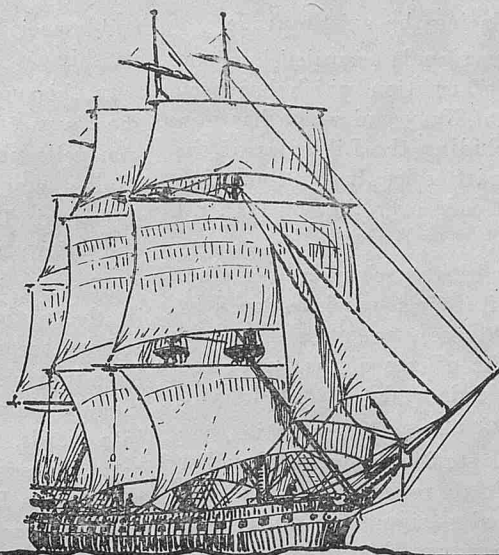
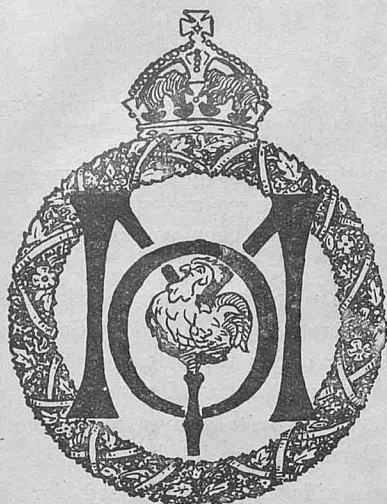


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VOL. XI. No. 113.

THE MARINE OBSERVER.

JANUARY 1934.

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THE MARINE OBSERVER 1934.

A happy New Year to all our readers, may 1934 see the dawn of better times for the Merchant Navy and be a year of steady progress for the Voluntary Corps of Marine Observers.

On January 1st, 1934, The 1931 International Code of Signals comes into operation internationally replacing the existing code.

In this number is a brief history of sea signals compiled by Commander J. HENNESSY, R.N.R., giving information which has been sought for of recent years in the Merchant Navy and which has now been compressed from many sources including the Libraries of the Admiralty, Trinity House and the United Service Institution. The improvement is great in the new signal code over that of 1897, all will agree.

The improvement in visual signalling between ships at sea since 1856 when the first International Code of Signals was introduced by the Board of Trade and before which there was much disregard of signals is beyond any dreams which the officers of the Royal and Merchant Navies who drew up the 1856 code could have had.

To-day when in any part of the world ships of any nation can signal to any ship or any shore signal station knowing that her signals can be understood, it is difficult to realize that less than eighty years ago—due to diversity of codes—signalling at sea was generally ineffective and less than 120 years ago there was no signal code of flags at all in the Merchant Service.

Indeed not only in signalling but in navigation and in many branches of seamanship, in fact generally in what the Honourable Company of Master Mariners has termed Seacraft there has been tremendous improvement.

The year 1863 marks the commencement of greatly reduced casualties for in that year the Rule of the Road was adopted.

Only 40 years ago from a little book we had given us upon going to sea, entitled "Rule of the Road," by that great benefactor of Merchant Seamen, THOMAS GREY, whose wisdom has made itself felt throughout the sea service, we learnt the four LLLs.

"I must say this daily and act on it always.

I understand LLLL to be the symbol or sign for four things which I must never neglect; and these things are, Lead, Log, Latitude and Look-out.

Therefore, I say, use the Lead and the Log; and mind the Latitude and Look-out.

I believe in the Lead, as it warns me against dangers which the eye cannot see.

I believe in the Log, as it checks my distance run.

I believe in ascertaining the Latitude as it helps to define my position.

I believe in the Look-out as it warns me against dangers to be seen.

The lead warns me against dangers invisible, the Log warns me against false distances, the Latitude helps to define my position, and the Look-out warns me against dangers visible.

And I earnestly resolve, and openly declare, that as I hope to sail my ship in safety on the ocean, as I wish to spare the lives of my fellow-creatures at sea, and as I wish to go in safety all my days, so will I steadfastly practise that which I believe.

And I hereby warn seamen, and tell them that if they neglect any one of these four things, either the Lead, the Log, the Latitude, or the Look-out, they or their fellows will some day surely perish."

It is often said that we seamen are too conservative but in the calling of the sea wise conservatism is necessary. Changes and innovations which may be premature may result in mistakes with consequent waste or disaster. Adaptability with seamanlike caution has been the guiding principle of the British Merchant Navy, proof

of which may be found here and there in the pages of this journal from the first number.

Descriptions and the use of modern navigational instruments by those who have made good use of them at sea are of great interest and especially to those who may not have been so fortunate as to be shipmates with them.

In this number Captain Sir BENJAMIN CHAVE, an old member of the Corps of Voluntary Marine Observers, now Agent at Southampton, tells us of a Direction Finder under the sole control of the navigator on the Bridge and Lieutenant NORMAN DUCK, R.N.R., one of Captain LATTA's officers in *Empress of Britain* gives us a humorous and interesting account of the Echo sounder in that ship.

Whether improved navigational aids lessen the need for skill in the navigator and whether improved organization of shipping reduces the responsibility of masters and mates are questions which have frequently been asked of recent years. All who have experience know the answer but sometimes it may be difficult to put it clearly into words. In his book "For Ever England," Lord MORTISTONE, better known to the Merchant Navy as General SEELY, coxswain of the Brooke Life Boat and great yachtsman, who, though not a professional seaman has a great knowledge and understanding of the sea, ships and seamen, says:—

"Many people who have not had much to do with the sea have the mistaken impression that modern science has made the task of the navigator so simple that any one can do it. There was never a more complete delusion. As in everything else in human experience, added opportunities give added dangers. The great sailing ship of days gone by never attempted to go either round Eastabout or Westabout to reach Portsmouth or Southampton in a night of storm. She hove-to in mid-channel till daylight came. If the south-westerly gale and thick weather continued, she would either beat off and on, or run up Channel and anchor in the Downs. Not so the modern ship, capable of keeping a regular speed, save only in exceptional storms, whose passengers and perishable goods must be landed within a few hours unless the whole time-table of the Company is to be destroyed. The captain, the officers, the crew, and the pilot know this full well. The safety of the ship must not be jeopardized. That is laid down in clear and unmistakable terms. Time is everything. Steamship companies only keep their ships going on very narrow margins of profit. If time is persistently lost, the Company goes bankrupt and every one loses his job. I have been in many steamers and one great sailing ship. Each have their special dangers and difficulties, but I should say without hesitation—and I think that others with far more knowledge of the sea than I have would agree with me—that the problem of making port in due time is more exacting to-day than in the days of the sailing ships of times gone by. The thing that strikes me more and more as I go about the world in British ships is the ever-increasing standard of skill and devotion to duty which the captains of ships and the pilots who bring them to port display."

Ocean Currents.

The discovery made in 1932 during our examination and charting of the currents in the Arabian Sea and Bay of Bengal that the seasonal change of the direction of the mean current circulation took place before the change of the monsoon wind seemed so remarkable that we have continued to investigate this matter.

The mean set and drift of the current and the mean direction of the wind during each month of the year have been worked out for comparatively small areas covering the Arabian Sea and Bay

of Bengal and there can now be no doubt that the current does generally change its direction from counter-clockwise to clockwise round these great bights, off their shores in January to April according to locality and mainly in February, while the N.E. monsoon is still blowing. That is, the S.W. Monsoon Current makes off the shores of the northern head of the Indian Ocean while the N.E. Monsoon wind is still blowing, and runs stronger when the S.W. Monsoon wind has set in.

The change in the mean set of the current from clockwise to counter-clockwise takes place at the end of October when the S.W. Monsoon is over and as would be expected if the wind were the main cause of this current.

Based upon EKMAN's theory will be found a suggestion to explain this reversal of current in an article in this number by Mr. E. W. BARLOW. It is thought that owing to the cooling of the sea by the N.E. Monsoon wind, and the sea at the heads of the bights being consequently a good deal cooler than at their mouths; also owing to the fact that colder water exists off the western shores than off the eastern shores, due to the currents bringing cold water there, a slight difference in the level of the sea surface is produced. The level of the sea being slightly higher where it is warmer and slightly lower where it is cooler due to expansion and contraction of the water; this in turn produces differences of pressure in the water which set the current running and the rotation of the earth with the trend of the coast determines the direction. Only about February does this marked difference of sea temperature exist. Navigators often notice at sea that on occasions changes of sea temperature occur with a change of current and on other occasions there may be no change of sea temperature with change of current. In fact from individual observations or even a number of observations taken by a few observers it seems that sea temperature is not a great factor in telling that there is a current, it is far too complex a balance of forces for that! All we can hope to do is to determine facts by collective observation and when sets of facts occur together see if they explain each other. This suggested explanation of this reversal of the current still requires many facts to be determined, but it is worth the careful consideration of all engaged in this survey of the currents. By the way, while we are writing of EKMAN's theories probably not many of our readers know that during the drift across the Arctic Sea in the *Fram*, NANSEN came to the conclusion that the current set with the wind, but somewhat to the right, and that this was due to the rotation of the Earth. He asked Professor EKMAN to work it out by mathematics.

In this number are Section Charts of the currents for the quarter February, March and April for the Red Sea and for the part of the Indian Ocean North of Australia.

Those who have followed this investigation of the currents will remember that we wrote in these notes in last year's January number of errors in current observation which had occurred, due to refraction. In charting the currents observed in the Red Sea, we are taking even more than our usual care to exclude any observations which are not reliable. With the large number of observations of set and drift logged since 1910 in the Red Sea the mean results give a better measurement of the surface currents along the main steamship route in this sea than has ever been obtained before.

As all set and drifts concerning which there is evidence of the probability of faulty observation are rejected, the current roses may be taken to represent truly the variations of the current, and

the tables of maximum drifts, the probable strongest currents in the Red Sea.

In the next number the weather conditions prevailing in these regions being charted for currents will be reviewed.

In the July and October numbers articles giving the results of our investigation carried out as the charts are made will be published as usual. Meanwhile all who can assist by sending information are asked to do so. Information of the currents close to both shores of the Red Sea and along the North and North West coasts of Australia are particularly desired.

The gaps in the Atlas of Indian Ocean Currents under construction are filling up well. When the currents charted this year in THE MARINE OBSERVER have been added there will be blank only the region between Latitude 8° S. and 30° N. and Longitude 100° E. to 140° E. including the China Sea, Gulf of Siam and East Indian Archipelago.

It is intended to chart this region in 1935 and we hope the publication of the New Atlas will follow soon after the end of that year.

Weather.

The general arrangement of THE MARINE OBSERVER will be the same as last year. The great thing is to keep the information in its pages other than "routine matter" ever changing like the weather of the British Isles, but if possible bright like last summer with its glorious sunshine and good sailing breezes.

In this number the description of the Selected Ship Routine Wireless Weather Reporting Service in all parts of the world has been revised, brought up-to-date and clarified.

The instructions for the guidance of the commanders, observing officers and W.T. operators of British Selected ships have been simplified as far as possible to meet the demands made upon the service which have grown since it was established on May 1st, 1930. We invite the attention of the Commanders of British ships to this and request them to instruct their observing officers and W.T. operators accordingly. We also invite the attention of the Meteorological Services of the Dominions and other countries desiring the assistance of British Shipping in this matter of Weather reports from the sea to the request repeated on page 27 for the information required to complete and keep up-to-date the Lists of receiving and intercepting stations published quarterly. It is essential that the Shore stations and the ships working this system should have the same information for smooth and efficient working.

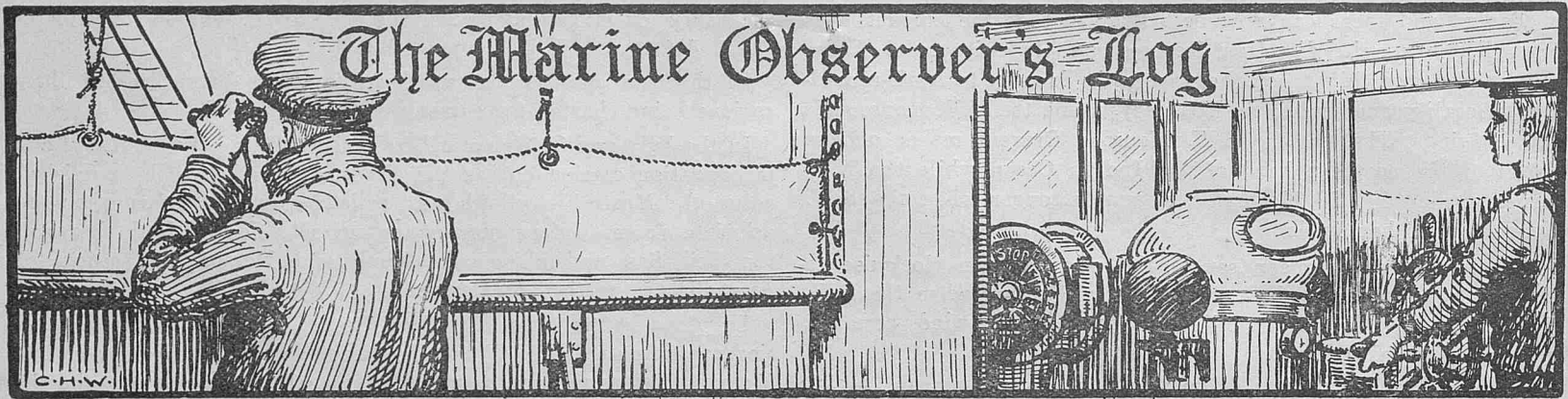
In the April, July and October numbers Wireless Weather Signals following the principles required by the Convention of Safety of Life at Sea will as usual be given in geographical order for all parts of the world.

Now that the Marine Division is extracting data from all Meteorological Logs as they come in, recovering arrears with the old Logs and striving to make a success of the "Two Years' Plan" so that the scheme for completing the survey and charting of the oceans may be finally adopted, we depend more than ever upon those at sea to provide good stuff for THE MARINE OBSERVER. That our dependence is not misplaced has never been better shown than in the Marine Observer's Log of this number which is a fine augury for the coming year.

MARINE SUPERINTENDENT.

London,

November 3rd, 1933.



January, February and March.

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.

THE AGULHAS CURRENT.

THE following is an extract from the Meteorological Record of M. V. *Clan Macdougall*, Captain F. FORRETT, Melbourne to Cape Town, observer, Mr. G. L. ROE, 3rd officer.

The following tables show the current experienced by the M. V. *Clan Macdougall* on the seven voyages to Durban between November,

After passing Aliwal Shoal and steering to pass one mile off the Bluff the current nearly always becomes weak and occasionally a favourable set of about one knot is felt.

The best passages from the Cape to Durban were made in the month of August, as will be seen by referring to (4) and (6) and the

F = Favourable.

A = Adverse.

