	N. J. Haynes ...	J. J. Stormont ...	E. Woolhouse ...	"	"	Fm. 911 5.1.33 to 30.1.33	13.3.33
Clan Macnair...	W. G. Holman...	A. W. Daish ...	...	"	"	" 3.11.33 to 26.11.33	6.12.33
255 *† Clan Macneil ...	A. Low ...	B. A. Harding, H. F. Town, B. H. Magill.	A. Huey ...	"	"	Fms. 911 & 138 19.11.33 to 21.1.34	5.3.34
001 *† Clan Macphee ...	W. Calderwood ...	J. Dulson, R. G. Bagnall, H. Hind.	J. B. Allan ...	"	"	" 11.11.33 to 6.12.33	28.12.33
168 *† Clan Mactaggart	W. F. West ...	H. R. Crosscombe, R. D. Helme, M. E. Murphy.	J. C. Scott ...	"	"	" 21.8.33 to 27.11.33	4.12.33
002 *† Clan Macwhirter	P. Macfarlane ...	K. C. Simpson, A. S. Pale- thorpe May.	J. G. Thompson ...	"	"	" 24.11.33 to 20.12.33	15.1.34
003 *† Clan Malcolm ...	H. Cater ...	K. Banks, D. Sutton ...	J. Cruickshank...	"	"	" 12.3.33 to 30.5.33	8.6.33
283 *† Clan Morrison...	R. P. Galer, R.D., Commr., R.N.R.	A. Hamby, E. Croucher, J. Brodie.	A. R. Cox ...	"	"	" 5.12.33 to 27.12.33	2.1.34
279 *† Clan Urquhart ...	G. Young ...	N. M. Jackson ...	...	M.	"	Fm. 911 23.11.33 to 12.12.33	28.12.33
041 *† Clydebank ...	G. Sutherland ...	...	...	S.	A. Weir ...	"	"
Colonial...	W. E. Harraden ...	A. Smart ...	...	"	Harrison ...	Fm. 911 26.11.33 to 12.2.34	15.2.34
187 *† Comedian ...	A. Cadogan ...	D. Fraser, T. Glover, S. Richardson.	C. De Freitas ...	"	"	Fms. 911 & 138 20.10.33 to 30.12.33	10.1.34
016 *† Comliebank, M.V.	S. Currie ...	C. R. Aitken, L. St. J. French, W. A. McMoreland.	M. Timlin ...	S.	A. Weir ...	" 7.12.33 to 20.1.34	10.2.34
185 †† Comorin ...	C. W. Cartwright, D.S.C.	R. E. Tucker, D. Meikle, D. S. Charles.	E. Habicht ...	M.-S.	P. & O. ...	Fm. 912 29.12.33 to 20.1.34	10.2.34
198 *† Contractor	D. L. Whyte ...	L. Seddon, R. Myles ...	E. L. Arthur ...	M.	Harrison ...	Fms. 911 & 138 23.9.33 to 19.12.33	28.12.33
Coptic, M.V. ...	D. Christie ...	P. Saville, G. A. Harvey, S. Wallis.	W. J. Quaid ...	M.L.	Shaw Savill & Albion.	Fm. 915 30.10.33 to 13.1.34	19.1.34
258 †† Corfu ...	F. E. French, R.D., Capt., R.N.R.	C. S. Cooke, D. M. F. Lombard, J. T. Sheffield.	A. S. Fraser ...	M.-S.	P. & O. ...	" 2.9.33 to 7.1.34	15.1.34
Cornwall ...	A. E. Lettington ...	G. Dibley, T. M. Devitt, N. Baddeley.	...	M.L.	Federal ...	Fms. 911 & 138 25.11.33 to 28.2.34	2.3.34
006 *† Coronado ...	R. A. Thorburn, R.D., Commr., R.N.R.	C. Harrocks, R. Philpott ...	W. Oakley ...	S.	Elders & Fyffes...	Fm. 915 12.12.32 to 15.4.33	19.4.33
Dearne	T. H. Woodhead ...	H. Robinson...	...	M.L.	Goole Stm.Shipping	Fms. 911 & 138 28.11.33 to 3.2.34	8.2.34
214 *† Counsellor	J. Jackson ...	E. B. Stephens, A. A. Heaton, G. Dewar.	G. Lightowler...	M.	Harrison ...	" 1.12.33 to 10.2.34	16.2.34
036 *† Cumberland	T. L. Maltby ...	N. A. Thomas, N. A. Blount, R. A. Bellfield.	T. Bryant ...	S.	Federal ...	" 12.9.33 to 10.1.34	18.1.34
285 *† Custodian ...	T. O'Connor ...	W. H. Slaughter, H. M. Fitzsimmons, R. F. Hart.	G. Cavage ...	M.	Harrison ...	" 13.8.33 to 18.10.33	23.10.33
169 *† Dalgoma ...	P. H. Beeching ...	H. E. Evans, A. W. Smith, F. F. Ellis.	F. Stabbford- Hextall.	M.	British India ...	" 11.10.33 to 26.11.33	7.12.33
Deebank ...	J. Robertson ...	D. I. C. Robertson, W. Olding, S. Eperon.	...	M.L.	A. Weir ...	Fm. 915 15.8.33 to 30.11.33	8.12.33
260 *† Defender ...	W. T. Owen ...	A. M. Dewar ...	C. A. A. Jenkins ...	M.	Harrison ...	Fms. 911 & 138 7.8.33 to 23.10.33	1.11.33
079 †† Desado ...	D. Collins ...	F. A. C. Thacker, A. Ballardie	A. W. Davey ...	M.-S.	Royal Mail	" 16.11.33 to 3.1.34	6.1.34
138 *† Designer ...	W. A. Hansen ...	G. J. Crispin ...	...	M.	Harrison ...	Fm. 911 28.10.33 to 16.1.34	25.1.34
Diplomat ...	R. Kinloch ...	J. H. Roberts, E. Whitehouse	...	"	"	" 15.10.33 to 23.1.34	5.2.34
284 *† Director ...	B. Worthington ...	A. E. Rogers, H. W. Jones...	D. Mackoe ...	"	"	Fms. 911 & 138 14.8.33 to 6.9.33	23.11.33
Discoverer ...	W. Rowberry ...	E. P. Simmons ...	...	"	"	Fm. 911 1.10.33 to 3.11.33	20.12.33
251 *† R.R.S. Discovery II.	A. L. Nelson ...	R. A. B. Ardley, F. E. C. Davies, L. C. Hill.	F. Brewer ...	M.L.	Falkland Is. Govt.	Fm. 915 29.12.32 to 3.5.33	2.1.34
Domala...	J. Endersby ...	W. R. Way ...	...	M.	British India	Fm. 911 7.1.34 to 8.2.34	5.3.34
136 *† Doric Star	S. N. Capon ...	G. L. Evans, M. C. O'Hare, E. A. Irvine.	G. A. Dobson ...	"	Blue Star ...	Fms. 911 & 138 20.1.34 to 4.2.34	22.2.34

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
275 *† <i>Dramatist</i> ...	A. J. Meek ...	G. H. Howard, C. V. Watts	E. R. Gledhill ...	M.	Harrison ...	Fms. 911 & 138 22.12.33 to 25.2.34	28.2.34
142 †† <i>Duchess of Atholl</i> ...	D. S. McQueen ...	A. E. Shergold, C. E. Duggan, E. V. Glennie.	E. Murphy ...	M.-S.	Canadian Pacific {	Fm. 912 " 26.11.33 to 12.1.34	15.1.34
152 †† <i>Duchess of Bedford</i> ...	J. Turnbull, C.B.E., R.D., Capt., R.N.R.	L. Outram, P. L. Boxendal, W. J. Roberts.	S. H. Sinclair ...	M.-S.	" " {	Fms. 911 & 138 12.11.33 to 12.1.34	19.12.33
151 †† <i>Duchess of Richmond</i> ...	A. Freer, R.D., Capt., R.N.R.	A. Massey, W. P. P. Phillips, N. Scallan.	J. F. Yorstan ...	"	" " {	Fm. 912 7.1.34 to 12.1.34	27.1.34
143 †† <i>Duchess of York</i> ...	R. N. Stuart, V.C., D.S.O., R.D., Commr., R.N.R.	T. L. Gillett, J. Stewart, K. Hutchings.	J. Potts ...	"	" " {	Fms. 911 & 138 17.11.33 to 6.12.33	9.12.33
290 *† <i>Dumana</i> ...	H. T. Hudson, R.D., Commr., R.N.R.	W. M. Bain, A. H. Usher, B. P. Wing.	J. Tynan ...	M.	British India ...	Fms. 911 & 138 15.11.33 to 16.1.34	28.2.34
098 †† <i>Dunbar Castle</i> , M.V.	C. N. Bickford ...	L. H. Farrow, J. Trayner ...	P. P. Williams ...	S.	Union Castle ...	" " 28.10.33 to 28.12.33	3.1.34
052 *† <i>Dunster Grange</i> , M.V.	R. Smiles ...	E. G. Raynor, D. Murray, R. G. Williams.	W. Guthrie ...	M.	Houlder ...	" " 8.10.33 to 26.12.33	30.12.33
102 *† <i>Duquesa</i> ...	C. R. Frost ...	A. McEwan, R. F. Martin, H. W. Bammall.	H. Croker ...	"	Furness Withy ...	" " 20.11.33 to 21.1.34	27.1.34
215 *† <i>Durenda</i> , M.V. ...	J. Blencowe ...	N. Atkinson ...	J. B. Clewe ...	"	British India ...	" " 10.7.33 to 20.9.33	23.10.33
077 †† <i>Eastern Coast</i> ...	W. Quirk ...	H. Close ...	A. Blow ...	M.L.	Coast Lines ...	Fms. 911 & 138 25.11.33 to 14.1.34	17.1.34
107 *† <i>El Argentino</i> , M.V.	F. Ellis, D.S.C.	W. Findlay, G. Brighton, C. G. Adlard.	E. Lovelock ...	M.	Union Castle ...	" " 6.11.33 to 8.1.34	18.1.34
009 *† <i>Elmworth</i> , M.V.	J. Dick ...	R. Newlands ...	K. A. Allington	"	R. S. Dalgleish ...	" " 24.11.33 to 15.2.34	26.2.34
108 *† <i>Elstree Grange</i> , M.V.	W. E. Williams ...	P. A. Hawkesworth, W. F. Heritage.	R. Tilzey ...	M.	Houlder ...	" " 21.6.33 to 22.7.33	7.9.33
109 *† <i>El Paraguayo</i> ...	R. Owen ...	G. Fletcher, F. G. Rice, R. L. Aldridge.	J. Hunt ...	"	" " ...	" " 31.10.33 to 4.1.34	30.1.34
110 *† <i>El Uruguayo</i> ...	T. McNamara ...	F. E. Hailstone ...	P. J. Vere ...	"	" " ...	" " 4.9.33 to 10.11.33	14.11.33
088 *† <i>Empire Star</i> ...	G. Owen, R.D., Commr., R.N.R.	L. White, F. W. B. Gaubert, J. H. Mortimer.	A. H. Walley ...	S.	Blue Star ...	" " 6.6.33 to 14.9.33	26.9.33
282 †† <i>Empress of Australia</i> .	E. Griffith, Lt.-Commr., R.N.R.	S. W. Keay, E. Roberts, F. H. Stell.	J. Butler ...	S.	Canadian Pacific	" " 20.1.34 to 10.2.34	19.2.34
034 †† <i>Empress of Britain</i> .	R. G. Latta ...	H. H. Saunders, D. Dunn, N. W. Duck.	L. B. Cleary ...	"	" " ...	" " 16.12.33 to 24.1.34	6.2.34
154 †† <i>Empress of Canada</i> .	A. J. Hailey, Lt.-Commr., R.N.R.	W. C. Halliday, G. E. Morrell, J. Marshall.	R. D. Thomas ...	M.L.	" " ...	Fm. 915 14.7.33 to 22.11.33	31.1.34
153 †† <i>Empress of Japan</i> .	L. D. Douglas, R.D., Lt.-Commr., R.N.R.	A. Kennedy, A. Le Maistre, R. Wolfenden.	" " ...	"	" " ...	" " 3.6.33 to 24.10.33	3.1.34
134 *† <i>Esperance Bay</i>	R. McKenzie ...	C. W. Jennings, R. Grant, A. J. Tillott.	A. Stander ...	M.	Aberdeen Commonwealth.	Fms. 911 & 138 13.10.33 to 14.1.34	18.1.34
049 *† <i>Fordsdale</i> ...	J. Avera, Commr., R.N.R.	M. Bennett, L. B. Miller, D. Ashley-Emile.	P. H. Smythe ...	M.	Shaw Savill ...	" " 4.12.33 to 1.3.34	6.3.34
239 *† <i>Foylebank</i> ...	C. S. Newton ...	H. Ingledew, R. N. Wilkie, J. MacCullum.	B. Cunliffe ...	S.	A. Weir ...	" " 1.12.33 to 11.1.34	24.1.34
030 †† <i>Franconia</i> ...	J. C. Townley, R.D., Capt., R.N.R.	P. G. Britten, W. B. Tanner, J. Ashcroft.	J. Harvey ...	"	Cunard ...	" " 12.10.33 to 15.10.33	18.10.33