Date.	(1) 1929—Nov. 24-26.					(2) 1930—Oct. 24-26.					(3) 1931—Feb. 28-Mar. 2					(4) 1931—Aug. 14-16.					(5) 1932—Feb. 2-5.					(6) 1932 Aug. 26-28.					(7) 1933—Jan. 27-30.				
Point.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.	Distance off.	Wind.	Force.	Average Speed.	Current.
	mls.			kts.	kts.	mls.			kts.	kts.	mls.			kts.	kts.	mls.			kts.	kts.	mls.			kts.	kts.	mls.			kts.	kts.	mls.			kts.	kts.
Cape Agulhas ...	5	S.	4	—	—	8½	S.	2	—	—	8	S.W.	6	—	—	8	W.N.W.	5	—	—	7	E.	4	—	—	9	W.N.W.	6	—	—	5	W.S.W.	4	—	—
Seal Point ...	8	S.E.	2	12.0	A 1	4½	S.	2	12.8	A ¼	5½	S.W.	6	13.1	Nil	2½	W.	6	13.3	F ¼	4	E.	6	11.6	A ¼	8	W.	7	13.2	Nil.	2½	W.S.W.	3	13.3	F ¼
Great Fish Point	5	E.	2	12.8	A ¼	Rain and mist. Not seen.					3½	W.S.W.	4	14.3	F 1	4½	W.S.W.	4	14.4	F 1¼		Not seen.			3½	W.	7	14.8	F 1¼	6½	S.	4	13.8	F ¾	
Hood Point ...	5	N.E.	2	10.9	A 2	3	E.	4	12.5	A ¼	1½	W.S.W.	4	14.0	F ¾	2½	W.S.W.	4	13.4	F ¼	2	E.	5	10.4	A 1	2	W.S.W.	7	12.3	A ¾	5½	S.	5	10.5	A 2½
Bashee River	2½	E.	2	10.0	A 3	9½	E.N.E.	5	10.6	A 1½	2½	N.E.	1	13.6	F ¾	7	W.S.W.	4	12.7	A ¼	3½	E.	6	10.0	A 1½	1½	W.S.W.	6	14.0	F ¾	2½	S.W.	4	11.0	A 2
Lt.-Ho.																																			
Cape Hermes ...	4	E.N.E.	2	10.9	A 2	11½	N.E.	2	8.0	A 4½	3	N.W.	2	12.0	A 1	7½	S.W.	4	14.4	F 1¼	7½	N.E.	6	8.0	A 3	4½	W.	4	14.0	F ¼	1½	S.W.	4	11.2	A 1½
Port Shepstone	6½	E.N.E.	4	10.0	A 3	3	N.E.	2	10.2	A 3	2½	S.W.	2	10.9	A 2	2½	S.W.	4	13.3	F ¼	3	N.E.	5	9.3	A 2	4½	S.E.	2	12.6	A ½	2½	S.E.	3	12.0	A 1
Green Point ...	7	E.N.E.	3	12.1	A 1	5	N.E.	2	12.0	A 1	4½	S.W.	2	12.1	A 1	4	S.W.	4	14.8	F 1½	2½	N.E.	5	11.0	A 1	6	S.E.	2	15.0	F 1½	5½	E.	3	11.0	A 2
Port Natal (Bluff)	1	E.N.E.	3	13.0	Nil	1	N.E.	2	13.0	Nil	1	S.W.	2	14.0	F 1	1	S.W.	4	14.0	F 1	1	N.E.	4	13.0	Nil	1	S.E.	2	14.0	F ¼	1	W.	1	11.0	A 2

1929, and January, 1933. The distance passed off the various points on the coast, the average speed over the ground between points and the direction and force of the wind are also given. The information is derived from the rough logs of the various voyages.

In the foregoing tables it will be noted that the strongest adverse current was experienced in the months of October and November, the greatest velocity being attained between Hood Point and Port Shepstone. This is almost invariably the case, but on occasions a stronger set has been found between Great Fish Point and Hood Point.

Between Hood Point and Cape Hermes a strong set out is often experienced as will be seen by referring to (2). On this occasion Hood Point was passed at 2.02 p.m. 25th October, the weather being overcast with almost continuous drizzle and only moderate to poor visibility. In consequence cross-bearings were difficult to obtain and although the vessel had passed only 3 miles off Hood Point she was 9½ miles off the land on passing Bashee River Light at 8.45 p.m. This set out continued until Cape Hermes was passed.

following observations obtained in September would seem to bear out the tabulated results.

On September 12th, 13th and 14th Captain FORRETT then in the *Clan Macdougall* had a favourable set of 35 miles between Slang Kop and the Bluff when passing the following distances off the coast, Slang Kop 5 miles, C. Agulhas 5 miles, C. Recife 4 miles, Hood Point 4½ miles, Bashee River 4½ miles, C. Hermes 5½ miles, Port Shepstone 3 miles. The wind was S.W'ly.

In February, 1930, in the same ship he experienced an adverse set from the Cape to Durban with an average rate of one knot.

An interesting instance of the velocity sometimes attained by the Agulhas Current is provided by the following.

On February 12th, 1932, the *Clan Macdougall*, on passage from Durban to Lourenço Marques, was stopped off Cape St. Lucia owing to an engine defect. During a stoppage of 3 hours 40 minutes the total set and drift, by bearings of the light, was found to be S. 18° W. 19 miles—a rate of five knots.

NOTE.—The speed of the Agulhas Current noted during the drift of the *Clan Macdougall* in February, 1932, is the same as that of the maximum drifts quoted in the article on the Currents in the Western Portion of the Indian Ocean, MARINE OBSERVER, Vol. VIII, December, 1931.

The *Clan Macdougall*, in seven voyages from the Cape to Durban found the strongest Agulhas Current between Hood Point (East London) and Shepstone Point. This is also in agreement with the Marine Observer Charts. The remarks on the favourable counter-currents are interesting and it is probably owing to these that the ship made the two best passages in the month of August, for it was shown in the article referred to above that August is one of the months when the Agulhas Current is the strongest.

CURRENTS AND SEA TEMPERATURE.

Cape of Good Hope.

THE following is an extract from the Meteorological Log of S.S. *Deebank*. Captain J. ROBERTSON, Tyne Dock to Australia, via Cape of Good Hope, observer Mr. W. OLDING.

March 14th, 1933, rounding Cape of Good Hope. The currents around Table Bay and the coast, thence to the Cape were found to be very variable and appeared like eddies around the various bays and indentations of the coast.

After passing the Cape an increase of 9.5° F. was noted in the sea water temperature and the speed of the ship reduced by about one knot.

The engine speed and patent log showed no change. Colour of the water was the same, being bluish grey.

DRIFT OF NATIVE CANOE.

THE following is an extract from the Meteorological Record of S.S. *Berwickshire*, Captain E. H. EVENS, Birkenhead to Cape Town, observer Mr. J. C. ROBERTSON, 2nd Officer.

On January 10th, 1933, at 1130 G.M.T. in Latitude 7° 27' N.; Longitude 14° 57' W. passed Native Canoe, presumed to be Native Boat which the S.S. *Giekerk* reported having passed on January 5th at 1800 G.M.T. in Latitude 7° 49' N., Longitude 14° 23' W. In such case, the set and drift of the boat in the 4 days 17½ hours was S. 57° W. 40 miles, an average of 8.5 miles per day. A gentle E.N.E'ly. breeze was experienced in this vicinity on the 10th, which selected ship reports indicated calm on the 9th.

ST. PAUL'S ISLAND.

South Indian Ocean.

THE following is an extract from the Meteorological Record of S.S. *Berwickshire*, Captain E. H. EVENS, East London to Port Pirie, observer Mr. J. C. ROBERTSON, 2nd officer.

February 9th, 1933, at 12.30 p.m. A.T.S. being off north-west point of St. Paul Island, course was altered, and vessel steamed along the West, South and East coasts of the island at, from ½ to ¾ of a mile off, as far as the entrance to Crater Lake, when course was resumed. The whistle was frequently sounded but there was no sign of human life. Of animal life, only two goats were observed grazing in the vicinity of the flagstaff, which stands on the East coast to the North of the entrance to the Lake.

When off the entrance to the Lake the Provision Depot cannot be seen, but a good view of the huts was obtained approaching it from the south-eastward. There are three or four small and one large hut in apparent good condition, especially the large hut which appears in excellent order.

Along the south coast there appears to have been one or two landslides.

No set was apparent on the west side of the Island, but a N.W'ly one was experienced on the east side, vessel being set N.W. by N. at a rate of ½ knot.

The weather at the time was not ideal for observations, being overcast and cloudy with light rain showers, and the summit of the Island being frequently obscured. A steady W.S.W'ly wind was blowing, but on the east coast sudden variable gusts were experienced particularly off the Lake Entrance. Position of St. Paul Island, Latitude 38° 43' S., Longitude 77° 31' E.

HURRICANE.

South Pacific.

THE following is an extract from the Meteorological Record of S.S. *Tekoa*, Captain J. HOWELL-PRICE, D.S.O., D.S.C., Balboa to New Zealand, observer Mr. C. W. FULCHER, 3rd officer.

On February 23rd, 1933, a gale warning was received from Suva Radio giving weather observations from several stations amongst the Fiji and Tonga groups, and on plotting these observations, it was seen that a tropical storm was centred near the island of Niaufoo, and would probably move S.S.E. The ship was then in Latitude 21° 53' S., Longitude 157° 39' W., about 1,000 miles from the centre of the storm. Twenty-four hours later, a further weather report was received, unfortunately much mutilated by atmospherics, but sufficient data was available to show the storm now centred S.W. of Vavau. No further weather reports were received, but the weather at sunset 25th was very threatening, heavy greasy Cu.-Nb. and St.-Cu., although very low, moving rapidly from N.N.W. to S.S.E., in spite of the wind blowing E.N.E. at ship, and a long N.W. swell set in, gradually growing more and more pronounced. By noon on the 26th the wind was N.E. by E. 6; sky heavily overcast with St.-Cu. and Nb. barometer 29.87 in. steady; occasional drizzle and a long heavy N.W. swell. At 2.00 p.m. heavy rain set in and at 3.30 p.m. the barometer began to fall, slowly at first but with increasing rapidity, the wind veering until at 6.00 p.m. it was E. by N. force 8. The wind remained steady at E. by N. for the next five hours, gradually increasing in strength to force 10, but veered two points just before midnight, when the log read "Wind E. by S. force 10: barometer 29.22 in. weather org., very high sea and very heavy confused swell." At 3.30 a.m. 27th, the wind veered suddenly to S.S.E. moderating to force 7, with a very high and very confused sea and swell. The position was then Latitude 30° 40' S., Longitude 172° 39' W. This comparative lull lasted until 4.30 a.m., by which time the barometer had fallen to 28.75 in., a total drop of 1.12 inches in 13 hours, and the wind then freshened to force 10, still from the S.S.E. continuing to blow steadily while the barometer began to rise. At 7.00 a.m. the barometer had risen 0.24 inch, the wind being E. by S. force 11, and shortly afterwards, the rain, which had fallen torrentially since 2.00 p.m. of the previous day, ceased, and the weather began to moderate, the wind veering and leaving a high sea and a very heavy very confused swell. The weather at noon was: Wind W.S.W. force 6, barometer 29.56 in., cloudy and showery.

It was conjectured that the storm had curved in approximately Latitude 25° S., Longitude 179° W., and when it was realised by the steadiness in the direction and the increasing force of the wind that the ship was in or very near to the direct path of the storm, every endeavour was made to get away from it, a speed of 11 knots being maintained in spite of the sea and swell, and throughout the ship behaved splendidly, shipping very little water and sustaining but very little damage around the decks.

The times used are all apparent time ship.

PAMPERO.

East Coast of South America.

THE following is an extract from the Meteorological Record of S.S. *Arlanza*, Captain G. F. HUFF, Southampton to Buenos Aires, observer Mr. H. V. TODD, 2nd officer.

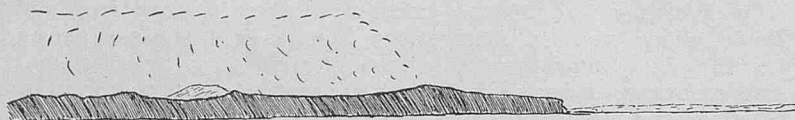
March 31st, 1933, 0505 G.M.T., much lightning to southward, barometer falling, wind N.E. 4 (ship in front of trough of low pressure approaching from west). A low dark cloud billowed up from the south-west and when it reached the zenith there was an abrupt change of wind (no shifting, veering or calm, but a buffet of wind) to S. by E. force 7. No rain occurred, but lightning became fierce and incessant, occasional heavy claps of thunder. Barometer immediately commenced to rise and temperature fell from 72° F. to 63° F. in three minutes. At 0520 G.M.T. wind ceased somewhat, rain commenced and fell in torrents until 0730 G.M.T., barometer rising rapidly all this time. After 0730 G.M.T. lightning and thunder ceased and rain gradually ceased. Day broke, fine and clear, fresh S'ly breeze. Cold.

This phenomenon is locally called the "Pampero" as distinguished from the "Frente frio" (Cold front) and "Frente Caliente" (Warm front).

SMOKE FROM A BUSH FIRE.

South-West Coast of Australia.

THE following is an extract from the Meteorological Record of S.S. *Moldavia*. Captain C. H. C. ALLIN, Colombo to Melbourne, observer Mr. J. K. CRONE, 2nd Officer.



Chomelalup Hill

D'Enfercaux Pr
bearing 065° 10 m

On January 4th, 1933, at 0030 G.M.T., when bound from Fremantle to Adelaide, the smoke from a Bush Fire was observed to be rising as indicated in the accompanying diagram. It appeared that the surface wind over the land was comparatively light, so that the smoke, while it rose, was being carried westward and was forming a fairly uniform curtain. A notable feature, however, was the fact that its upper edge was remarkably well-defined, which seemed to indicate that at that altitude either (i) it reached a layer of warm air which arrested its ascent, or (ii) it encountered a much stronger current of air which carried it away without any further visible ascent. The latter seemed the more probable explanation. Bearings of the fire were taken at intervals and its position plotted, and in addition, vertical sextant angles were taken to ascertain the height to which the smoke was rising. By means of LECKY's "Danger Angle Tables" this was found to be approximately 3,000 feet. At the time of observation, there were no clouds over the land, but detached St-cu. was passing to the Southward.

At 0118 G.M.T., Course was altered to 101°, bringing the wind right ahead, and the St-cu. to the Southward was observed to be moving with the wind. In order to calculate the velocity of this cloud, the intervals of time for a change of bearing of 5 degrees of a particular piece were noted, commencing when it was 10 degrees before the beam and continuing till it was 15 degrees abaft the beam.

Between bearings, vertical sextant angles of the base were taken. Assuming the altitude of the base to be 4,500 feet, "Danger Angle Tables" showed that the distance was 11 miles; from this it was calculated that the relative speed of the cloud was between 55 and 60 knots, the actual speed therefore being between 40 and 45 knots.

A similar wind velocity over the fire would probably cause the definition of the upper edge of the smoke as observed.

Air Pilots can no doubt tell us whether such an abrupt increase of wind force is experienced when ascending under certain conditions. Meanwhile, the suggestion is here put forward that, in this instance, the slow movement of the lower air was due to screening or friction caused by the land. Assuming that the surface wind direction over the land was the same as that over the sea, the air at the position of the fire had already traversed 80 miles over the land.

MOUNTAIN CLOUD.

South Coast of Spain.

THE following is an extract from the Meteorological Record of S.S. *Moldavia*, Captain C. H. C. ALLIN, Bombay to London, observer Mr. J. K. CRONE, 2nd Officer.