159 *† <i>Fresno City</i> ...	B. D. Thomas ...	B. E. Duffield, F. W. P. Davies, C. S. Whitticombe.	R. H. Werner ...	"	Reardon Smith ...	" " 24.5.33 to 13.1.34	3.2.34
186 †† <i>Georgic</i> , M.V. ...	F. F. Summers, R.D., Commr., R.N.R.	W. G. Jones, J. H. Walker, J. Law.	H. S. Reid ...	S.	White Star ...	" " 20.11.33 to 2.2.34	17.2.34
234 *† <i>Glaucus</i> ...	W. B. Ewan ...	O. Thomas, F. O. Browning, J. A. A. Evans.	J. C. Wilson ...	M.L.	A. Holt ...	Fm. 915 2.8.33 to 27.12.33	14.2.34
126 *† <i>Glenbank</i> ...	E. N. K. Blackmore	R. W. Brooks, P. G. Neill, S. W. Bell.	C. N. Lawrence	S.	A. Weir ...	" " 31.7.33 to 11.11.33	16.11.33
085 *† <i>Governor</i> ...	J. Angier ...	J. L. Williams, A. Watson ...	J. Maudsley ...	M.	Glen ...	Fms. 911 & 138 25.9.33 to 7.11.33	8.12.33
111 *† <i>Hardwicke Grange</i>	D. Flynn ...	" " ...	" " ...	"	Harrison ...	" " 25.9.33 to 7.11.33	8.12.33
218 *† <i>Harmonides</i> ...	W. H. Fowler ...	W. L. Baker, A. O. Seybold, W. E. Ellis.	A. Turner ...	M.	Houlder ...	" " 20.8.33 to 6.2.34	21.2.34
262 *† <i>Hauraki</i> , M.V.	F. R. Elwell ...	E. E. Avery, C. Hare, L. C. Higgins.	J. C. Shaw ...	S.	R. P. Houston	" " 4.12.33 to 1.3.34	7.3.34
253 *† <i>Hertford</i> ...	A. T. Norton ...	H. A. Brockett, W. A. McGarry, H. J. P. Weston.	W. R. Clark ...	M.L.	Union S.S. Co., N.Z.	Fm. 915 7.3.33 to 3.6.33	6.12.33
182 †† <i>Hibernia</i> ...	E. R. Kemp ...	W. H. Timberlake, H. K. Cockerill, N. L. Warren.	P. Moroney ...	"	Federal ...	Fms. 911 & 138 27.10.33 to 5.2.34	9.2.34
116 †† <i>Highland Chieftain</i> , M.V.	J. R. Bulmer ...	R. Woodall ...	" " ...	"	LM & S. Railway	Telegraphic Report 2.3.34	2.3.34
099 †† <i>Highland Monarch</i> , M.V.	C. A. Cocks, D.S.C., R.D., Capt., R.N.R.	J. Wraice, J. I. James, C. K. Brown.	G. Grieve ...	M.-S.	Royal Mail ...	Fms. 911 & 138 11.12.33 to 28.1.34	2.2.34
230 †† <i>Highland Patriot</i>	A. E. Turner ...	G. Spalding, H. Chamberlain, W. L. Irving.	J. Malcolm ...	"	" " ...	" " 30.10.33 to 17.12.33	2.1.34
250 †† <i>Highland Princess</i> , M.V.	R. G. Clayton, D.S.C., R.D., Commr., R.N.R.	R. N. Fletcher, E. V. Scullard, J. H. Fitton.	A. Staig ...	"	" " ...	" " 18.10.33 to 28.2.34	2.3.34
075 *† <i>Hobson's Bay</i> ...	R. A. Robinson ...	P. Yeatman, F. Dawson, W. B. Tennent.	J. Hilton ...	"	" " ...	" " 28.12.33 to 11.2.34	19.2.34
026 †† <i>Homerie</i> ...	O. V. Schlanbusch ...	W. Paine, T. Stevens, H. Davies.	H. Morgan ...	"	" " ...	" " 30.11.33 to 14.1.34	24.1.34
261 *† <i>Huntingdon</i> ...	T. V. Roberts, R.D., Commr., R.N.R.	F. Charnley, D. Ashley-Emile, S. Masters.	A. R. Porter ...	M.	Aberdeen Commonwealth.	" " 18.8.33 to 18.11.33	2.12.33
200 *† <i>Huntsman</i> ...	F. A. Frank, D.S.O., R.D., Commr., R.N.R.	B. Harrison, H. Morgan, J. Walfaire.	F. A. Bradley ...	S.	White Star ...	" " 22.12.33 to 5.1.34	8.1.34
235 *† <i>Hurunui</i> ...	H. G. B. Field ...	C. Cremen, C. W. Roberts, G. D. Gregory.	A. Mugridge ...	"	Federal ...	" " 4.12.33 to 9.1.34	21.2.34
89 *† <i>Inanda</i> ...	H. Russell ...	J. Richardson, D. Goddard.	J. Taylor ...	M.	Harrison ...	" " 22.11.33 to 14.2.34	21.2.34
189 †† <i>Ingoma</i> ...	F. C. Pretty, D.S.C.	R. Dunnigan, T. Farrar, J. C. Cordran.	C. Beadell ...	S.	New Zealand Shipping.	" " 4.3.33 to 26.5.33	10.6.33
226 *† <i>Japanese Prince</i> , M.V.	W. H. Gibbings ...	T. B. Littlechild, W. S. Eustance, G. McGuinness.	E. J. Cook ...	M.	Harrison ...	" " 10.12.33 to 18.1.34	22.1.34
189 †† <i>Ionic</i> ...	J. T. Ling ...	D. Douglas-Kerr ...	" " ...	"	" " ...	" " 12.11.33 to 18.2.34	1.3.34
226 *† <i>Javanese Prince</i> , M.V.	W. H. P. Jackson ...	N. E. Banks ...	S. A. Sorrell ...	S.	White Star ...	Fms. 911 & 138 31.12.33 to 18.1.34	30.1.34
226 *† <i>Javanese Prince</i> , M.V.	T. B. Marsham ...	P. L. Pallot, H. E. Readshaw, H. H. Sanderson.	" " ...	M.L.	A. Holt ...	Fm. 915 26.10.33 to 16.1.34	27.2.34
226 *† <i>Javanese Prince</i> , M.V.	J. Smith ...	W. M. Henry, R. Scott, E. S. Oberdori.	A. Norrie ...	M.L.	Prince ...	" " 20.8.33 to 21.12.33	31.1.34

FLEET LIST

V

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received
188 †† <i>Kaisar-i-Hind</i> ...	W. A. Cotching ...	J. Travis, F. M. Squire, H. Toon.	W. Stevenson ...	M.-S.	P. & O. ...	Fms. 911 & 138 31.12.33 to 8.1.34	5.2.34
<i>Karama</i> , M.V.	W. Dawson ...	W. Hill, N. S. Milne, C. Knox.	A. Strachan ...	M.L.	Shaw Savill & Albion.	" " 25.10.33 to 1.2.34	7.2.34
<i>Kemmendine</i> ...	R. B. Reid ...	C. R. Roy ...	" " "	M.	Henderson ...	Fm. 911 9.11.33 to 17.1.34	26.1.34
147 †† <i>Laconia</i> ...	B. B. Oram, R.D., Commr., R.N.R.	J. Ashcroft, E. W. Connell, E. Gleave.	W. McArdle ...	S.	Cunard ...	Fms. 911 & 138 11.12.33 to 20.12.33	2.1.34
193 *† <i>Lahore</i> ...	J. H. Hollow ...	F. Hull, D. I. Spencer, S. R. Eva.	A. J. Grace ...	M.	P. & O. ...	" " 26.11.33 to 15.2.34	20.2.34
<i>Lancastria</i> ...	G. R. Dolphin, R.D., Commr., R.N.R.	" " " " " "	" " " "	S.	Cunard ...	" " " " " "	"
082 *† <i>La Paz</i> , M.V. ...	W. J. Good ...	G. Pattison, S. E. Ayland ...	J. Ross ...	M.	Pacific S.N. Co.	Fms. 911 & 138 13.8.32 to 10.11.33	28.12.33
076 *† <i>Largs Bay</i> ...	W. M. Jermyn ...	C. Meyer, N. Miller, H. Clark	S. P. Lewis ...	"	Aberdeen Commonwealth.	" " 26.10.33 to 23.1.34	6.2.34
112 *† <i>La Rosarina</i> ...	L. Bearpark ...	T. C. Townsend, S. W. Howell, H. Powell.	H. Delve ...	"	Houlder ...	" " 26.11.33 to 14.2.34	17.2.34
267 *† <i>Lassell</i> ...	V. G. Hickman ...	T. J. Sweeney, W. Gillespie, W. Kimmings.	S. Foster ...	S.	Lampart & Holt	" " 20.8.33 to 2.11.33	9.11.33
100 †† <i>Laurentic</i> ...	C. P. Freeman, R.D., Commr., R.N.R.	J. Dray, F. W. Laws, A. Thompson.	W. Davies ...	"	White Star	Fms. 911 & 138 15.1.34 to 4.2.34	7.2.34
083 *† <i>Lautaro</i> , M.V. ...	J. H. Kirkwood ...	J. Williams, G. B. Wardale...	D. Irwin ...	M.	Pacific S.N. Co...	Fm. 912 15.1.34 to 4.2.34	7.2.34
254 *† <i>Limerick</i> ...	P. L. Molyneux ...	T. Devitt, D. Chadwick, T. Windus.	E. K. Roberts ...	"	Federal ...	Fms. 911 & 138 17.7.33 to 7.11.33	11.11.33
093 *† <i>Llandaff Castle</i> ...	C. Le Brocq ...	R. E. H. Partington ...	" " " "	S.	Union Castle ...	" " 10.10.33 to 4.12.33	14.12.33
094 *† <i>Llandoverly Castle</i>	J. MacMahon ...	A. G. Malan, A. G. Bidwell, H. S. Warren.	A. E. Hunter ...	"	" " "	" " 11.12.33 to 1.2.34	12.2.34
097 †† <i>Llangibby Castle</i> , M.V.	H. Linklater ...	H. L. Hollands ...	J. Gilbert ...	"	" " "	" " 4.11.33 to 25.11.33	26.1.34
216 *† <i>Llanstephan Castle</i>	W. Weller ...	S. S. Smith, J. A. Wilson ...	H. W. Langshaw	"	" " "	" " 10.12.33 to 12.2.34	19.2.34
084 *† <i>Lobos</i> , M.V. ...	R. E. Dunn, O.B.E.	E. F. Potter, H. Matthews ...	W. Armstrong	M.	Pacific S.N. Co...	" " 12.10.33 to 22.12.33	28.12.33
137 *† <i>Logician</i> ...	R. J. Herschel ...	E. L. Stockley, W. Moore, W. R. Mackenzie.	J. McCanbe ...	"	Harrison ...	" " 8.10.33 to 3.1.34	16.1.34
008 *† <i>Losada</i> , M.V. ...	A. Ridyard ...	D. W. Hutchison ...	D. C. Kerr ...	"	Pacific S.N. Co...	" " 24.9.33 to 8.1.34	13.1.34
232 *† <i>Madura</i> ...	J. A. Wright ...	H. J. Hall, S. Henderson, K. R. C. Letts.	H. O. Francis ...	M.	British India ...	Fms. 911 & 138 26.10.33 to 7.1.34	16.1.34
078 *† <i>Magician Mahana</i> ...	A. G. Peterkin... J. M. Cameron ...	W. E. Shotton, J. Haycocks	J. S. Forrest ...	M.L.	Harrison Shaw Savill & Albion	" " 19.10.33 to 6.1.34	13.1.34
101 *† <i>Mahia</i> ...	C. M. Andrews ...	R. A. Costa, H. C. Howe, B. D. Atkin.	G. Cain ...	S.	" " "	Fms. 911 & 138 22.10.33 to 27.2.34	7.3.34
140 *† <i>Mahratta</i> ...	F. L. Adamson ...	H. F. Scoins, W. J. Wilson.	H. Henshaw ...	M.	Brocklebank ...	" " 28.8.33 to 24.10.33	21.11.33
014 *† <i>Mahronda</i> ...	R. G. Hanna ...	J. B. Leigh, H. Willington, M. Melville.	" " " "	"	" " "	" " 19.1.34 to 9.2.34	21.2.34
242 *† <i>Mahseer</i> ...	T. A. Tyson ...	J. W. Robertson, R. Humble, J. Henshaw.	J. Caddy ...	"	" " "	" " 28.8.33 to 25.12.33	8.1.34
015 *† <i>Mahsud</i> ...	R. W. Kershaw ...	H. Gillespie, J. R. Paisley, C. A. Jackson.	G. D. Plant ...	"	" " "	" " 6.11.33 to 6.12.33	1.1.34
042 *† <i>Maimoa</i> ...	H. P. Thurston ...	J. A. McNab, A. Turnbull, A. S. Anthes.	R. Small ...	S.	Shaw Savill & Albion.	" " 12.10.33 to 30.1.34	22.2.34
054 †† <i>Majestic</i> ...	E. L. Trant, R.D., Commr., R.N.R.	R. B. O'Brien, E. A. Stuart, W. T. Fitzgerald.	J. R. Thomson...	"	White Star ...	" " 30.11.33 to 9.1.34	12.1.34
018 *† <i>Makalla</i> ...	J. W. Maughan ...	A. C. Hocking, J. Richardson, A. Hill.	E. P. Hopkins	M.	Brocklebank ...	" " 15.11.33 to 15.12.33	19.12.33
225 *† <i>Makura</i> ...	D. MacDonald...	G. H. Kime, D. H. Richards, J. W. S. Madden.	R. Gough ...	M.L.	Canadian-Australasian	Fm. 915 16.2.33 to 23.9.33	6.12.33
236 *† <i>Malayan Prince</i>	E. Harcastle ...	R. M. Dennis, W. A. Nash, J. Baird.	F. W. Williams...	"	Prince ...	" " 13.6.33 to 5.11.33	12.12.33
219 *† <i>Malda</i> ...	F. Caffyn ...	V. R. Christnas, R. H. O'Neill, L. A. Wintle.	L. Hugo ...	M.	British India ...	Fms. 911 & 138 23.9.33 to 21.12.33	29.12.33
195 †† <i>Maloja</i> ...	J. B. Browning, R.D., Commr., R.N.R.	J. D. Green, D. Buckle, L. Harper.	P. T. Darby ...	M.-S.	P. & O. ...	" " 26.8.33 to 29.11.33	4.12.33
146 *† <i>Mandasor</i> ...	L. T. Owen ...	F. C. Madden, W. Couling, A. D. Arrard.	R. H. Jones ...	M.	Brocklebank ...	" " 20.10.33 to 12.11.33	11.12.33
064 *† <i>Manela</i> ...	R. W. White ...	D. W. Speirs, P. McPhail, H. Sladden.	N. Cavell ...	"	British India ...	" " " " " "	"
177 *† <i>Mantola</i> ...	D. F. James ...	J. Small, J. Duncan, L. J. Kew.	H. H. Tanner ...	"	" " "	Fms. 911 & 138 20.10.33 to 1.1.34	9.1.34
197 †† <i>Mantua</i> ...	J. M. Legg ...	J. E. Heath, G. A. Wild, G. C. Cullen.	F. Harvey ...	M.-S.	P. & O. ...	" " 2.12.33 to 31.12.33	6.1.34
104 *† <i>Marquesa</i> ...	F. Stephenson ...	J. Wetherall ...	W. H. Jarvis ...	M.	Furness Houlder	" " 19.12.33 to 20.2.34	26.2.34
213 †† <i>Mashobra</i> ...	F. B. Bignold ...	S. R. Millard, W. D. L. Reves, L. Caulfield.	J. Done ...	M.-S.	British India ...	" " 21.8.33 to 9.11.33	17.11.33
021 *† <i>Masula</i> ...	J. Mackenzie ...	L. G. Martin, R. A. Whitehead.	D. Lloyd ...	M.	" " "	" " 4.10.33 to 11.12.33	5.1.34
217 *† <i>Matakana</i> ...	W. G. West ...	" " " " " "	" " " "	S.	Shaw Savill & Albion.	" " " " " "	"
221 †† <i>Mataroa</i> ...	J. H. Gaskell, R.D., Lt. Commr., R.N.R.	G. F. Cresswell, A. G. Fisher, L. R. Bull.	G. H. Tuck ...	"	" " "	Fm. 915 15.7.33 to 16.10.33	24.10.33
023 *† <i>Matheran</i> ...	H. D. Fulcher ...	W. Spencer, R. Penston, T. Johnston.	A. Ryland ...	M.	Brocklebank ...	Fms. 911 & 138 8.11.33 to 17.1.34	26.1.34
223 *† <i>Matiana</i> ...	L. D. Patterson ...	A. H. Baird, J. L. Marsland, J. Bridgman.	H. O. Wilson ...	"	British India ...	" " 23.11.33 to 6.2.34	27.2.34
024 *† <i>Matra</i> ...	N. P. Cornish ...	G. Shaw, W. Robertson, A. E. Austin.	H. W. Forster ...	"	Brocklebank ...	" " 9.10.33 to 1.2.34	22.2.34
032 †† <i>Mauretania</i> ...	R. V. Peel, R.D., Capt., R.N.R.	J. V. Locke, J. W. Caunce, H. V. Clarke.	G. H. Sellars ...	S.	Cunard ...	" " 17.11.33 to 11.1.34	13.1.34
278 *† <i>Middlesex</i> ...	H. T. Wilde ...	J. R. Ricketts, E. G. Williams, C. Coraran.	H. Haddon ...	"	Federal ...	" " 9.9.33 to 20.12.33	25.1.34
194 †† <i>Moldavia</i> ...	C. H. C. Allin ...	J. K. Crone, E. J. Kerridge, W. H. Wood-Roe.	K. G. Barber ...	M.-S.	P. & O. ...	" " 21.9.33 to 12.1.34	5.3.34
199 †† <i>Mongolia</i> ...	C. B. Roche ...	H. M. Flint, G. Aspinall, J. King.	A. Morris ...	"	" " "	" " 12.8.33 to 15.11.33	18.11.33
148 †† <i>Montcalm</i> ...	A. Rothwell ...	J. Dobson, D. Parsons, F. W. Roberts.	J. Biggins ...	"	Canadian Pacific	Fm. 912 17.12.33 to 3.3.34	5.3.34
						" " 11.2.34 to 3.3.34	5.3.34