March 6th, 1933, at 1130 G.M.T., when off Adra, the snow-clad summits of the Sierra Nevada were observed to be very clearly defined. The predominating type of cloud at the time was A-Cu., but immediately over the summits the sky was clear with the exception of a cloud of unusual appearance. The notable features of it were perfect whiteness, well-defined edges, and lack of "texture." It at once recalled the description of the Antarctic "Whale-back" type given by Mr. ARDLEY in the February, 1932, MARINE OBSERVER; but, lenticular in form, it differed from his description in that the lower edge was as convex as the upper. The Weather Chart for the morning of the 6th showed that a wedge of high pressure was extending northward over the western half of the Iberian peninsula, and that, at the time of observation, the middle line of the wedge was probably not far to the west of the mountains. It appears, therefore, that the atmospheric pressure conditions approximated to those given by Mr. ARDLEY as

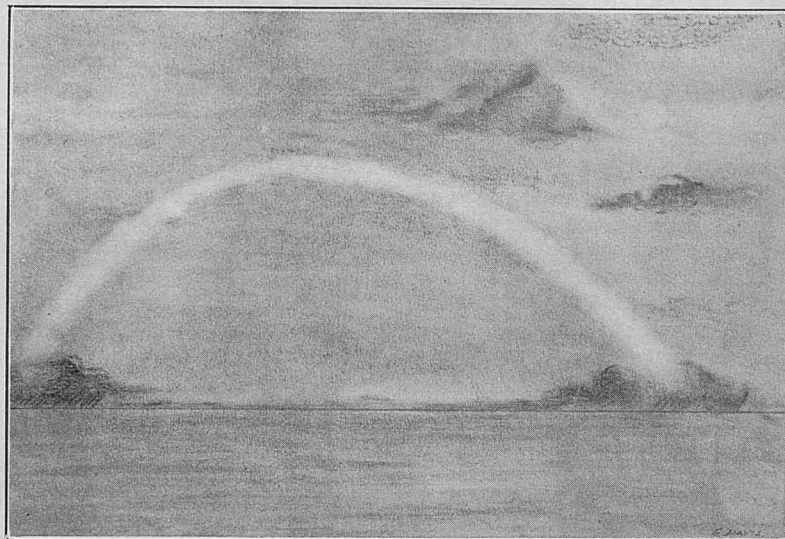
favourable to the formation of the "whale-back" type of cloud, over snow-clad peaks.

NOTE.—This cloud was undoubtedly of the same type as that observed by Mr. ARDLEY in the Antarctic. There are two reasons for the difference noted in the shape of the under surface of the cloud. The chief one is the effect of perspective, due to the viewpoint of the observer. Apart from this probably the shape of the mountain top affects the shape of the cloud formed above it.

CLOUD ARCH.

South Atlantic.

THE following is an extract from the Meteorological Record of S.S. *Armada Castle*, Captain H. B. HARVEY, Southampton to Cape Town, observer Mr. C. LLOYD, 2nd officer.



February 8th, 1933, 0200, a well-defined arch of cirro-stratus was observed as illustrated in the accompanying sketch joining up rain squalls bearing S.E. and W., respectively, distance about 8 miles. This formation remained for about forty minutes then dispersed. The sky was clear with little cirro-cumulus.

Position of ship: Latitude 10° 26' S., Longitude 2° 39' W.

FOG IN THE GULF OF TEHUANTEPEC.

North Pacific.

THE following is an extract from the Meteorological Record of M.V. *Pacific Enterprise*, Captain G. W. A. NEWMAN, Colon to Los Angeles, observers Messrs. C. G. WHITE, 2nd officer and W. G. WILLCOX, 4th officer.

M. V. *Pacific Enterprise* on a passage from Colon to Los Angeles encountered dense fogs when crossing the Gulf of Tehuantepec. In twenty years' experience of the North Pacific Trade the master—Captain G. W. NEWMAN has not encountered this phenomenon south of Cape San Lucas, and for that reason thought it worthy of note.

On February 15th, 1933, at about 7.00 a.m. A.T.S. low banks of stratus cloud appeared along the northern horizon. The weather was dead calm, the sky cloudless overhead. At 8.30 a.m. A.T.S. light northerly airs began to stir, drifting the cloud banks towards the ship, and at 9.15 a.m. the ship entered the bank. Visibility became less than 50 yds. from the navigating bridge, but from the main deck visibility was still several miles. Gradually, however, the bank lowered and at 9.40 it was a very dense fog, the ends of the ship not being visible from the bridge. This lasted until 11.0 a.m., when visibility again became almost normal from the main deck, whilst still very poor from the bridge. At 11.30 a.m. ship ran clear of the bank and was able to proceed full speed again with excellent visibility.

Temperatures of air and water were 78° and 79°, respectively, and although observations were made every few minutes there was no material change in these temperatures. Barometer 1016.5 mb. corrected—steady throughout, sea smooth and low average E.'ly swell. Light variable N.E.'ly airs.

Position of ship: Latitude 14° 00' N., Longitude 95° 30' W. (approx.).

ZODIACAL LIGHT.

North Atlantic.

THE following is an extract from the Meteorological Record of S.S. *Orduna*, Captain M. GALLOWAY, Spain to Bermudas, observer Mr. R. D. ECKFORD, 4th officer.

February 13th, 1933, coming on deck at 1850 (2240 G.M.T.) observed a glow of zodiacal light, the bright central cone of which extended to Altitude 40° on a base of 30° . Outside and surrounding this central cone diffused light could be discerned rising as high as Aldebaran.

Cumuli clouds beyond the Western horizon obscured the light to an altitude of 8° . The axis of the cone appeared to be vertical, and although no bearings were taken it was clear it changed its azimuth to the Northward during the time it was under observation.

At 2000 (2350 G.M.T.) it appeared less pointed and less bright, nor did the fainter light extend so far outside the cone. It was at this time of more uniform brightness.

2030 (2420 G.M.T.) General increasing cloudiness obscured the final stages from view.

Sunset 1735 ship (2125 G.M.T.).

End of twilight 1900 ship (2250 G.M.T.).

Position at 1900: Latitude $33^\circ 30' N.$, Longitude $53^\circ 30' W.$

AURORA AUSTRALIS.

South Indian Ocean.

THE following is an extract from the Meteorological Record of s.s. *Opawa*, Captain F. W. ROBINSON, Dakar to Auckland, New Zealand via Cape of Good Hope, observer Mr. H. P. WILLIAMSON 3rd Officer.

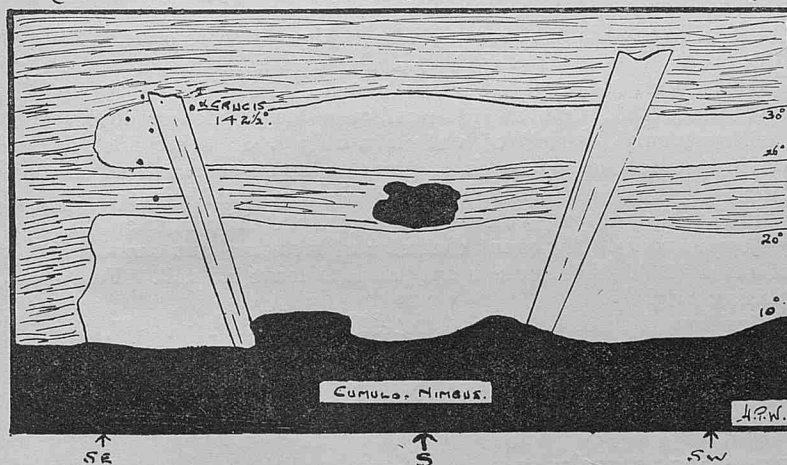


Figure 1, at 1432 G.M.T.

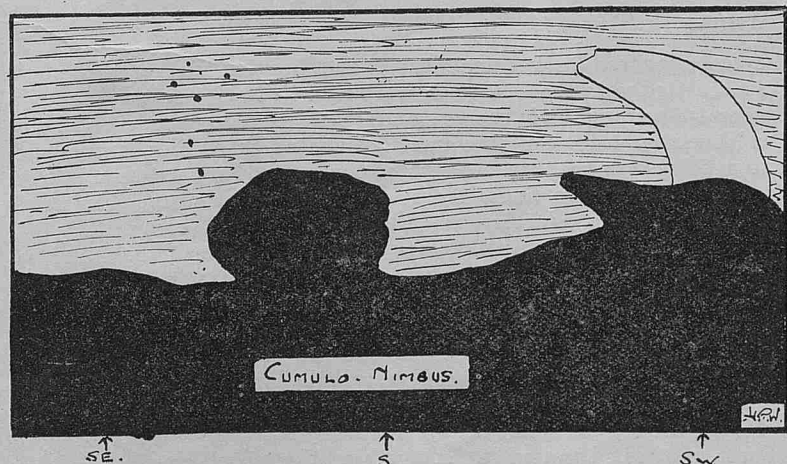


Figure 2, at 1440 G.M.T.

At 1416 G.M.T. on the February 19th, 1933 (8.30 p.m. at ship) the sky to the southward, above a bank of heavy Cu.-Nb. clouds which extended the full length of the Southern horizon up to an approximate altitude of 10° , became illuminated with diffused auroral light.

This diffused light gradually became more intense, and, at 1430 G.M.T. had formed two broad parallel lanes of light through which stars, such as those of the Southern Cross, showed as though they were in close proximity to the moon when full.

Two minutes later (1432 G.M.T.) two white rays were observed lasting for about two minutes, with a small detached Cumulus cloud between them, one bearing 140° and the other 202° , apparently radiating from a centre well below the horizon and bearing approximately 170° , FIGURE 1.

These two lanes of light gradually disappeared as though being "wiped away" starting with the eastward ends, and, at 1440 the sky had the appearance as shown in FIGURE 2.

At 1443 all traces of auroral light, other than glow, had disappeared, but this glow, reminiscent of "lunar twilight," persisted, and appeared in the sky to the southward, except when obscured by rain squalls, until augmented and finally eclipsed by the rising moon.

At no time during the observations was any Cirrus cloud visible, the sky being clear of clouds above 10° except during squalls. Weather, wind W.S.W. 6, beq, Cu. and Cu.-Nb. clouds. Deviation of Standard and Steering Compasses remained unchanged.

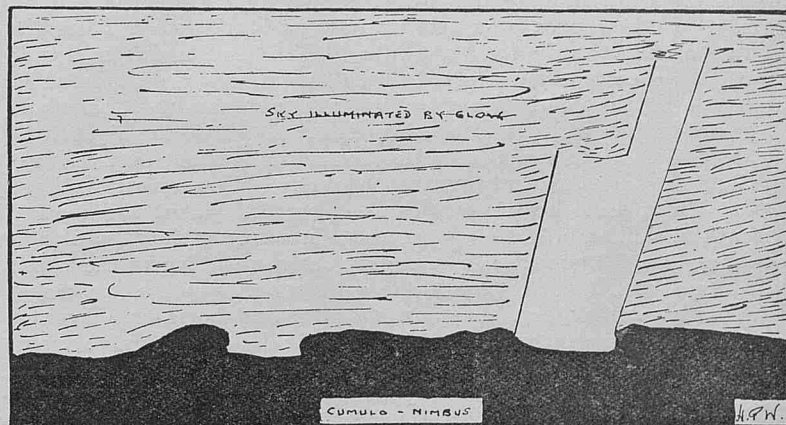


Figure 3.

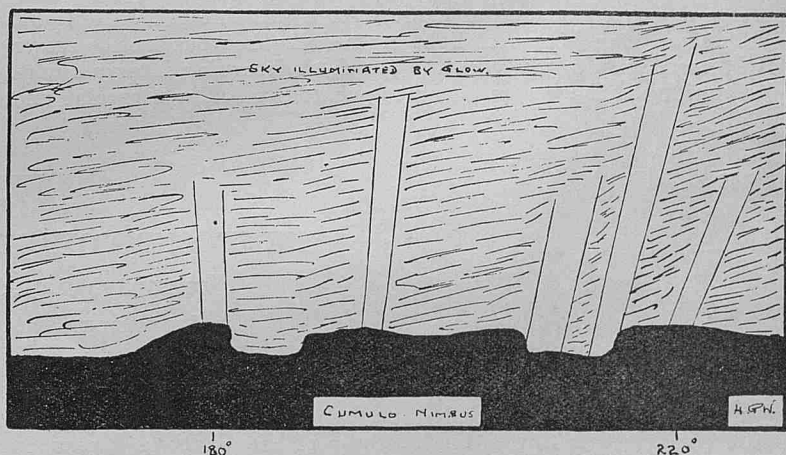


Figure 4.

Further manifestations occurred two nights later, (21/2/33) which consisted of a bright glow of diffused auroral light in the southern sky from 1410 to 1630 G.M.T., and several faint but distinct white rays appeared between 1422 and 1437 G.M.T. vessel's position being in the vicinity of Latitude $43^\circ 07' S.$, Longitude $116^\circ 17' E.$

FIGURES 3 and 4 show the appearance of the sky at 1422 and 1425 G.M.T. respectively.

THE following is an extract from the Meteorological Record of s.s. *Port Adelaide*, Captain R. WILLIAMS, Liverpool to Adelaide via Cape of Good Hope, observers Messrs. D. F. MORGAN 2nd Officer and R. BETTESS, 3rd Officer.

It was observed that, on the night of February 20th, 1933, in Latitude $50^{\circ} 34' S.$, Longitude $94^{\circ} 14' E.$, the twilight appeared to last for a longer period than on the previous nights. As the night advanced it was noticed that most of the diffused light appeared to be at its greatest intensity about the bearing of S.E. (True). Suddenly at 22.30 A.T.S. the sky in the S.E. quadrant was brilliantly illuminated by an arch of white light which rapidly crossed the heavens till it met the sea horizon again on the bearing S.W. (True). The arch was not of regular shape but appeared to be made up of two arcs the centres of which bore S.S.E. and S.S.W. respectively. The middle section on and about the bearing South was practically in the form of a straight line; this section had the greatest angular altitude above the horizon, namely 18° . Its breadth was estimated to be about 6° . The arch maintained its position in the sky during the whole of the period the phenomenon lasted. At irregular intervals bright patches of light would form on the lower edge of the arch and with great rapidity formed straight beams of light which projected themselves towards the zenith, sometimes reaching considerable altitudes before fading away. Most of this type of activity was found in the S.E. quadrant. The phenomenon lasted in such a manner till 02.30 A.T.S. February 21. Weather at the time of observation, Wind W.S.W. force 6; visibility good; rough sea and heavy W.S.W. Swell, fine and clear with occasional passing clouds.