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
149 †† <i>Montclare</i> ...	G. F. McCombie, R.D., Commr., R.N.R.	J. Soames, W. Thorburn, A. Tibbett.	... ..	M.-S.	Canadian Pacific	Fms. 911 & 138 12.11.33 to 23.2.34 Fm. 912 10.12.33 to 29.12.33	28.2.34 4.1.34
150 †† <i>Montrose</i> ...	M. F. Murray ...	C. D. Watt, A. C. Harrison, E. J. Oatridge.	A. G. Hill ...	"	"	Fms. 911 & 138 30.12.33 to 16.2.34 Fm. 912 28.1.34 to 16.2.34	19.2.34 19.2.34
164 †† <i>Mooltan</i> ...	R. Harrison, D.S.O., Capt., R.N.R.	J. M. Sinclair, A. D. Dennis, N. Thompson.	J. E. Marsh ...	"	P. & O. ...	Fms. 911 & 138 24.9.33 to 28.12.33	2.1.34
196 †† <i>Mulbera</i> ...	A. C. Miller ...	P. M. Wilson, E. J. Studart, E. Reed.	J. D. Lovelock	"	British India ...	" " 10.11.33 to 17.1.34	23.1.34
073 *† <i>Nagara</i> ...	S. Weller ...	F. Crankshaw, J. L. Smith ...	— Stanton ...	M.	Royal Mail ...	" " 27.9.33 to 13.11.33	22.11.33
201 †† <i>Naldera</i> ...	R. C. Dene ...	E. J. R. North, R. D. W. Mackay, E. V. Lewis.	E. F. Whibley ...	S.	P. & O. ...	" " 15.11.33 to 11.2.34	12.2.34
291 *† <i>Nankin</i> ...	M. B. Skinner ...	B. W. Dun, F. O. Colvin, A. H. Krummel.	E. Bovel ...	M.L.	Eastern and Aus- tralian.	Fm. 915 2.8.33 to 23.10.33	3.1.34
227 *† <i>Nardana</i> ...	J. V. Reilly ...	T. Warland, H. Goater, R. Mulhallen.	R. Rawcliffe ...	M.	British India ...	Fms. 911 & 138 2.7.33 to 9.11.33	23.11.33
202 †† <i>Narkunda</i> ...	F. Sudell, R. D., Commr., R.N.R.	J. O. V. Young, G. Randall, P. G. Lawrence.	A. McFarlane ...	M.-S.	P. & O. ...	" " 21.10.33 to 25.1.34	27.1.34
<i>Nascopie</i> ...	T. F. Smellie ...	T. O. Josh ...	... ..	S.	Hudson Bay Co.	Fm. 911 10.8.33 to 26.9.33	17.10.33
286 *† <i>Natia</i> ...	E. W. Bridges ...	T. Davies, M. A. Murch, N. F. Seaton.	L. Hooper ...	M.	Royal Mail ...	Fms. 911 & 138 9.10.33 to 6.12.33	11.12.33
027 *† <i>Nebraska</i> ...	A. R. Murley ...	P. R. Cocks, G. B. Medlycott, — Smith.	— White ...	"	"	" " 9.8.33 to 1.9.33	23.9.33
288 *† <i>Nelore</i> ...	H. J. Bright ...	G. E. Smith, A. A. Stevenson, A. G. Rose.	C. Williams ...	M.L.	Eastern and Aus- tralian.	Fm. 915 15.3.33 to 7.9.33	17.11.33
019 *† <i>Nerbudda</i> ...	A. A. Parker ...	F. D. Copeland ...	... ..	M.	British India ...	Fms. 911 & 138 2.12.33 to 31.12.33	6.1.34
162 *† <i>Nestor</i> ...	F. Adcock ...	P. Elder, W. Pearse, T. Silcock.	C. F. Townsend	S.	A. Holt ...	" " 26.10.33 to 23.1.34	13.2.34
210 *† <i>Niagara</i> ...	T. V. Hill ...	R. N. Turner, D. A. Menlove, L. P. Bourke.	G. M. Power ...	M.L.	Canadian- Australasian.	Fm. 915 22.6.33 to 12.8.33	12.10.33
<i>Norfolk</i> ...	R. L. H. McNish, D.S.O., Lt.-Commr., R.N.R.	H. N. Lawson, J. Knott, P. A. Block.	B. C. Wheeler ...	"	Federal ...	" " 19.10.33 to 25.1.34	3.2.34
<i>Northern Coast...</i>	H. Cameron ...	... ..	... ..	M.L.	Coast Lines ...	" " 15.4.33 to 9.8.33	14.8.33
<i>Northumberland</i>	H. L. Upton, D.S.C., R.D., Commr., R.N.R.	A. W. Marshall, C. B. Cathie, J. Brooke Smith.	M. Savage ...	"	"	" " 15.4.33 to 9.8.33	14.8.33
231 *† <i>Nuddea</i> ...	T. W. Wordingham ...	K. H. Goodman, A. D. C. Kidner, V. Irving.	W. J. Workman	M.	British India ...	Fms. 911 & 138 3.10.32 to 7.12.33	5.2.34
<i>Observer</i>	J. Lowe ...	K. H. Davies	... ..	M.	Harrison ...	Fm. 911 26.9.33 to 28.12.33	23.1.34
004 †† <i>Olympic</i> ...	J. W. Binks, R.D., Lt.-Commr., R.N.R.	W. Tugwell, G. Brooks, H. S. Law.	N. Clarke ...	S.	White Star ...	Fms. 911 & 138 15.12.33 to 15.2.34	17.2.34
243 *† <i>Oparua</i> , M.V. ...	F. W. Robinson ...	H. D. Horwood, H. P. Williamson, J. C. Grose.	F. W. Fowler ...	M.	New Zealand Shipping.	" " 9.7.33 to 25.10.33	3.11.33
170 †† <i>Orama</i> ...	E. P. Cameron, R.D., Capt., R.N.R.	C. H. Denton, L. Sly, W. L. Mackay.	H. Varley ...	S.	Orient ...	Fms. 911 & 138 13.11.33 to 12.2.34	27.2.34
080 *† <i>Orari</i> ...	J. G. Almond ...	N. Baddeley ...	... ..	M.	New Zealand Shipping.	Fm. 911 10.12.33 to 21.1.34 Fm. 912 10.12.33 to 21.1.34	7.3.34 7.3.34
246 †† <i>Orbita</i> ...	D. R. Morgan ...	... ..	... ..	M.-S.	Pacific S.N. Co.	" " 27.10.33 to 14.2.34	2.3.34