At 20.15 A.T.S., before the sky was quite dark on the night of February 21st, 1933, in Latitude $50^{\circ} 12' S.$, Longitude $102^{\circ} 26' E.$, a cone of diffused white light was observed to appear above the S.W. horizon. In the space of a few minutes it had spread across the sky to the zenith, in the form of a broad white band, and from thence down to the eastern horizon. At 20.20 A.T.S. a glow appeared in the sky over the south horizon and in a few minutes the whole heavens was one mass of flickering light. Most of the light took the form of straight lines radiating from two common centres bearing W.S.W. and E.S.E. towards the zenith. The waves of light travelled from each horizon towards the zenith. About the bearing of south the lines of light appeared to intersect giving the sky in that direction the appearance of a grey curtain waving in the wind. To the northward of the zenith the light waves appeared to travel in a spasmodic manner from the west to the east horizons. Some of these waves curved in towards the zenith finally joining on to themselves and thus forming wheels or fans of light which appeared to revolve rapidly right-handedly at the same time appearing in different colours, principally green, brown and red, with their many different shades and combinations. This type of phenomenon lasted till midnight when the general effect slowly vanished out of the sky. At 01.00 A.T.S. the auroral activity commenced again. This time the sky to the south was aglow with a soft diffused white light. At the same time beams of light crossed the heavens from west to east horizons passing through the zenith at irregular intervals with great rapidity. The beams of light appeared to follow a regular and

well-defined path the angular width of which was estimated to be about 10° . To northward of the path the sky was quite dark and devoid of light. The light from the sky while the phenomenon lasted was of sufficient brilliancy to cast shadows of awning spars, chartroom, and rails on the bridge deck. Unfortunately at 02.30 A.T.S. the sky became completely overcast and spoiled the effect of the display. Even so the light filtering through the clouds was sufficient to show up very well the sea horizon. Weather at times of observation: wind W.S.W. force 6, rough sea and heavy W.S.W. swell, fine and clear with occasional passing clouds to overcast and clear, visibility good.

SOLAR HALOS.

North Indian Ocean.

THE following is an extract from the Meteorological Record of S.S. *Tactician*, Captain F. TRINICK, Calcutta to United States America, observer Mr. L. J. SHARMAN, 3rd officer.

March 12th, 1933, at 0600 G.M.T. 10.57 A.T.S., the arcs of two solar halos were observed, both arcs being to the southward of the sun. The radius of the smaller halo was $22\frac{1}{2}^{\circ}$ the breadth being 1° and the radius of the larger halo was $46\frac{1}{2}^{\circ}$ breadth $1\frac{1}{2}^{\circ}$. Both halos showed the colours of the spectrum, the smaller halo being the brighter. By 11.30 A.T.S. the larger halo had disappeared and about 11.45 A.T.S. the smaller halo attained its greatest brilliancy, the complete circle being visible for about 10 minutes, the northern segment being very faint. By 13.40 A.T.S. the smaller halo had disappeared. The predominating form of cloud during the phenomenon was tufts of cirrus, and cirro-stratus haze.

Position of ship, Latitude $8^{\circ} 16' N.$, Longitude $76^{\circ} 34' E.$

METEOR.

South Atlantic.

THE following is an extract from the Meteorological Log of S.S. *Port Hunter*, Captain R. S. DURHAM, D.S.C., Montevideo to Dakar, observer Mr. P. A. MUNDAY, 3rd officer.

February 10th, 1933, at 9.45 p.m., very bright meteor observed to South-eastward, period of visibility only 2 or 3 seconds, during which it travelled swiftly from point to South-eastward at altitude of 20° passing just southward of δ Centauri and disappearing at altitude of about 2° , colour changing from bright green to deep yellow en route. Apparent diameter of meteor about one-third that of moon ($10'$). The meteor appeared to leave no tail. Full moon shining brightly.

Position of ship, Latitude $0^{\circ} 22' S.$, Longitude $26^{\circ} 54' W.$

THE SECOND VOYAGE OF "DISCOVERY II".

A Circumnavigation of the Southern Ocean.

By LIEUTENANT R. A. B. ARDLEY, R.N.R.

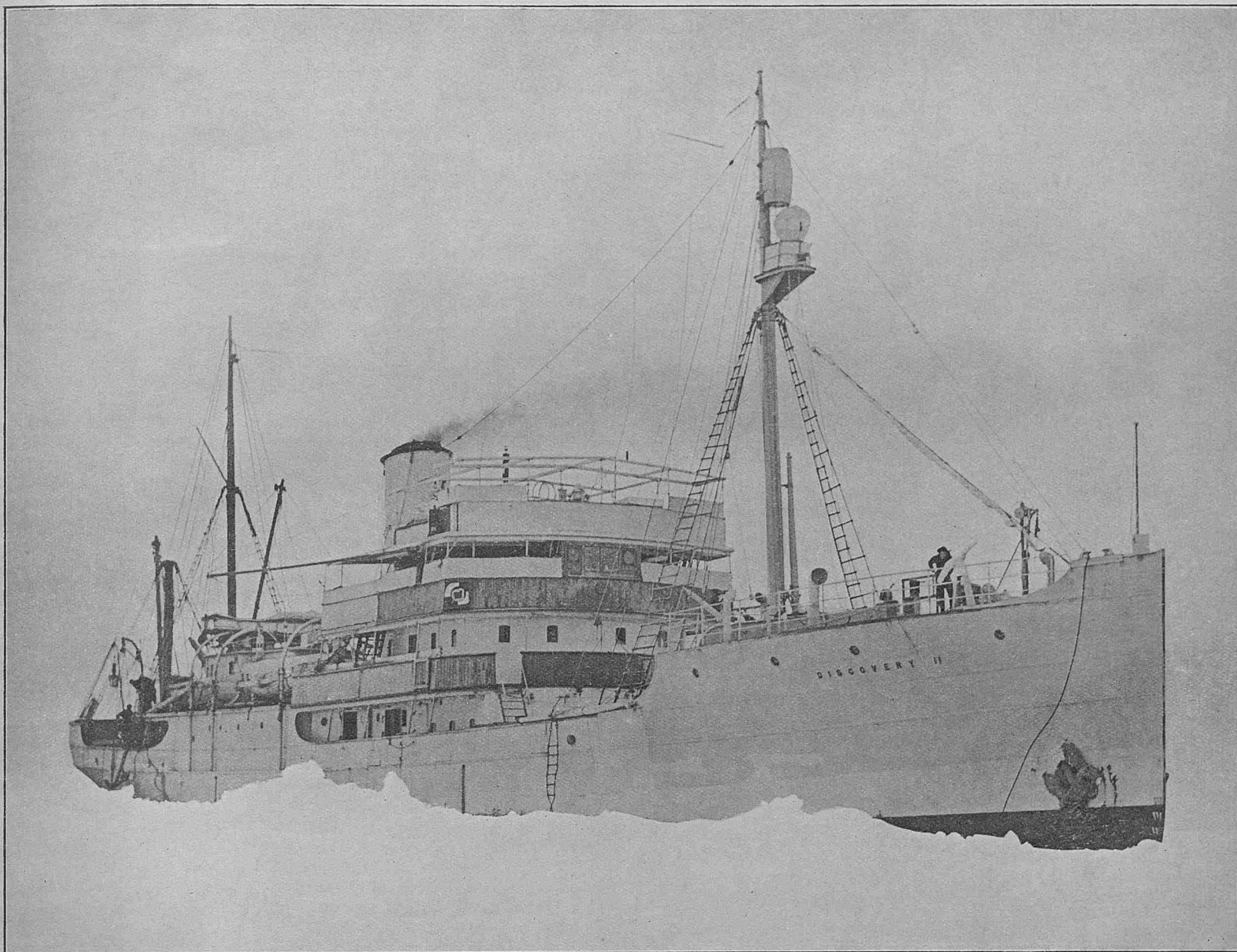
THE *Discovery II* sailed from London on her second commission on October 3rd, 1931, and returned there on May 5th, 1933. The programme for this cruise included an extension of the scientific research performed in the Atlantic sector of the Southern Ocean on her first voyage, and a complete circumnavigation of the Antarctic continent. A month was also allotted for hydrographic survey work in the South Orkneys and South Shetlands. All this work was carried out, and the voyage was a successful one. Mr. D. Dilwyn John was in charge of the Scientific work and had four other Scientists with him.

After leaving London, the ship called at Dartmouth and St. Vincent, Cape Verde Islands, proceeding thence direct to Port Stanley in the Falklands. A number of scientific stations were performed on this outward voyage.

Port Stanley was reached on November 5th, and we left on the 12th, steamed through Magellan Strait, and worked a line of stations south on the meridian of 75° West. On this meridian, light drift ice was met in latitude $64^{\circ} 20' S.$, during thick weather, and as

the ice appeared to become denser and heavier further south, we skirted its edge to the eastward, working two stations a day throughout and sounding with the deep-sea echo machine every half-hour. On November 27th, the ship was 12 miles north of Elephant Island, but nothing was seen on account of the usual dirty weather. From here we worked two lines of stations to the northward, then south to the ice again, skirting its edge to the north-eastward. We arrived in Grytviken, South Georgia, on December 12th. Here we spent Christmas, and after performing some local scientific work and two days surveying in harbour, we put to sea again on January 5th, 1932, working to the eastward. On January 12th, in $56^{\circ} 42' S.$, $20^{\circ} 38' W.$, we met light drift ice, but the floes were so strung out and straggling that they offered very little hindrance to navigation, so we carried on working southward.

In $61^{\circ} 30' S.$, we spent a day searching for a rock reported hereabouts, but failed to find it. A number of detached small rocks have been reported from the sub-Antarctic Ocean from time to time, and the *Discovery II* has unsuccessfully searched for at least half-a-



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dozen of them. There is little doubt that the reporters of these dangers have mistaken small black icebergs for rocks; we have seen several such icebergs, one or two of which needed to be approached closely in order to make certain of their nature.

The sea-ice still continued easily workable, with broad leads and patches of open water, and we were able to make southing at an average speed of about six knots till January 19th, when, in $70^{\circ} 10' S.$, $23^{\circ} 20' W.$, we met very heavy consolidated pack. At this position the field to the southward was a single floe without visible limits, and its surface was a perfect maze of pressure ridges and hummocks. Clearly the way was barred; it was quite impenetrable. In our programme there was no time to be wasted in waiting for ice conditions to alter, so we were obliged to turn northward again. However, a little to the west of the longitude in which we had run so easily south, the ice had tightened up considerably, and the ship had often to be worked at full power to push her way through, though in navigating we of course chose the easiest and most workable ways in sight. On the 22nd, a great tabular berg, $1\frac{1}{2}$ miles long, passed astern of the ship, forging north eastward on the current at a speed of about one knot, and churning up and pressuring the sea-ice as it passed. On the 23rd in latitude $65^{\circ} S.$, longitude $33^{\circ} W.$, the ice was very heavy, consisting of large pressured floes, mainly several square miles in area. Leads were few and generally difficult to work.

On this day, while manoeuvring in a restricted space in tight floes, the rudder received a blow, and the rudder stock, a solid forged steel shaft 9 inches in diameter, twisted through 70° on its long axis, so that the rudder was jammed hard to port and the

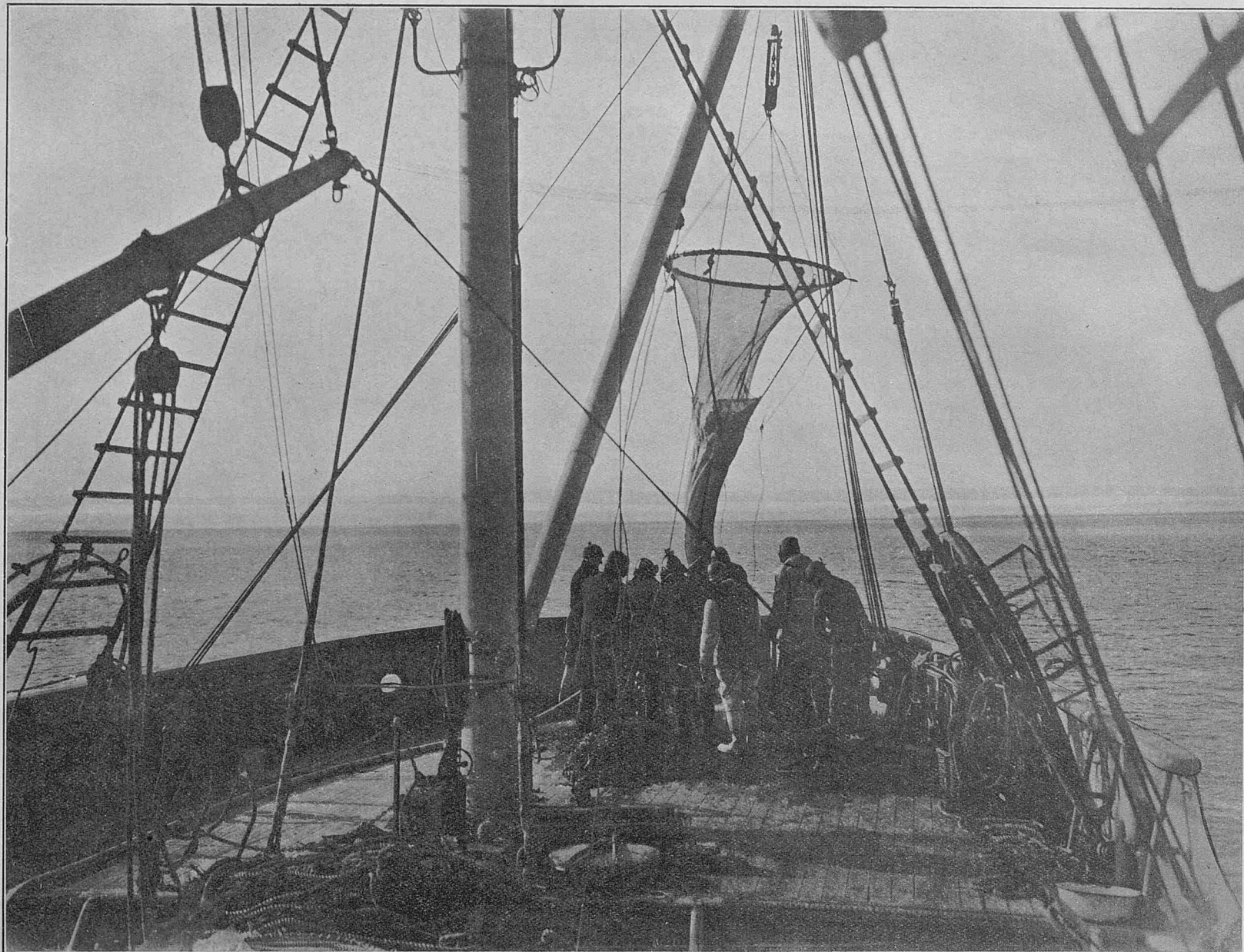
quadrant also was hard a-port. The quadrant was keyed on to the rudder-head, and the key had sheared in its way and jammed. The ship was stopped in a pool and the quadrant and tiller lifted off the rudder-head. The engines were given a burst ahead, washing the now free rudder amidships, and the tiller was screwed up on tin liners.

There was no time to be lost, for a gale would have caused much movement in the ice and the ship might have received a nasty nip. We then continued to work north, the ship making good an average speed of about 3 knots, though sometimes in difficult corners she would hardly move more than a few yards in an hour or so. On these occasions, the stream anchor was taken out on to the ice and hove on, to assist the engines and utilise every ounce of available power.

Two days later, the rudder received another blow, and the liners failed to grip the head, so the process of lifting the quadrant had to be gone through again. Also a sharp ledge from an overcut floe pierced our bilge on the starboard side, breaching one of the oil fuel tanks.

At this time the ship was confined in a pool between two very large floes, and had to remain twelve hours in this position until the ice opened slightly.

On January 26th, we came to the end of the very large floe-ice and ran among very heavy broken-up floes, most of which stood from six to eight feet out of the water. Next day we cleared the pack in $61^{\circ} 20' S.$ and proceeded straight to South Georgia for temporary repair.



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During the time the ship had been among the sea-ice, scientific stations were worked at every opportunity, despite a certain amount of difficulty in working the gear among moving ice. Comparatively few seals and penguins were seen during this spell, and dull weather persisted.

The ship reached South Georgia on January 29th and was made seaworthy in Leith Harbour, where the kindness and efficiency of Mr. HANSEN, the Manager of the Whaling Station, deserves more than a passing mention. Leith, like all South Georgian harbours, is subject to very violent williwaws, and a ship requires the strongest gear obtainable for mooring.

On February 8th the ship was at sea again, and a line of stations was worked across to Port Stanley; South Georgia being again reached on the 21st. The next day we sailed for Simonstown to refit, and strong westerlies helped the ship to make a good passage, for the Cape was reached on March 4th.

In Simonstown the ship was drydocked and her shell-plating repaired and rudder stock renewed.

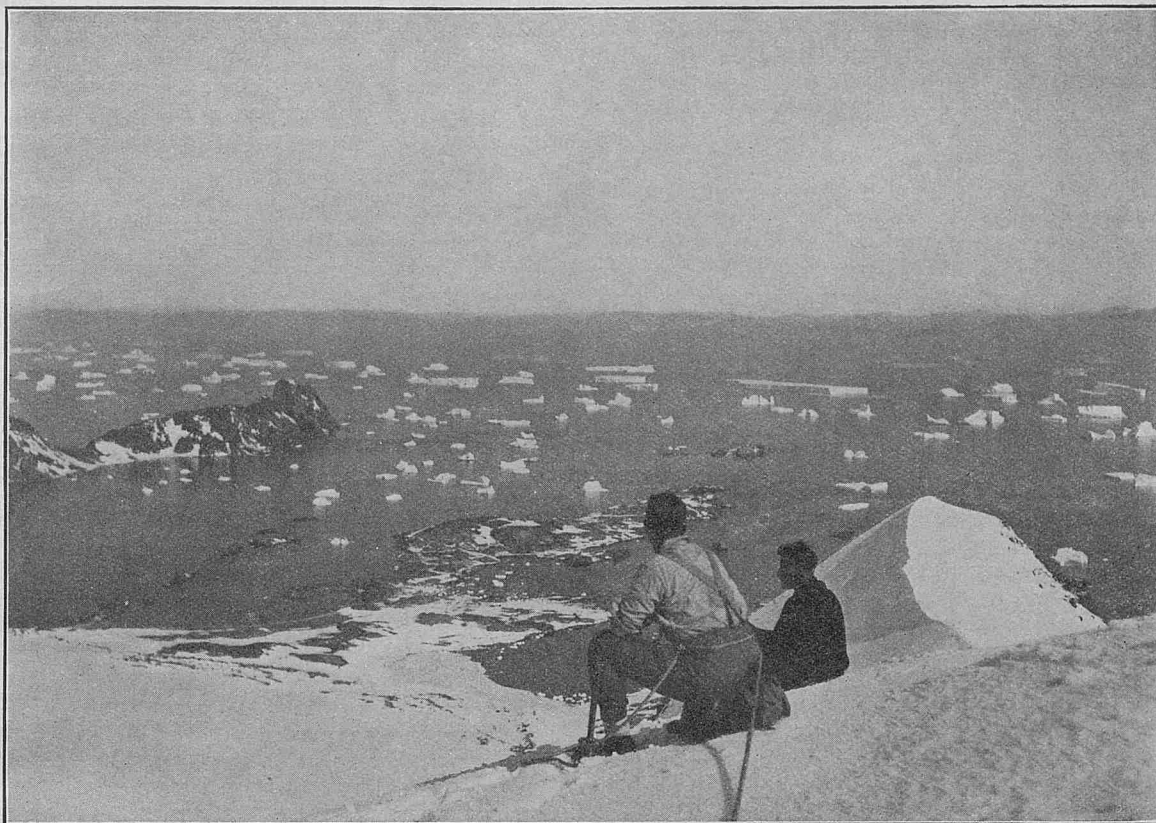
April 8th saw us at sea again, setting forth on the circumnavigating cruise. A course was laid S.S.E. towards Enderby Land, and the edge of the sea-ice encountered in $65^{\circ} 15' S.$, about 40 miles from the coast. The original intention on this cruise was to make a W-shaped track between the Cape and Fremantle, with the central apex of the W about midway in longitude and in about latitude 40° South. However, on the first leg of the voyage we reached a higher latitude than was expected so late in the season. Also a run of bad weather, and the shortening hours of daylight, necessitating a certain amount of heaving-to, delayed the ship and increased

the comparative fuel consumption. So it was decided to modify the cruise, and the ship worked east in high latitudes, passing about 200 miles south of Heard Island, and arrived in Fremantle on May 10th. On the 16th we sailed again, in order to obtain the advantage of the full moon when at our farthest south, where by this time the daylight hours were very short.

On May 27th the sea-ice was met in $63^{\circ} 30' S.$, about 90 miles off the coast of Banzare Land, and after some scientific work in the ice-edge, course was set for Melbourne. In the high latitudes here, the ship was only a few hundred miles from the Magnetic Pole, and the compasses became very sluggish. The weather, though always dull and overcast, was not as bad as we had expected.

We left Melbourne on June 13th, and proceeded south once more, this time the ice was met in $61^{\circ} 30' S.$, $155^{\circ} 30' E.$, and the ship arrived in Auckland on July 4th, and remained there refitting for six weeks.

During these winter cruises the Aurora australis was seen on almost every clear night in the high latitudes. Several times the displays were really magnificent, but one cannot better the following fine description of the phenomena given in the Terra Nova reports by Dr. E. A. WILSON. It is applicable . . . — “the movement which accompanied the displays was very striking. Unhappily it is an impossible thing even to suggest in picture, for as the curtains appear to fold in one direction, they are waved out of sight in another, while the varying intensity of the varying beams of light which compose them, now brilliant, now vanishing altogether, now stealthily appearing or disappearing imperceptibly, gives the onlooker a strange feeling of expectation and bewilderment, to which



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View from summit spur 1,361 feet of Powell Is. showing Ellison Harbour, Crutchley Is. and part of Fredrikson Is., S. Orkneys.

is added the conviction that the whole is very beautiful, but quite impossible to represent on paper."

Apart from these, the voyages were almost devoid of incident. Scientific stations occupied an average of about four hours every day and soundings were taken every half-hour, as usual. Few bergs were seen, and the long hours of darkness made us rather glad that this was the case.

In Auckland the ship was painted and prepared for the second half of the commission, and New Zealand proved a pleasant change from the greyness of the high Southern Ocean.

By the middle of August, the *Discovery II* was ready for sea again, and some scientific work was performed round the North Island. These waters, as everyone knows, teem with fish, and in our night anchorages we caught many with lines—mainly terakitu and barracoudas.

We sailed from Wellington on September 1st, heading S.S.E. for the ice-edge, which was met on the 9th in $62^{\circ} 17' S$. On this day it blew a strong gale from the N.W., with a very steep sea, and the ice-edge was not a comfortable locality, for the sea was littered with small growlers and detached heavy fragments of floes.

From here a W-shaped track was completed to Magellan Strait, the rest of the voyage being uneventful though attended by one or two heavy gales. Magallanes was reached on October 5th, and we were in familiar waters again. Most of the oceans we had traversed since leaving the Cape had been very sparsely sounded, so this work alone was of considerable value.

We sailed from Port Stanley on October 14th, and from then until Christmas the time was spent working lines of stations down to the South Shetlands, South Orkneys, through the Sandwich group and up to South Georgia, where again Christmas was spent.

The month of January, 1933, had been set aside from the scientific programme for hydrographic survey of the South Orkney Islands. Here we arrived on January 1st, and, fortunately finding them clear of sea-ice, proceeded at once on survey. The main scheme of the work consisted of a very complete running survey, from seaward, of all the islands. The ship was steamed slowly along as near the coast as convenient, and the coastline plotted in as the work proceeded. Several astronomical positions, as Key points, were fixed, and, as the ship worked round, soundings were taken

at frequent intervals. Most of the coasts were run over twice in this way, and the approaches to the islands were well sounded and examined. Several landings were made, but in general the coasts are either ice-cliff faces, or forbidding rocky crags, and only in a few places is landing easy.

The three best harbours in the group were surveyed in more detail, and sounded out in the ship's whalers, the method being to run lines from the ship at anchor to fixed points ashore. On the rocky shores the boats got considerably knocked about, but they stood up to the work well.

Before our visit, the South Orkneys had been very imperfectly charted, and some parts of them were fantastically misshapen on the charts. There was also a considerable amount of doubt as to the geographical position of the whole group, so the survey was a very necessary work. Lieutenant A. L. NELSON, R.N.R., the Chief Officer, was in charge of the hydrographical work.

The islands are very rich in bird life, and several species of seal haul out on the beaches to breed. There are always many icebergs grounded off the group, and during the survey we found that the numerous bergs were a great inconvenience, for they necessitated constant alterations of course, and, when grounded close inshore, sometimes interfered with the shooting-up of points in the survey.

On January 30th, the job was completed, and we were obliged to carry on with the voyage, so proceeded west, working stations, to the South Shetlands. On February 1st, to the south of Clarence Island, we encountered a great ice-island, 38 miles long and 12 wide, and the following day, it being thick, and the position of some small islands south-west of Elephant Island being uncertain, we were obliged to anchor, in 65 fathoms, under the lee of one of them; and we were glad of our heavy anchoring gear, for a considerable swell was running. Thence to the west through Bransfield Strait, with a lot of heavy snow, and finally we worked a line of stations north to Port Stanley, arriving there on February 10th. We stayed in Stanley 10 days, during which time the Falkland Islands held a week's celebration of the centenary of the founding of the colony.

On March 1st, we sailed from South Georgia to perform the last V of the circumnavigation. On March 12th, the ice was met in $69^{\circ} 21' S$, $9^{\circ} 48' E$, and on the same day we heard that Captain

RIISER-LARSEN had come down in a Norwegian whaling ship with two companions, dogs, and sledging equipment, with the intention of sledging around the shores of the Weddell Sea. Three days previously he had landed on the sea-ice, about 200 miles E. by N. of our position, but had met with disaster; the sea-ice broke up and he lost nearly all his dogs and stores. Luckily he and his companions were picked up by a whale-catcher.

After spending two days working stations at the ice-edge, we worked north along the meridian of 15° E. On this northward run a large station was worked every 300 miles. These stations each occupied about seven hours, for a large net was used to fish the water, in sections, down to 3,000 metres. Simonstown was

reached on March 29th and the ship refuelled, and we set out homeward on April 3rd.

During the whole of the ship's cruising in the Southern Ocean on this commission, only one ship was sighted in the open sea—a whaling factory working near the South Orkneys, and it was of some interest to us to get back into the steamer routes.

On the homeward voyage, stations were worked as far as Latitude 5° South, and we called at Las Palmas for fuel and mail.

Our homecoming was marred by the tragic loss, over the side, of the Captain, Commander W. M. CAREY, R.N. (Retd.), on May 2nd, the day before the ship reached England.

RADIO DIRECTION FINDER.

By CAPTAIN SIR BENJAMIN CHAVE, K.B.E.

AN instrument has been designed by The Radiomarine Corporation of America for operation on the bridge by the Navigator, which is independent of the ship's Wireless outfit and the wireless operators.

Navigators welcome this aid to position finding because it is entirely in their own control on their own bridge, available at any time. Bearings may be taken without interfering with other radio traffic and without delay. Not only may bearings of land stations be used for position finding, but also bearings on a ship in distress, and bearings on a ship under way in a fog which may be of great value in avoiding the danger of collision.

This instrument is in operation aboard the Cunard Liners *Aquitania* and *Berengaria* where it is fitted on the bridge over a repeater from the gyro compass so that bearings are read directly to the true Meridian. In ships without a gyro compass, the instrument is supplied with a dumb compass card so that bearings may be taken in degrees from the ship's head, or the card may be adjusted so that bearings may be taken relative to the Meridian.

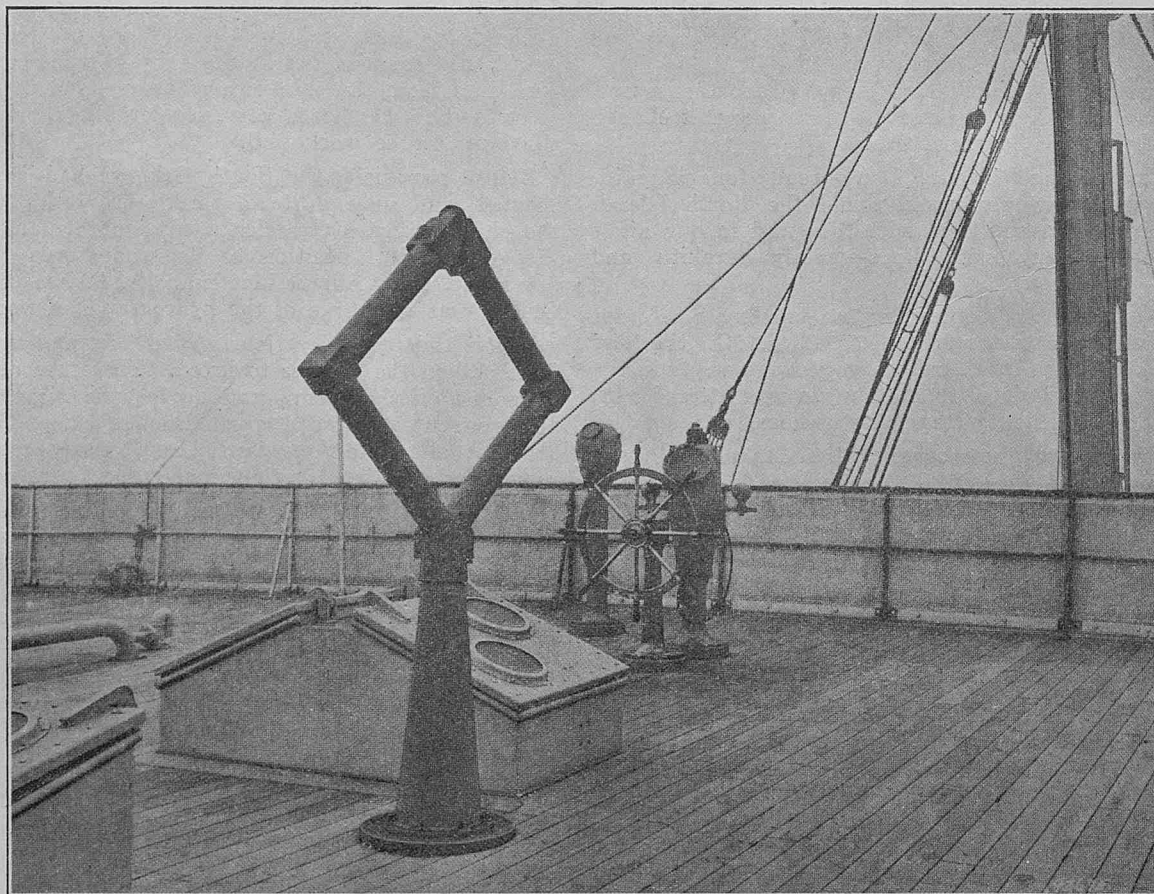
The R.C.A. direction finder consists of a rotatable loop aerial arranged for outside mounting above the chart house or bridge, connected by a shaft passing through the deck to an indicating device, which allows bearings to be taken directly from a compass

card or gyro repeater. Interposed between the loop and the indicator is a novel form of mechanical compensator which automatically provides the necessary correction to offset errors introduced on account of metal objects aboard the ship. The wires leading down through the shaft from the loop aerial are connected to a receiver amplifier mounted in the base, the entire instrument being self contained in one unit.