087 †† <i>Orduna</i> ...	A. Ridyard, O.B.E. ...	W. Vickers, R. D. Eckford, H. Eardley.	G. Inglis ...	"	"	" " 2.10.33 to 2.1.34	6.1.34
171 †† <i>Orford</i> ...	A. L. Owens, R.D., Capt., R.N.R.	P. Sargent, K. M. Morrison, W. H. Barker.	H. Cheese ...	"	Orient ...	" " 20.8.33 to 21.11.33	1.12.33
174 †† <i>Ormonde</i> ...	M. J. Sarson ...	T. L. Shurrock, C. E. Coles, B. Paul.	C. T. Seaton ...	S.	"	" " 30.10.33 to 30.1.34	17.2.34
172 †† <i>Oronsay</i> ...	R. L. F. Hubbard, R.D., Commr., R.N.R.	C. W. Pinckney, G. B. M. Jones, E. M. Mackay.	K. Alston ...	"	"	" " 18.9.33 to 19.12.33	3.1.34
173 †† <i>Orontes</i> ...	F. R. O'Sullivan ...	F. S. Gray, J. D. Birch, J. K. Johnson.	S. G. Boon ...	M.-S.	"	" " 16.10.33 to 15.1.34	19.1.34
105 †† <i>Orsova</i> ...	A. J. Baxter, D.S.C., R.D., Commr., R.N.R.	J. C. Dowding, R. Galpin, N. W. Smith.	R. B. Knights ...	S.	"	" " 26.4.33 to 17.8.33	22.8.33
206 *† <i>Otira</i> ...	W. Thompson ...	D. Campbell, M. G. Stuart, A. S. Marshall.	L. W. Farnfield	M.	Shaw Savill & Albion.	" " 3.9.33 to 5.12.33	9.12.33
156 †† <i>Otranto</i> ...	L. V. James, D.S.C. ...	A. Addison, G. R. Grandage, L. L. Lloyd Jones.	H. Curry ...	M.-S.	Orient ...	" " 9.8.33 to 2.11.33	4.12.33
<i>Pacific Exporter</i>	C. E. Holland, R.D., Commr., R.N.R.	W. Edmonds ...	C. North ...	S.	Furness Withy ...	Fm. 911 29.10.33 to 29.1.34	1.2.34
277 *† <i>Pakeha</i> ...	W. J. Williams ...	P. Last, T. H. Davies, R. S. Mackenzie	J. W. McGrouther	"	Shaw Savill & Albion.	Telegraphic Report ... 7.3.34	7.3.34
<i>Paris</i> ...	B. Shaw ...	E. W. Smith ...	A. H. Jones ...	"	Southern Rly. ...	Fms. 911 & 138 20.11.33 to 4.3.34	6.3.34
058 †† <i>Pennland</i> ...	H. Harvey ...	F. Chilman, F. Wilis, F. Good	R. Hammond ...	M.	Red Star ...	" " 23.10.33 to 30.1.34	3.2.34
204 *† <i>Peshawur</i> ...	E. P. Parfitt ...	T. C. Triscott, G. V. Legasick, J. H. Anderson.	A. H. Garbett ...	"	P. & O. ...	" " 7.9.33 to 5.2.33	17.2.34
<i>Phemius</i> ...	C. A. Lakin ...	G. W. Best ...	... ..	S.	A. Holt ...	Fms. 911 & 138 3.1.33 to 22.4.33	8.6.33
238 *† <i>Piako</i> ...	E. P. C. Aslin ...	C. A. Cremin, J. F. Clement	L. H. Leggett	M.	New Zealand Shipping.	" " 19.9.33 to 12.12.33	16.12.33
039 *† <i>Planter</i> ...	A. H. Brown ...	J. C. Sinclair, F. R. Hill, J. J. Devereux.	P. J. Aherne ...	"	Harrison ...	" " 3.7.33 to 16.11.33	2.12.33
040 *† <i>Port Adelaide</i> ...	R. Williams ...	E. G. Jones, E. W. Dingle, G. Puttick.	F. Amott ...	S.	Commonwealth & Dominion.	Fm. 915 19.8.33 to 5.12.33	9.12.33
<i>Port Alma</i> ...	W. Gilling ...	J. C. Goddard, W. B. Hopkins, A. L. Walton.	... ..	M.L.	"	Fms. 911 & 138 27.7.33 to 14.11.33	9.12.33
128 *† <i>Port Auckland</i> ...	C. A. Robinson ...	W. Easton, C. E. Midwinter, P. Bradnell.	S. Adams ...	S.	"	Fm. 911 15.6.33 to 8.10.33	23.10.33
268 *† <i>Port Bowen</i> ...	A. H. Brown ...	R. Bettess, W. Craig, E. N. Howard.	... ..	"	"	Fms. 911 & 138 22.9.33 to 6.1.34	20.1.34
130 *† <i>Port Caroline</i> ...	G. S. Hall ...	G. G. Langford, J. S. Moate, R. G. Gardner.	J. P. B. Jeffery.	"	"	" " 23.12.33 to 24.1.34	30.1.34
131 *† <i>Port Darwin</i> ...	J. J. Hudson ...	P. Howe, A. McClounan, R. Russell.	H. A. Palmer ...	"	"	" " 18.10.33 to 15.2.34	2.3.34
072 *† <i>Port Denison</i> ...	R. Needham ...	E. Wheeler, H. B. Walker, A. G. Russell.	C. Donaldson ...	"	"	Fm. 915 15.10.33 to 29.1.34	3.2.34
<i>Port Dunedin</i> , M.V.	G. W. Hearne ...	L. C. Asser, F. W. Elgar, H. Duckling.	... ..	"	"	" " 25.6.33 to 3.1.34	19.1.34
010 *† <i>Port Fremantle</i> , M.V.	W. J. Enright, R.D., Commr., R.N.R.	C. F. Post, G. F. Pannett, W. M. Clough.	H. Lothian ...	"	"	" " 13.10.33 to 27.1.34	6.2.34
<i>Port Gisborne</i> , M.V.	W. G. Higgs ...	R. B. Linklater, N. Muzzell, D. Watson.	... ..	"	"	" " 12.8.33 to 19.11.33	23.11.33
252 *† <i>Port Hardy</i> ...	J. Jack ...	D. F. Morgan ...	... ..	S.	"	"	"
135 *† <i>Port Hunter</i> ...	R. S. Durham, D.S.C.	C. B. Townshend, P. G. M. Lee, L. E. Craven.	... ..	M.L.	"	"	"