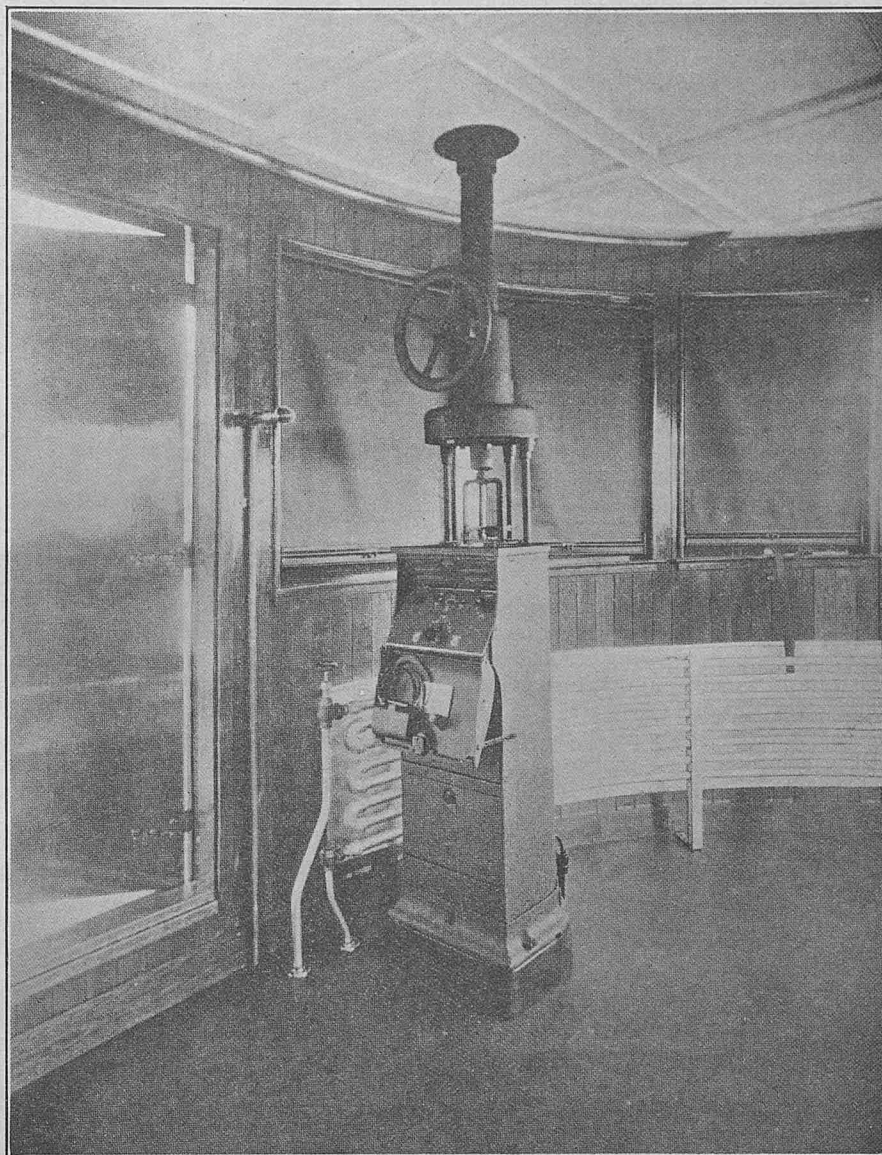
The loop aerial rotates on ball bearings, swinging quickly and easily from one position to another when the hand wheel is turned. This hand wheel is situated in the room below the loop, being mounted vertically and connected to the loop shaft through a friction device with a two to one reduction. This method renders it easy to control the loop in a gale.

The automatic compensator permits adjustment to be quickly and accurately effected to correct variations up to plus or minus 18 degrees every 90 degrees. After the instrument has been calibrated and the compensator adjusted accurate readings may be taken directly from the indicator.

The receiver-amplifier is of the super heterodyne type with uni-control tuning calibrated for quick and easy adjustment to the wave length desired. All receiver controls are arranged on a small



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Reproduced by kind permission of the Radiomarine Corporation of America.

slanting panel on the top of the pedestal casting and are within easy reach of the operator. All batteries are contained in the bottom of the pedestal casting which is of non-corrosive aluminium alloy.

The complete instrument occupies a space in the chart room only 18 inches in diameter. The base of the pedestal supporting the loop above deck is $15\frac{3}{4}$ inches in diameter while the maximum spread of the loop from corner to corner is $48\frac{9}{16}$ inches.

The operation of taking bearings comprises listening to a radio signal with head phones and rotating the loop by the hand wheel until the strength of the signal falls to zero. Provision is made for plugging in two sets of head phones so that bearings may be observed by two persons simultaneously and instruction given in the use of the instrument.

Locks are provided for the cover over the receiver panel and battery compartments. Closing the receiver cover automatically turns off the tube filaments and puts the battery on trickle charge.

The net weight of the complete instrument is 355 lbs.

Aboard *Aquitania* February 9th, 1932, bearings were recorded of Mizzen Head when the signals were distinct at a distance of 970 miles. The Captain and Officers of this ship and those of the *Berengaria* express complete satisfaction with the simplicity of operation, and are particularly pleased that the instrument is on their bridge, under their control, and always available independently of the ship's ordinary wireless receiving and sending outfit, or of the wireless operators, who, in the Atlantic Service are very busily engaged in their extensive passenger traffic, and the English and American press work.

ECHO SOUNDING.

By LIEUTENANT NORMAN W. DUCK, R.N.R.

THE amazing strides which science has made during the first quarter of the century are nowhere more appreciated than by those "who go down to the sea in ships."

Latterly, invention has followed invention with such rapidity, that before the mariner has had time to appreciate one, another has appeared to distract his attention; and the multiplicity of ideas for reducing the hazards of the sea is becoming quite confusing.

Speculation as to the probable advance and the increasing accuracy of these aids, leads the mariner to conjure up the brightest of futures,

when navigation by purely instrumental control—or to borrow a simile from the air, "Blind Navigation"—will be the accepted thing. Mr. BERNARD SHAW, who travelled with us recently, prophesied that girls of fourteen years of age would be doing our jobs a decade or so hence. This, of course, does not sound so bright. Such perfection is yet to be reached and meanwhile we welcome that which will help us determine the three "L's" with greater reliability.

The "L" we deal with in this article, is the "Lead," or rather—its modern substitute the "Echo Sounding Machine," and here

science would seem to have almost reached perfection. This instrument is one of the few good things of lasting benefit, developed during the travail of war, for, by necessity, the various methods of detection by sound had to be thoroughly explored and tested for "the confusion of our enemies" on and below the surface of the sea.

Mr. S. G. BROWN of Gyroscopic Compass fame, was, it is believed, one of the foremost in the practical field with experiments which he carried out at the London Zoo, where, I understand, the otters and sea lions proved to be of the greatest assistance.

The use of sound echoes for the detection of dangers and assistance to navigation, has long been familiar to the seamen. Echoes of the steam whistle from the cliffs and banks of narrow channels are still extensively employed by those who trade on the foggy coast of Western Canada; whilst on the Eastern side the presence of icebergs may sometimes be detected by similar echoes. Unfortunately this practice is never to be relied upon; the aberration of sound through air having yet to be satisfactorily understood.

Sound waves travelling through water, do not suffer from such disadvantages, although difference in the salinity, pressure and temperature of sea water do have some effect. Errors due to these causes are, however, inappreciable in practical navigation and never in any case amount to more than 4 per cent. of the depth.

Too many of us are still obliged to have recourse to the less modern methods of finding the depth, and even those who are fortunate enough to be shipmates with "the blind man's walking stick," as our Commander so aptly describes it, still retain painful memories of the old, laborious, time consuming ways.

The hand manipulated deep sea lead held its own from the time of the hollowed out tree trunk until well into the last century, when Lord Kelvin introduced the wire and pressure method; an immense advance on the previous "Watch there Watch" system which it replaced. Although time did not seem to matter so much in those good old days, the discomfort of taking a cast from the weather side, and the annoyance of having to heave to, must have been extremely exasperating to all concerned, especially so if the result of all this labour was "no bottom."

At speeds up to eighteen knots, sounding can be obtained sufficiently quickly with the wire and pressure method, but the occasional pot-hole or hummock on the sea bed always makes one a little dubious as to the correctness of previous casts. When using echoes there can be no doubt about the general depth, pot-holes, etc., will be registered, but by their infrequency we know them for what they are. That look of disgust which would spread over the "Old Man's" face when one reported eighty fathoms where the chart showed no more than fifty, will trouble the offending junior no more.

It is fit to mention here that the accuracy of chart sounding as checked by "Echo" machines, speaks volumes for the work of the Hydrographical department of our Navy.

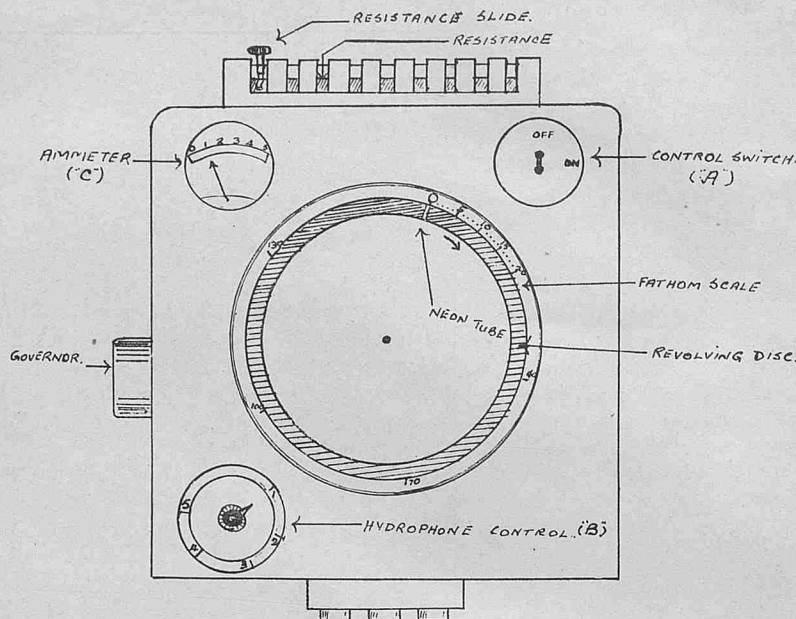
The vessel in which the writer is now serving has twice circled the world, and in all, covered a quarter of a million miles during the first three years of her life, and only on one occasion have soundings obtained by our machine differed appreciably from those charted.

Approaches to most of the world's ports "checked up" with remarkable reliability.

A simple explanation of the instrument and the principles on which it works may be of interest, and here I hasten to add, that this is no advertisement for any particular make, but owing to the differences in the various machines I find it necessary to specify the one with which I am at present shipmates.

The *Empress of Britain* is fitted with a "Fathometer" working on the system which Professor R. A. FESSENDEN evolved in experiments aboard the United States Revenue Cutter *Miami*, whilst that vessel was on ice patrol early in 1914.

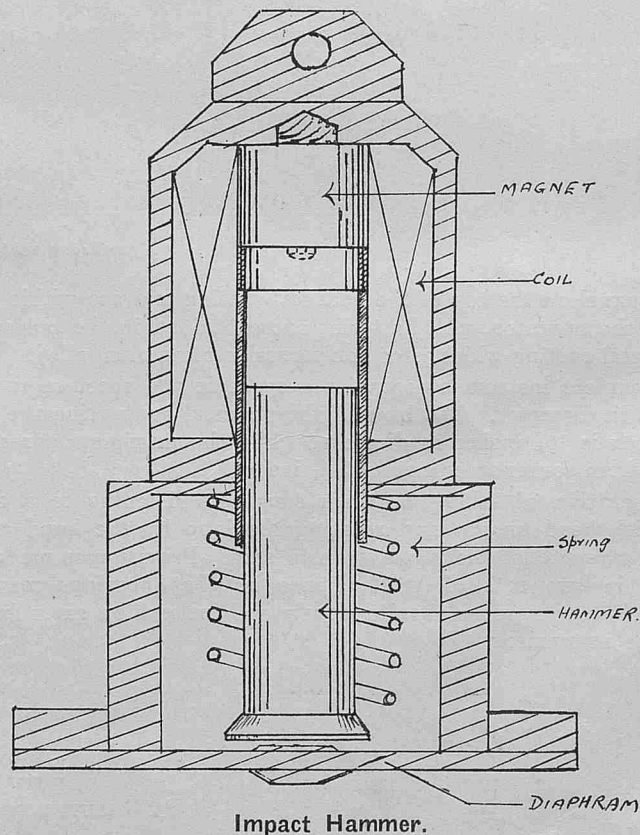
Very much like a radio-set in appearance, the set is fitted on the starboard fore and aft bulkhead of the wheelhouse (inside) and is protected against damp by a wooden cupboard. It consists of a steel cabinet as illustrated and is fitted with a control switch in the upper right-hand corner and a hydrophone control switch in the lower left-hand corner, "A" and "B" respectively in the illustration. This latter switch is similar to the volume control of a radio-set and does the same sort of work. "C" in the top left-hand corner is an ammeter, which provides a visible indication of the amount of current supplied to the sound-producing hammer. On the top of this box, and in connection with the



ammeter, is a resistance with sliding contact. The outer circle on the front of the box is a fixed fathom scale, graduated from zero to 130 fathoms. The inner circular ring or disc, revolves and carries a tiny neon tube behind a slit radial to the disc. It is the red flash of this tube which read against the fathom scale registers the depth. The disc revolves 23.6 times per minute.

Below this steel cabinet is a wooden box containing the dry batteries and valves necessary for the amplification of the returning echo, as will be explained later.

Fitted on the inside of the vessel's bottom, but not piercing it, is the impact hammer, enclosed in a steel chamber, and 46 feet forward of this we have the hydrophones similarly fitted.



Impact Hammer.

The simplest way to explain the action is, I think, to take an imaginary "cast." The operator connects the instrument to the ship's main electrical supply—in our case 220 volts—by an ordinary double-pole switch. The upper right-hand corner switch ("A") is switched on, this starts the motor inside the steel cabinet; the sliding contact is then moved along from left to right until the ammeter registers the minimum operating current required—3 to 3.5 amps. Turn the hydrophone control ("B") clockwise until flashes appear.

Could anything be simpler! Just contrast this with the work required to take a pressure cast.

A word or two now about the "insides" of the instrument.