FLEET LIST

vii

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
<i>Port Wellington</i>	G. W. Hearn ...	A. J. Knell, E. Rogerson, V. N. Ford.	A. Stratton ...	M.L.	Commonwealth & Dominion	Fms. 911 & 138 6.10.33 to 24.1.34	8.2.34
106 *† <i>Princesa</i> ...	A. B. Friend ...	E. Loughheed, O. S. Sheard, F. Poulson.	R. Shackleton ...	M.	Houlder ...	" " 31.12.33 to 18.1.34	14.2.34
163 *† <i>Protesilaus</i> ...	R. G. Sturrock...	M. J. Eynon, G. Brown, J. M. Kirk.	S. W. Lacey ...	M.L.	A. Holt ...	Fm. 915 13.7.32 to 21.12.33	31.1.34
063 *† <i>Queen City</i> ...	R. V. Arkwright ...	...	...	S.	Reardon Smith...	...	...
205 †† <i>Rajputana</i> ...	P. C. Headlam, R.D., Commr., R.N.R.	B. N. Nankwell, S. H. Baldwin, K. W. Richardson.	W. Banbury ...	M.-S.	P. & O. ...	Fms. 911 & 138 25.11.33 to 14.12.33	8.1.34
228 †† <i>Ranchi</i> ...	A. H. Hignett, R.D., Commr., R.N.R.	T. T. Ferguson, J. P. McArthur, C. B. Holmes.	H. S. Horn ...	"	" ...	" " 15.10.33 to 18.1.34	20.1.34
224 †† <i>Rangitane</i> ...	A. W. Mackellar, R.D., Capt., R.N.R.	R. C. Aldridge, J. Clarke, S. R. Leggett.	W. Smith ...	"	New Zealand Shipping	" " 21.10.33 to 22.1.34	31.1.34
257 †† <i>Rangitata</i> , M.V.	J. L. B. Hunter ...	R. L. Warren, O. Chadwick, M. Johnson.	C. E. Terry ...	"	" " "	" " 18.11.33 to 21.2.34	6.3.34
240 †† <i>Rangitiki</i> , M.V.	H. Barnett ...	L. F. Malcouronne, J. Guille, R. Vincent.	L. V. Horn ...	"	" " "	" " 7.10.33 to 18.12.33	9.1.34
207 †† <i>Ranpura</i> ...	G. H. S. Furlong, O.B.E., R.D., Capt., R.N.R.	G. Maclean, G. F. O'Bryen, A. Taylor.	G. W. Bailey ...	"	P. & O. ...	" " 11.9.33 to 30.10.33	7.11.33
071 †† <i>Rawalpindi</i> ...	R. H. Stringer, O.B.E., R.D., Commr., R.N.R.	L. Porter, R. A. Perry, E. G. May.	J. D. Robb ...	"	" ...	" " 4.9.33 to 6.12.33	13.12.33
247 *† <i>Recorder</i> ...	J. J. Egerton ...	S. A. McCallum, A. S. Milne, V. E. Dunn.	F. M. Devaney...	M.	Harrison ...	" " 28.8.33 to 17.11.33	22.11.33
132 *† <i>Reina del Pacifico</i> , M.V.	J. Ross ...	R. Bridson, W. A. Hearle, J. K. Campbell.	J. J. Moore ...	"	Pacific S.N. Co....	" " 14.11.33 to 3.1.34	9.1.34
<i>Remuera</i> ...	E. A. Holland ...	H. Hill, D. H. Clegg, J. C. Baker.	H. Dedman ...	M.L.	New Zealand Shipping	Fm. 915 26.8.33 to 1.12.33	6.12.33
<i>Rhexenor</i> ...	W. R. F. Holden ...	W. G. Smith, C. T. Morgan, W. F. Lockead.	...	"	A. Holt ...	" 4.5.33 to 3.10.33	9.11.33
<i>Rotorua</i> ...	C. B. Lamb ...	W. J. Glassborow, R. H. Chapman, R. H. Carter.	...	"	New Zealand Shipping	" 1.10.33 to 23.1.34	27.2.34
203 *† <i>Royal Star</i> ...	W. Walsh ...	N. Clarkson, R. E. Winnall, H. Arton.	J. Walker ...	M.	Blue Star ...	Fms. 911 & 138 23.10.33 to 10.1.34	6.2.34
<i>Ruahine</i> ...	G. Kinnell ...	F. R. F. Wilson, A. Hocken, D. S. R. Martin.	F. G. Bedford ...	M.L.	New Zealand Shipping	Fm. 915 21.7.33 to 15.11.33	21.11.33
<i>St. Helier</i> ...	R. Pitman ...	...	...	S.	G.W. Railway ...	Telegraphic Report 6.3.34	6.3.34
<i>St. Julien</i> ...	T. Richardson ...	H. D. Freeman ...	...	A.	Bunch Steam ...	Fm. 911 " 24.2.34	24.2.34
<i>St. Keverne</i> , S.T.	A. Hatton ...	...	...	"	Fishing Co. ...	Fm. 912 8.11.33 to 7.2.34	10.2.34
<i>St. Patrick</i> ...	C. W. Sanderson ...	T. D. Thomas ...	...	S.	G.W. Railway ...	Telegraphic Report 6.9.33	6.9.33
093 †† <i>Scotia</i> ...	W. Hughes ...	W. H. Hughes ...	...	"	L.M. & S. Railway	Telegraphic Report 7.3.34	7.3.34
<i>Seythia</i> ...	W. A. Hawkes...	W. M. Stewart, A. B. Fastig, A. D. McCallum.	J. Doyle ...	"	Cunard ...	Fms. 911 & 138 27.11.33 to 14.1.34	18.1.34
211 *† <i>Shropshire</i> , M.V.	R. P. Mann ...	D. Hetherington, J. K. Gemmel, H. B. Peate.	D. McLellan ...	"	Bibby ...	" " 24.12.33 to 28.2.34	7.3.34
121 *† <i>Siamese Prince</i> , M.V.	E. E. Jones ...	W. A. Niven, H. J. Steele, ...	J. Hanlon ...	M.L.	Prince ...	Fm. 915 14.7.33 to 1.12.33	6.1.34
<i>Silverwalnut</i> ...	W. N. Tulloch ...	...	...	"	Thompson ...	...	...
141 *† <i>Somerset</i> ...	E. R. Pilcher ...	H. M. Knight, B. C. Hamilton, J. N. A. Low.	A. E. Howard ...	S.	Federal ...	Fm. 915 6.7.33 to 20.10.33	8.11.33
<i>Spero</i> ...	W. A. Dossor ...	H. D. Vickers, A. Kirk ...	...	M.L.	Ellerman Wilson	" 1.7.33 to 21.1.34	3.2.34
020 *† <i>Stirlingshire</i> ...	F. T. Mee ...	F. J. E. Houghton, R. E. Smallbone, E. G. G. Mobbs	F. A. Tee ...	S.	Turnbull Martin	Fms. 911 & 138 31.7.33 to 4.12.33	15.12.33
<i>Stephen</i> ...	O. J. P. Lee, R.D., Capt., R.N.R.	H. Sapworth, L. A. Sayers ...	...	M.L.	Booth ...	Fm. 915 12.3.33 to 13.9.33	4.10.33
270 †† <i>Strathaird</i> ...	W. P. Townshend, R.D., Capt., R.N.R.	R. H. Hand, H. Fitzmarshall, L. T. Brown.	F. W. Helm ...	M.-S.	P. & O. ...	Fms. 911 & 138 17.11.33 to 7.2.34	10.2.34
059 †† <i>Strathnaver</i> ...	B. J. Ohlson, D.S.O., R.D., Commr., R.N.R.	R. E. Baldwin-Wiseman, C. W. Mayne, N. W. Leech.	P. R. Hobbs ...	"	" ...	" " 21.11.33 to 10.1.34	12.1.34
274 *† <i>Sultan Star</i> ...	W. Bevan ...	G. T. Riley, J. Lewis ...	J. J. Winsor ...	M.	Blue Star ...	" " 12.11.33 to 12.2.34	20.2.34
044 *† <i>Tacoma City</i> ...	H. Paul ...	T. J. Paull, J. M. Hughes, C. K. Hughey.	R. Lea ...	M.L.	Reardon Smith...	Fm. 915 25.6.33 to 3.12.33	1.1.34
<i>Tacoma Star</i> ...	T. Williams ...	S. Foulkes, J. O. W. Davies, G. Wooller.	...	S.	Blue Star ...	Fm. 911 10.10.33 to 27.12.33	1.1.34
229 *† <i>Tactician</i> ...	F. Trinick, O.B.E.	A. Frew, S. Leyland, L. J. Sharman.	J. Quill ...	M.	Harrison ...	Fms. 911 & 138 17.11.33 to 24.1.34	26.1.34
045 †† <i>Tainui</i> ...	A. McIntosh ...	P. Campbell, H. Winyard, D. Pickersgill.	A. Bloxham ...	M.L.	Shaw Savill & Albion	Fm. 915 4.11.33 to 13.2.34	21.2.34
081 *† <i>Tairoa</i> ...	S. Oswald ...	W. Thowless, L. B. Miller, G. Sangwin.	L. Arnold ...	S.	" " "	Fms. 911 & 138 22.4.33 to 25.8.33	5.9.33
046 †† <i>Tamaroa</i> ...	G. Williams ...	R. G. James, J. G. Allen, E. Johansen.	A. Lund ...	M.-S.	" " "	" " 9.9.33 to 9.12.33	13.12.33
264 *† <i>Tanda</i> ...	E. T. Pilcher, Lt.-Commr., R.N.R.	W. B. Williams ...	W. Harris ...	M.L.	E. & A. S.S. Co....	Fm. 915 3.5.33 to 10.9.33	6.12.33
165 *† <i>Tantalus</i> , M.V....	R. Brawn ...	J. H. Brawn, J. MacArthur, J. A. MacGregor.	J. Clarkson ...	S.	A. Holt ...	Fms. 911 & 138 1.11.33 to 31.1.34	5.3.34
047 *† <i>Taranaki</i> , M.V.	J. W. Johnson...	T. B. Marsdon, B. M. Norris, C. Stewart.	T. Todd ...	"	Shaw Savill & Albion.	" " 3.8.33 to 14.11.33	17.11.33
069 *† <i>Tekoa</i> ...	J. Howell Price, D.S.O., D.S.C.	J. McCulloch, L. W. Fulcher, A. B. Goord.	F. Gardiner ...	M.	New Zealand Shipping	" " 31.7.33 to 14.12.33	8.1.34
048 †† <i>Themistocles</i> ...	C. Wood, D.S.C.	R. Pattison, R. Hamilton, W. Hart.	F. G. Lord ...	M.-S.	Aberdeen	" " 4.6.33 to 28.9.33	5.10.33
161 *† <i>Titan</i> ...	G. G. Rundle ...	G. Roberts, J. R. McCarthy, C. B. L. Wren.	S. Wingfield ...	S.	Commonwealth	" " 7.12.33 to 31.12.33	29.1.34
244 *† <i>Tongariro</i> ...	F. S. Hamilton ...	G. W. Pring, N. A. Thomas, H. Dawson.	E. G. Stride ...	"	New Zealand Shipping.	" " 11.4.33 to 29.7.33	10.8.33
025 †† <i>Transylvania</i> ...	D. W. Bone ...	T. O. Dunn, H. D. Campsie, A. Middleton.	J. McDonald ...	"	Anchor ...	" " 24.9.33 to 6.11.33	8.11.33
119 *† <i>Trojan Star</i> ...	D. H. Mills ...	M. D. Stacey, E. R. Pearce, A. Fowler.	H. D. C. Cox ...	M.	Blue Star ...	" " 29.6.33 to 24.9.33	26.9.33
245 *† <i>Turakina</i> ...	J. Laird ...	C. Edgecombe, H. G. Letts, J. Reeve.	N. Hallett ...	"	New Zealand Shipping.	Fm. 915 20.5.33 to 29.8.33	1.9.33
276 †† <i>Tuscania</i> ...	W. B. Rome ...	J. Lefevre J. Noble, J. Gibson	J. Reid ...	S.	Anchor ...	Fms. 911 & 138 25.10.33 to 21.1.34 Fm. 912 30.12.33 to 21.1.34	25.1.34 25.1.34