The motor is kept at a constant speed of 1,886 r.p.m. by a governor fitted on one end of the shaft, the other end of which carries the revolving disc to which the neon light is attached and by suitable gearing revolves it relative to the speed of sound through salt water (some 4,900 feet per sec.). This same shaft also carries cams which interrupt the current in the hammer magnet and allows the hammer to operate at the *same instant* that the neon tube passes the zero mark on the fathom scale. The impact hammer is kept in suspension by an electro-magnet against the action of a strong spring. When the spring takes charge, the hammer is forced down and strikes a steel diaphragm, the sound thus produced passes successively through a water link and the shell plating to the ocean bed where it is reflected to the hydrophone.

The hydrophone picks up the reflected echo and passes it to the amplifying cabinet, where by means of valves and dry batteries the sound current is intensified sufficiently to actuate the small neon tube on the revolving disc, which flashes against the depth on the scale which is below the keel at that moment.

The final result of all this, is that 24 accurate measurements of the depths are received in 61 seconds. It must, of course, be remembered that before referring the sounding to the chart, the draft of the ship in fathoms is added.

Masters of coastwise craft who are familiar with the type of bottom to be met with in their particular trading localities may not think very highly of this method which fails to provide samples of the bottom. In connection with this, it is curious to note (and we are very interested to know if others have experienced the same thing) that when sounding over hard bottom, the flashes produced are sharp and well defined, whilst the flash received from soft ground is invariably blurred and seems to last momentarily longer. It is beyond us to account for this, but perhaps the difference observed in bouncing a tennis ball on hard and soft ground may provide an explanation. This effect has been noticed too many times for it to be accounted for by the differences in the quantity of current supplied to the hammer.

Perhaps an electric eye will be developed shortly through which we may view the sea bed at will and thereby eliminate the drawback of not knowing the type of bottom over which we are sounding.

Vessels on regular trades are familiar with certain large patches of even soundings where the accuracy of their instrument can be checked, due allowance being made for the height of the tide above the chart datum. Actually no more check is required than timing the revolving disc, a perfectly simple operation.

What of the future? We can visualise the directional beam "Echoes" being sent out ahead to warn us of impending danger. In fog, what a relief to know the exact bearing and distance of other vessels, ice, or the shore. Roll on this day!

THE CATAPULTING OF AN AEROPLANE FROM A LINER.

BY HERR P. PETERSEN, CHIEF OFFICER S.S. "EUROPA".

THE following article received through The Cachalots (the master mariner's Club of Southampton) and published through the courtesy of Mr. L. I. M. BIGBY, manager of Messrs. THOMAS MEADOWS, Ltd., agents to the North Deutscher Lloyd S.S. Co., will be of interest to the British Merchant Navy generally and to Marine Observers in particular.

"The day before each flight, extensive tests are made to assure the proper working of all parts. The empty launching sled which carries the plane the length of the 88-foot catapult, is given a service-test. This manoeuvre enables a check on the compressed-air system by which the sled is discharged. The various equipment, including especially the releasing device and the retarding device which holds the sled at the end of the catapult as the plane is projected, is carefully tested. At the same time a test run of the plane's motor is made to assure perfect performance for the flight.

On this same day, that is, the one preceding the actual start, weather forecasts are requested from the land stations. On westward flights the New York office of the North German Lloyd is advised, which then supplies the necessary weather data. On eastward flights the weather bureaus at Hamburg and at Croydon, England, are advised of the proposed start and they supply the required meteorological information.

The third day after the *Europa's* departure from Cherbourg, the following announcement appears on the ship's bulletin board: 'The catapult airmail plane will start to-morrow at 8 a.m., weather conditions permitting. Mail closes 8 p.m. to-night.'

Way up topside, on the airplane deck, between the imposing stacks, 80 feet above the water, the airplane is at rest on the catapult awaiting the moment for its projection from the ship on the flight to New York, where the airmail will be delivered 20 hours before the ship's arrival there.

Preparations are begun one and a quarter hours before the start. The sled is brought forward, and adjusted carefully to the plane. The whole is then hauled backward along the catapult and coupled to the releasing device which holds the sled at the end of the catapult. The catapult is then swung out to the proper direction in reference to the wind. To prevent damage by wind gusts or the rolling of the ship, the wings of the plane are controlled by ropes in the hands of two sailors. In the meantime weather reports arrive from Washington, New York and Boston, which are then discussed with the pilot. The first officer in the meantime has calculated the ship's position and given the plane its compass course. After a study of the chart by the first officer, the pilot receives written

advices, giving the ship's position, the course to be flown, the distance to the nearest land and the final destination, as well as the designated direction signals sent hourly during the flight.

A consultation with the captain covering all points, and then the pilot and chief officer proceed to the airplane deck, where in the meantime every detail has been thoroughly checked. The mail has been stowed aboard and the pilot has signed a receipt for the bags of mail for the mail inspector. The plane's motor has been warmed up, the direction of the catapult in relation to the ship's course and the prevailing wind has been confirmed and the pressure in the air tank checked. Telephonic communication is maintained between the bridge and the plane deck, and, as everything is in readiness, the pilot bids good-bye and climbs into the cockpit.

A final test of the plane's elevators, ailerons and rudder, an increasing rumble of the motor developing into a roar, rising suddenly in sharpness and intensity before returning to the normal rumble. This is the pilot's signal that all is ready for the start. Miniature lamps in the cockpit signal the pilot that the catapult is ready—the order is given to open the starter valve and slowly the cable hauling the sled becomes taut under the tension. The plane's motor is 'given the gun' and the starting lever is thrown. The coupling is automatically released and the plane shoots the length of the catapult, reaches a speed of fifty-six miles, and is off in its element.

The plane circles the ship amid the cheers of passengers and crew and then is off on its course to the coast. Land stations and vessels are notified by radio. Fifteen minutes after the plane has left, radio communication is established by the ship's station, which transmits directional data. Every twenty minutes the plane sends radio advices which are picked up aboard the ship with the aid of the radio direction finder. The plane's course and the ship's position are entered on the chart. A computation in which are involved the plane's speed and its wind drift enables a definite location on the chart. By this method the plane's course is under constant supervision and control. When the plane has sighted land it can check its course and radio direction advices are no longer necessary, but the ship is kept advised of its position until shortly before arriving at its destination, when the last despatch is sent: 'Will land in ten minutes; aerial withdrawn.'

This is followed by a dispatch from the North Deutsche Lloyd's offices that the plane has landed and the time given, which notice is posted on the ship's bulletin board. Mail forwarded by the plane is in the hands of addressees eighteen to twenty hours before the *Europa* reaches port, and the passengers can receive answers from their relatives and friends when the ship reaches Quarantine."

NOTES ON THE HISTORY OF SEA SIGNALS.

BY COMMANDER J. HENNESSY, R.D., R.N.R.

THE practice of communicating pre-arranged signals when within visual range by means of signs and symbols dates back to beyond the Christian Era. The Greek historian POLYBIUS refers to a method of signalling devised by AENEAS TACTICUS 300 B.C. and to a system developed by himself, with which any word could be spelt.

The warriors of old communicated with each other by the pre-arranged display of shields and spear heads and we read of how the Piets beyond the Roman wall used smoke balls to make signals which were unintelligible to their adversaries. Primitive peoples have for centuries been able to communicate with great rapidity by means of beats on their native drums and up to the middle of the sixteenth century, beacon fires were used by our people to convey urgent and important news over great distances, such as those which were lit to warn England of danger as the Armada approached the Channel.

With the invention of the telescope early in the sixteenth century it became possible to discern objects at a distance and this resulted in the adoption of the Telegraph or Semaphore system on land. Stations were erected in prominent positions at suitable distances apart such as the well-known line of Telegraph which was erected between London and the coast at the time Napoleon concentrated his army at Boulogne in readiness to invade England. This system was the forerunner of the Electric Telegraph.

Prior to the last quarter of the seventeenth century there is no knowledge of any extensive system by means of which signalling could be carried out by ships at sea. Flags and banners were flown to distinguish particular ships, or persons of rank commanding them. A few restricted signals were made by the lowering of a certain sail or yard and later by the firing of cannon but communication was generally established with the use of boats or by hailing. A brief description will be given here of a few of the better known codes published for use at sea prior to the publication of the 1931 International Code of Signals which has just been brought into force.

The first attempt to introduce a general system of signals at sea is thought to have been made by JAMES II in about 1680 when as DUKE OF YORK he commanded the British Fleet, then operating against the Dutch, but it was not sanctioned by authority or adopted by general consent and for a century after this, captains continued to make their own signalling arrangements.

In 1803 Admiral Sir HOME POPHAM introduced his famous code which was adopted for general use in the Royal Navy and may be termed the parent of all subsequent codes used at sea. It was a numerical code worked with 10 flags representing the numbers 0 to 9, and one substitute flag, later, two substitute flags, were used. A Telegraph or distinguishing flag was always hoisted at a separate masthead, when signalling was in process. Numbers in the code book ranged from 0 to 9,999 but as only two substitute flags were used those numbers within this scope which contained the same digits more than three times could not be signalled and were not included.

This code was in use at the Battle of Trafalgar and the hostility with which some seamen then looked upon signalling is expressed by the irritation shown by COLLINGWOOD when the first hoists of NELSON's famous signal were made. He later exclaimed: "Great man! I forgive him." The original text of the signal as dictated by NELSON commenced with the words: "NELSON confides," but these were changed to "England expects" in order to meet the limitations of the code and so shorten the signal. The signal was made in the following hoists:—

England expects that every man will do his duty.

253 269 863 261 471 958 220 370 4 21 19 24.

It will be noticed that the use of a substitute was necessary only once in the twelve hoists, i.e., for the word do, and that the word duty had to be made alphabetically. The code was revised and enlarged several times up to 1839 when owing to the growing importance of signalling and the increased rapidity necessary with the extension of steam navigation an alphabetical code was substituted for naval service. This code had a flag allotted for each letter of the alphabet and was capable of making 16,000 distinct hoists, employing not more than three flags in any one hoist.

There was no code of signals used in the Merchant service up to 1817. Prior to that date ships flew their house flags when in port, the Blue Peter when about to sail and the Jack when requiring a

Pilot, beyond this no other flags were generally to be found on board a merchantman.

There was not of course the same necessity for signalling as in the Royal Navy, nevertheless it was advantageous to have some method whereby one vessel could warn another of approaching danger, or when, outward bound request to be reported by a passing homeward-bounder. It was these inducements which led Captain MARYATT, R.N., to publish his code for use in the Mercantile Marine. It was a numerical code of limited scope, based on the same principles as that of Sir HOME POPHAM. A flag was allotted to each of the numbers 0 to 9, in addition to which a Telegraph flag, Rendezvous flag, Pilot Jack, a first and second distinguishing pennant and a numeral pennant were used, which when hoisted superior or inferior as the case may be indicated in which part of the code the signal was to be found. In the early editions of the code the use of substitutes was avoided by leaving out those numbers in which the same digit occurred twice, but by 1841 when the eighth edition was published the code was so enlarged as to necessitate the use of the first and second distinguishing pennants as substitute or repeat flags. Divided into six parts the code contained lists of the names of English and foreign men of war and merchantmen. (Official numbers were not then allotted to ships.) A list of Lighthouses, Ports, Headlands, Rocks, Shoals, Reefs, etc. A collection of sentences and a Vocabulary.

In an attempt to produce an International Code of Signals Captain L. J. RHODES of the Royal Danish Navy in 1835 published "The Universal Sea Language" as a complete code of signals for day and night adapted to the use of Vessels of All Nations. One of the advantages claimed for this system was that other than the cost of the code book, no additional expense was necessary as the symbols used for working the code were such as were to be found in even the smallest fishing craft. They were The National Ensign, Pilot Jack, a Pendant and two white flags for which two table cloths or two shirts would suffice. It was contended that Communication could be established between any two vessels irrespective of their nationality or ignorance of each other's language which was impracticable with any other code then known.

The use of the code in British vessels was advocated by Captain Sir JOHN ROSS, R.N., who in a paper presented at the British Association for the Advancement of Science in 1835 said: "I can safely assure the section that during my service in His Majesty's Navy of about forty years, had I been in possession of these signals and had they been generally distributed and published as they are now intended to be I should have witnessed the saving of hundreds of lives and thousands of pounds in valuable property."

The numbers 1 to 40 were represented by combinations of from 2 to 4 of the symbols. Nos. 1 and 2 were composed of two symbols, Nos. 3 to 14 of 3 symbols and Nos. 15 to 40 of four symbols. Of these, the first 30 numbers also represented the letters of the alphabet, the diphthong Ae and Oe, the sign of abbreviation (') and the word Saint or St.

Each signal in the book was allotted a double number to make which required two separate hoists and in most cases had to be preceded by a distinguishing signal according to whether the sentence was taken from the Great or Small code. Only ships carrying two national ensigns could use the Great code. If it was desired to signal the ship's name, alphabetical spelling had to be resorted to which was a somewhat tedious business if the name were a long one. For instance, to make "Edinburgh Castle" required sixteen separate hoists involving the bending and unbending of 48 flags or symbols.

In the same year as RHODES introduced his code, another code intended for international communication at sea, called the "Universal Naval Signals" was published by Lieut. H. C. PHILLIPS, R.N. This was not such an extensive code as RHODES' but was much simpler to use. It employed symbols representing the numbers 1 to 7 and was numerical to this extent. A ball and weft were also used as distinguishing signals. The symbols depended on their shape and not colour to distinguish them. PHILLIPS' code, like that of RHODES', contained no list of ships' names with allotted signal numbers, and this in those days was the main inducement for a merchantman to provide himself with a signalling code.

That this was so, is shown by the publication of the Liverpool Shipmaster's Association's Signal Book in 1841. It was published

to facilitate the exchange of signals at sea and was simply a numbered list of their members with the name, rig and port of Registry of their commands. Each member had his number stencilled in white figures on a large blue flag with a red border. The flag was hoisted when leaving or entering port and when hailing or passing vessels at sea.

In competition to MARRYAT's work Lieutenant WALKER, R.N., published a code of signals in 1841 with which a combination of 40,000 numbers could be signalled. Eighteen flags were necessary to work the code which represented the numbers 0-9, two substitutes, and six distinguishing flags. The code was based on the same principle as that of MARRYAT's, but whereas in MARRYAT's code the method of using the substitutes was to repeat from the top of the hoist downwards, WALKER used them to work in the other direction. For instance, to make the signal 2332 by the two systems:—

MARRYAT.	WALKER.
2	2
3	3
2nd sub.	1st sub.
1st sub.	3rd sub.

In 1845 the Liverpool and Holyhead Telegraphic Vocabulary was published by the trustees of the Liverpool docks for use with the line of Semaphore or Telegraphic Stations which were erected at an average distance of 8 miles apart on the coast between Holyhead and Liverpool docks.

The Telegraph or semaphore apparatus consisted of two columns, each provided with two pairs of moveable arms by means of which four series of numbers from 1 to 9,999 could be indicated. With the addition of a distinguishing pendant the flags used with MARRYAT's code were adapted for use with the Vocabulary but in this case the substitute or repeat flags were used to repeat upwards through the hoist as in the WALKER code system.