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.12.33 to 7.3.34.	Date Last Return Received.
113 *† <i>Upwey Grange</i> , M.V.	H. P. Goodrich ...	A. Bradbury, G. T. Hurst, P. J. Walker.	G. L. Moody ...	M.	Houlder ...	Fms. 911 & 138 16.12.33 to 5.2.34	10.2.34
176 *† <i>Vancouver City</i> ...	H. E. Egerton ...	H. David, A. C. Holden ...	S. W. Sloan ...	S.	Reardon Smith ...	Fms. 911 & 138 2.11.33 to 26.1.34	6.2.34
292 †† <i>Vandyck</i> ...	P. Symonds ...	...	...	...	Lampont & Holt ...	...	...
292 †† <i>Viceroy of India</i> ...	E. J. Thornton, R.D., Commr., R.N.R.	F. E. Cox, R. H. Turner, M. F. Shute.	V. A. K. Smith ...	M.-S.	P. & O. ...	31.10.33 to 10.2.34	13.2.34
053 †† <i>Voltaire</i> ...	...	H. E. Morison ...	W. Burnett ...	S.	Lampont & Holt	23.12.33 to 6.1.34	10.1.34
263 *† <i>Wairuna</i> ...	R. L. Davies ...	J. Warwick, D. McKenzie, A. H. Dunning.	E. P. Nichell ...	M.L.	Union S.S. Co. of N.Z.	Fm. 915 14.10.32 to 21.1.33	12.4.33
005 †† <i>Warwick Castle</i> ...	W. M. Betts ...	P. Clissold, W. D. Roach, J. Oakley.	J. Hudson ...	S.	Union Castle ...	Fms. 911 & 138 4.11.33 to 24.2.34	26.2.34
060 †† <i>Westernland</i> ...	W. A. Morehouse ...	H. H. Grace, W. E. Hesketh, J. Mackie.	J. C. R. Eustice ...	„	Red Star ...	Fm. 912 „ 28.1.34 to 18.2.34	22.2.34
056 *† <i>Westmoreland</i> ...	E. A. Burton ...	R. Coin, F. T. Renny, H. Forster.	R. Glover ...	„	New Zealand Shipping.	Fms. 911 & 138 4.12.33 to 29.12.33	29.1.34
208 †† <i>Winchester Castle</i> , M.V.	J. H. Kerbey ...	W. S. Byles, R. F. Pembry...	W. A. Smith ...	„	Union Castle ...	„ „ 2.12.33 to 21.1.34	23.1.34
096 †† <i>Windsor Castle</i> , M.V.	A. Barrow ...	F. A. G. Hunter, N. Wilcock	G. Scurr ...	„	„	30.10.33 to 17.2.34	23.2.34
096 †† <i>Woolhing</i> ...	W. Lidbetter ...	H. Smith, E. W. Smith ...	C. Kelley ...	„	Southern Railway	Telegraphic Report ... 7.3.34	7.3.34
<i>Yoma</i> ...	J. A. Wilson ...	J. Crawford, ...	...	M.	Henderson ...	Fm. 911 23.9.33 to 5.12.33	20.12.33
043 *† <i>Zealandic</i> , M.V.	H. R. Gordon ...	K. Miller, T. Chapman ...	W. Latimer ...	S.	Shaw Savill & Albion.	Fms. 911 & 138 20.6.33 to 13.10.33	20.10.33
<i>Conway</i> , H.M.S.	F. A. Richardson, D.S.C., Commr., R.N.	The Senior Cadets ...	...	Cadets M.L.	...	Cadets' Met. Log. 24.9.33 to 16.12.33	20.12.33
<i>Pangbourne Nautical College</i> .	A. F. G. Tracy, Commr., R.N.	„ „ ...	...	„	...	„ „ 21.9.33 to 16.12.33	23.12.33
<i>Worcester</i> , H.M.S.	G. C. Steele, V.C., Commr., R.N.	„ „ ...	...	„	...	„ „ 22.9.33 to 13.12.33	15.12.33
<i>Watling Island</i>	...	The Keepers ...	...	Lighthouse Register	...	Lighthouse Register 1.5.33 to 31.10.33	3.2.34
<i>Cape Pembroke</i> ... (Falkland Is.)	...	„ „ ...	...	„	...	Lighthouse Register 1.7.33 to 31.12.33	3.2.34

SHIPS WATER SAMPLING THE NORTH ATLANTIC. FISHERIES LABORATORY, LOWESTOFT.

Name of Vessel.	Captain.	Observing Officer.	Line.	Received at Government Chemist, London.
<i>Dakarian</i> ...	W. Hannaford ...	A. A. Johnson ...	Leyland ...	30 Water Samples, 8.12.33.
<i>Darian</i> ...	J. Trickey, D.S.O.	F. Steventon ...	„	30 „ „ 25.1.34.
<i>Davision</i> ...	R. Thomas ...	A. F. Wood ...	„	30 „ „ 29.12.33.
<i>Hilary</i> ...	W. C. H. Jones, R.D., Commr., R.N.R.	G. E. Freeman ...	Booth ...	60 „ „ 8.12.33.
				30 „ „ 2.2.34.

SHIPS WATER SAMPLING THE ARABIAN SEA, JOHN MURRAY EXPEDITION.

Name of Vessel.	Captain.	Observing Officer.	Line.	Received at Port Office, Port Said.
<i>Britannia</i> ...	D. Munro ...	G. S. Sinclair ...	Anchor ...	2 cases of Water Samples, 13.11.33
<i>Castalia</i> ...	G. B. Kelly ...	H. D. Campsie ...	„	...
<i>Cheshire</i> ...	G. L. English ...	T. Holden ...	Bibby ...	2 „ „ „ 24.1.34.
<i>City of Simla</i> ...	J. McMillan ...	D. Campbell ...	Ellerman...	...
<i>Clan Macvicar</i> ...	M. H. Jones ...	L. S. Jones ...	Clan ...	2 „ „ „ 23.1.34.
<i>Clan Ogilvy</i> ...	T. Brocklebank ...	T. B. Fairweather ...	„	2 „ „ „ 21.11.33.
<i>Clan Skene</i> ...	C. C. Parfitt ...	S. W. Brown ...	„	...
<i>Elysia</i> ...	F. M. Henderson ...	R. B. Clements Mitchell	Anchor ...	2 „ „ „ 3.2.34.
<i>Gloucestershire</i> ...	C. A. Griffiths ...	W. F. Collins ...	Bibby ...	2 „ „ „ 27.12.33.
<i>Oxfordshire</i> ...	H. Lyon ...	C. Powrie ...	„	2 „ „ „ 5.12.33.
<i>Sagaing</i> ...	E. Esslemont ...	C. Fergusson ...	Henderson ...	2 „ „ „ 18.2.34.
<i>Staffordshire</i> ...	W. L. Forster ...	W. B. Boyer ...	Bibby ...	2 „ „ „ 13.12.33.
<i>Tarantia</i> ...	J. B. Caithness ...	J. M. Cherry ...	Anchor ...	2 „ „ „ 10.1.34.
<i>Worcestershire</i> ...	F. W. Beckett ...	A. Thomson ...	Bibby ...	2 „ „ „ 10.1.34.
<i>Yorkshire</i> ...	F. W. L. Midgeley ...	J. F. Reed ...	„	2 „ „ „ 7.2.34.

April, M.O., 1934.

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

MARINE METEOROLOGY, ATLASES AND BOOKS

CHARTS:—

ATLANTIC (NORTH AND SOUTH):—

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

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

ATLANTIC (NORTH):—

Atlas of Currents on the Main Trade Routes of the North Atlantic. (No. 323, 1930. 6s. 6d.) ($29\frac{1}{4} \times 19\frac{1}{2}$ in.)

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

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

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

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

ATLANTIC (SOUTH):—

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

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

CHARTS:—*continued.*

BAFFIN BAY AND DAVIS STRAIT:—

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

INDIAN OCEAN:—

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

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

PACIFIC OCEAN:—

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

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

RED SEA:—

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

SOUTHERN OCEAN:—

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

BOOKS:—

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

The Marine Observer's Handbook. Fifth Edition. (No. 218, 1930.) 2s. 6d. (8vo.)

PAMPHLET:—

Decode for use with the International Code for Wireless Weather Messages from Ships. Second Edition. (No. 329, 1933.) 3d. (8vo.)

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 2; York Street, Manchester 1

1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast

or through any Bookseller

[To face page viii]