In 1847 public attention was drawn by R. RETTIE, C.E., to the enormous loss of life and property due to the want of a Universal system of night signals. At that time steam vessels displayed one, two, and sometimes three lights in a variety of ways, but they only showed the immediate position of the ship and in no way indicated the direction in which she was heading, sailing ships, which at that time were in the great majority, exhibited no lights whatever when under way and the only rule laid down for the prevention of collision was "Steer to Port." RETTIE devised a code of night signals in which he advocated the use of a steering lamp by all ships. This consisted of a powerful lantern whereby a white, red or green light could be exhibited as required. The white light which was to be seen for a distance of 10 miles signified that a vessel was keeping a steady course. The colours were brought into use when approaching another vessel and signified a change of course, red to port, green to starboard. When in distress steam vessels were to exhibit a red light at the cross trees and sailing vessels a green light at the cross trees and a bright light at the mast head.

In 1848 the Admiralty issued orders that all steam vessels should carry a white light at the foremast head visible in all directions except abaft the beam of the vessel carrying it, and a green light and a red light on the starboard and port paddle-boxes respectively. The coloured lights to be fitted with a screen of wood on the in-board side in order to prevent both lights being seen at the same moment from any direction but that of right ahead. It was also laid down that the recognised Trinity House Rule of 1840 known as the "Rule of Port Helm" was to be invariably complied with. This was to the effect that all vessels should keep their course except where there is danger of collision and in that case each vessel should put her helm a-port so as to pass on the port side of the other vessel.

In February, 1852, a committee composed of Officers of the Royal Navy and Trinity House were appointed by the Admiralty to inquire into the expediency of compelling sailing vessels to exhibit lights at night with a view to prevent collision and in June, 1852, the Admiralty issued instructions that sailing vessels were to exhibit similar lights to those of a steamship with the exception of the white masthead light which they were not to carry.

Owing to the rapidly increasing tonnage and speed of ships the above regulations did not have the desired effect of reducing to any great extent the enormous loss of life and property sustained through collision at sea and in June, 1863, the Rule of the Road or Regulations for the Prevention of collisions at sea were brought into force as laid down by the Merchant Shipping Amendment Act of 1862.

These Rules contained 20 articles dealing with lights to be carried by all vessels, Fog signals and steering and sailing rules, they were quickly agreed to by all maritime nations and thus became International.

In 1851 HENRY DEMPSTER published a code of signals called "The Equilateral Triangular, Telegraph", the object being to make signalling at sea less complicated and expensive than was hitherto possible and more universal, for it was held that not more than one out of every five merchant vessels was equipped with any means of signalling on account of expense. This code was especially adapted for yachts, coasters and fishermen and was worked with eight triangular flags and four pendants, with which it was claimed that all letters of the alphabet, points of the compass and a succession of numbers to a considerable extent could be signalled at the rate of 10 letters or numbers per minute.

"Reynolds Polyglot Nautical Telegraph", devised by Captain CHARLES DE REYNOLDS of the French Navy, made its appearance in 1855. Its chief purpose was to facilitate signalling between the French and British Allied Fleets and the merchantmen of those nations but as its name implies was equally suitable for communication between ships of any nationality. The code was accepted by the British Admiralty for international signalling and published under the auspices of Rear-Admiral the Hon. R. S. DUNDAS, C.B., then Commander-in-Chief of the Baltic Squadron.

Owing to the diversity of codes then in use it was seldom that ships, even of the same nationality could communicate with each other. REYNOLD's code required no preliminary outlay for flags; it only required to work the code:—

(1) A square flag or piece of cloth of any colour.

(2) An opaque object such as a ball, ships fender, a hat, pitcher, or basket.

(3) A pendant or piece of cloth in such form.

By means of these symbols a combination of 18,800 numbers representing the same number of words or sentences could be signalled.

Combinations of the three symbols were used to represent the numbers 0 to 9 and to avoid the bending and unbending of the symbols after each hoist and so increase the rate of signalling; they were bent on separate halliards rove through a three sheave block, made fast to the peak.

Another code published in 1855 was RODGER's American code of Maritime Signals. This was a numerical code in which no repetition of the same number appeared in any one hoist, thereby avoiding the use of substitutes. The code was worked with ten flags termed "RODGER's calm and storm signal flags" so designed that the position and colour of the bunting of each flag could be distinctly seen during light winds or calms, when the flags hang perpendicular to the mast or halliards.

In 1856 MARRYAT's revised code was published and its title changed to "The Universal Code of Signals for the Mercantile Marine of All Nations". It was so enlarged as to necessitate the use of the three distinguishing pendants and the Telegraph flag as substitute flags. This admitted of every number being made up to 99,999. The Merchant Shipping Act of 1854 laid down that every British vessel was to be allotted an official number which was to be carved on her main beam and endorsed on her Certificate of Registry, and with the revised code all official numbers could be signalled.

With the allotting of official numbers to British ships in 1855 the attention of the Board of Trade was drawn to the entirely unsatisfactory state of signalling then existing in the Mercantile Marine.

Such a diversity of signal codes were obtainable that it was always uncertain whether two ships meeting at sea carried the same code, MARRYAT's code was supplied by many owners to their vessels but such was the dislike with which some seamen regarded signalling that it was never used, mainly on account of its complexity and the difficulty experienced in making signals. The chief inducement to signal was the exchange of ship's numbers and this required a six flag hoist spanning upwards of 60 feet. More often than not the lower flags of the hoist were hidden by sails and were therefore unreadable.

A committee composed chiefly of officers of the Royal Navy and Mercantile Marine was set up by the Board of Trade in 1855 to inquire into and report upon the subject of a Code of Signals to be used at Sea which resulted in the publication of the "Commercial Code of Signals for All Nations" with the British Vocabulary. This code was the first edition of the International Code of Signals as we now know it.

The numerical system which had been used in all previous codes was abandoned and the alphabetical system substituted. In addition to the code and answering pendant, a flag was allotted to each of the eighteen letters of the alphabet from A to W, the vowels being excluded so as to avoid the introduction of objectionable words composed of four letters or less both in the English and Foreign languages. Substitute or repeat flags were not used. As MARRYAT's code was the most extensive system then used in the Mercantile Marine the flags of that code were retained for use with the new code, in order to lessen the cost of its substitution.

The signal book was divided into three parts, Part 1 containing International or Universal signals, Part 2, British Vocabulary and Part 3, Coaster's signals for boats not supplied with flags.

The number of flags in a hoist expressed the nature of the signal made while the top flag in the hoist characterized the signal. For instance two-flag signals were all Urgent and Important signals and if with a burgee on top represented Attention signals, if with a square flag on top, Danger signals and so on, not more than four flag hoists were used in the code.

The signals contained in Part 1 were those which would convey the same meaning if translated into any language and contained two, three and four flag hoists, the latter being Geographical Signals. The British Vocabulary in Part 2 were four flag hoists but many of these signals were contained in the General signals of Part 1 in which case the three-flag signal letters were also given for reference.

The coaster's signals contained in Part 3 were worked with the following symbols of any size or colour. Two square flags or pieces of cloth, two wefts or strips of cloth and two balls or bundles. With combinations of these symbols representing the letters of the alphabet any signal in the code could be made if desired. The Mercantile Navy List was published at the same time as the signal book, with distinct signal letters assigned to each vessel so that any ship's name could be signalled in one four flag hoist.

At this time the several maritime countries reckoned Longitude from different meridians, it was therefore necessary when ships of different nationality exchanged their Longitude by signal to make a correction before it could be compared with their own. In order to facilitate the exchange of position between ships of different countries, a "Companion to the Commercial Code of Signals," by Commander BROWN, R.N., was published, whereby with the flags of the Commercial Code the Latitude or Longitude in degrees and minutes could be signalled in one hoist of three flags. Latitude signals were distinguished by a ball hoisted between the flags and Longitude signals by the ball being hoisted over or under the flags. The equivalent Longitude reckoned from the meridians of Greenwich, Amsterdam, Cadiz and Paris could be obtained at sight.

There was now in the possession of the Mercantile Marine a code of signals, obviating all deficiencies complained of in previous codes and by means of which each of the 78,000 signals contained in the code could be made complete in one hoist and in one place, without the use of sectional and distinguishing flags. A ship's name with particulars of her owner's Port of Registry, etc., could be signalled in one four flag hoist. Further, all the signals made with two or three flags and the geographical signals made with four flags, were intelligible to all nationals.

The Code was at once adopted by the Royal Navy and the Hon. East India Company and was recommended by the Committee of Lloyds, the Local Marine Boards and the leading Shipowners Societies. A French edition was also published. For a while both MARRYAT's and the Commercial Code were used but the efficiency of the new code and its simplicity in use soon commended it to master mariners and it became universally used.

The Commercial Code of Signals remained unaltered for 30 years when owing to the developments which had taken place in the shipping world during that time the Board of Trade set up a committee in 1887 to bring the code up to date. The proposals of the committee were then submitted to the principal Maritime Powers and a revised code was published in 1897 and renamed the International Code of Signals.

The revised code was so enlarged as to necessitate a flag being allotted to represent each of the 26 letters of the alphabet and the signal book, remaining the same in principle, was rearranged.

All the Urgent and Important signals, many of which had in the old code to be made by three flags, were made two flag signals.

The British Vocabulary of the old code was abolished and an extensive General Vocabulary substituted with the result that all the four flag signals of the old code, excepting those representing the names of ships or places, became either two or three flag hoists. Latitude or Longitude signals could now be made in degrees, minutes and seconds by three flag hoists without recourse to any other publication. The Alphabetical spelling table was retained for Universal communication and as there was now a flag for each letter of the alphabet words could be spelt directly.

A new system of Distant signals for use when the colours in the flags could not be distinguished was introduced as also was the systems of signalling by semaphore and the Morse Code.

In 1906 the British Signal Manual was introduced which was a special system of signalling to be employed when British merchantmen were communicating with British men of war. This manual was superseded in 1916 by the Allied Signal Manual which was based on experience gained in the War and drawn up for use between Allied men of war and Allied and neutral merchant vessels to meet the special requirements of convoys.

During the War signalling between men of war and merchantmen of all nationalities was constantly necessary and of great importance, as at times the safety of the ship depended on the explicitness of the signal. The International code was therefore put to a very severe test and failed to do all that was expected of it. As a result the British Government put forward a proposal for the revision of the code which was considered by the International Radiotelegraph Conference at Washington in 1927.

The Conference decided that the code should be remodelled on agreed lines, and that representatives of the Maritime Powers confer together and make it truly International. The British Government were asked to undertake the work. Accordingly an International Editorial Committee assembled in London in October, 1928, and completed the compilation of the codes in December, 1930. The code has been published in the English, French, German, Italian, Japanese, Spanish and Norwegian languages.

The code has been available since April, 1932, and will be compulsorily brought into universal use on January 1st, 1934.

Published in two volumes, Volume 1 is for visual and sound signalling and Volume 2 for Radiotelegraphy.

The flags have been increased by the addition of 10 numeral pendants and three substitute flags. Not more than four flags are used in any one hoist. By use of the numeral pendants signalling of numbers, times, Latitude, Longitude courses, bearings, etc., are simply and quickly made without the use of code groups, while the use of the substitutes make it possible to use any combination of four letter or figure groups, while only carrying one set of flags. The substitutes work downwards through the hoist, that is, they repeat the flag immediately above it. The system of signalling by the Morse Code has been amended and brought into line with radiotelegraphy so far as is possible. The British method of semaphoring with hand flags has been retained, but the Fixed semaphore and Distant Signals have been abolished. Single letter signals have a new signification which involve certain changes in the pilot and quarantine signals, for instance, the pilot signal S has been replaced by G. Both ship and aircraft Distress signals are now contained in the code.

The basic words forming the code and the code groups are both arranged alphabetically in two, three and four flag hoists, and serve both as a code and decode. There is also a section which contains words and phrases which in English have the same meaning but for which there is no duplicate translation in foreign languages. The signal letters of ships are now the same as their radio call signs and as hitherto are published separately.

Since Wireless Telegraphy was first installed in a British Merchant Vessel, namely the s.s. *Lake Champlain* in the Atlantic service in May, 1901, all passenger ships and all cargo vessels of 1,600 tons gross tonnage and upwards are bound to carry a radiotelegraph installation. The new Wireless code Volume 2 is not intended to supplant any commercial wireless codes hitherto used or to prevent radio signals being made in plain language which is the general practice, but to assist ships to make full use of radiotelegraphy especially when communicating internationally. The code will be found of great assistance when communicating with aircraft, harbour authorities and agents ashore while a special feature is a complete Medical Section which will enable Masters of vessels not carrying a doctor to obtain quickly correct medical advice in cases of doubt.

CURRENTS OF THE ARABIAN SEA AND BAY OF BENGAL. A FURTHER INVESTIGATION INTO THEIR SEASONAL VARIATION.

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

IN the article on the "Currents in the Persian Gulf, Northern Portion of the Arabian Sea, Bay of Bengal, etc." published in MARINE OBSERVER, Vol. IX, December, 1932, the table of mean quarterly currents showed that in the coastal areas of the Arabian Sea and Bay of Bengal the mean flow of current reversed its direction in the quarter February to April. The circulation round the heads of what are, in effect, two great bays is clockwise during the S.W. Monsoon period and anticlockwise during the quarter November to January when the N.E. Monsoon is at its height. During February to April, while the N.E. Monsoon still blows, the circulation becomes clockwise, the change of direction thus preceding the onset of the S.W. Monsoon. These changes are shown on the accompanying chart where the two mean quarterly currents are given. When the S.W. Monsoon begins its effect is to strengthen the drift of the current which already exists. A short investigation of the currents in areas adjacent to the coast of Arabia and the west coast of India showed that the change of direction takes place in or about the month of February. The East African Coast Current, from about Latitude 6° N. to Cape Guardafui, also changes its direction in February to April, flowing northward and thus forming the beginning of the clockwise circulation round the coastal areas of the Arabian Sea.

The currents of the Arabian Sea and Bay of Bengal have always been considered to be of monsoonal origin and there is no doubt that they are so during the greater part of the year. The question arises as to why the current changes to its S.W. Monsoon direction before the S.W. Monsoon arrives and while the N.E. Monsoon is still blowing. In order to find out more fully in what months the

change of direction begins in different parts of the Arabian Sea and Bay of Bengal a further investigation has been made, the results of which are given in Table I, p. 20.

The tables begin at the month of November, so that they do not end in the middle of the N.E. Monsoon period. Lines are drawn across the tables to show the months of current change during the N.E. Monsoon. Where the change of direction is sudden a single line is drawn. Where there are one or more months of transition these are enclosed between two lines.

In the case of the East African Coast Current III January is the transition month and the N.E. current is established by February. In the neighbourhood of Sokotra the current changes to a little east of north in March. In Arabian Sea III the change of direction is sudden and occurs at the end of March.

In Arabian Sea IV the change of direction is also completed by the end of February but is more gradual, February being a month of transition. In Arabian Sea V, February is also the transition month, the change being fully completed at the beginning of March.

The wind information given in the tables for each region is taken from the Monthly Meteorological Charts of the East Indian Seas, by inspection. The S.W. Monsoon is not established until May and does not acquire its full strength until June.

In order to get further information as to these changes the mean monthly currents in a number of smaller areas were computed and the results for four areas are given in TABLE 2. While smaller areas are likely to show the variations of current more clearly, there are smaller numbers of observations available, especially in certain months.

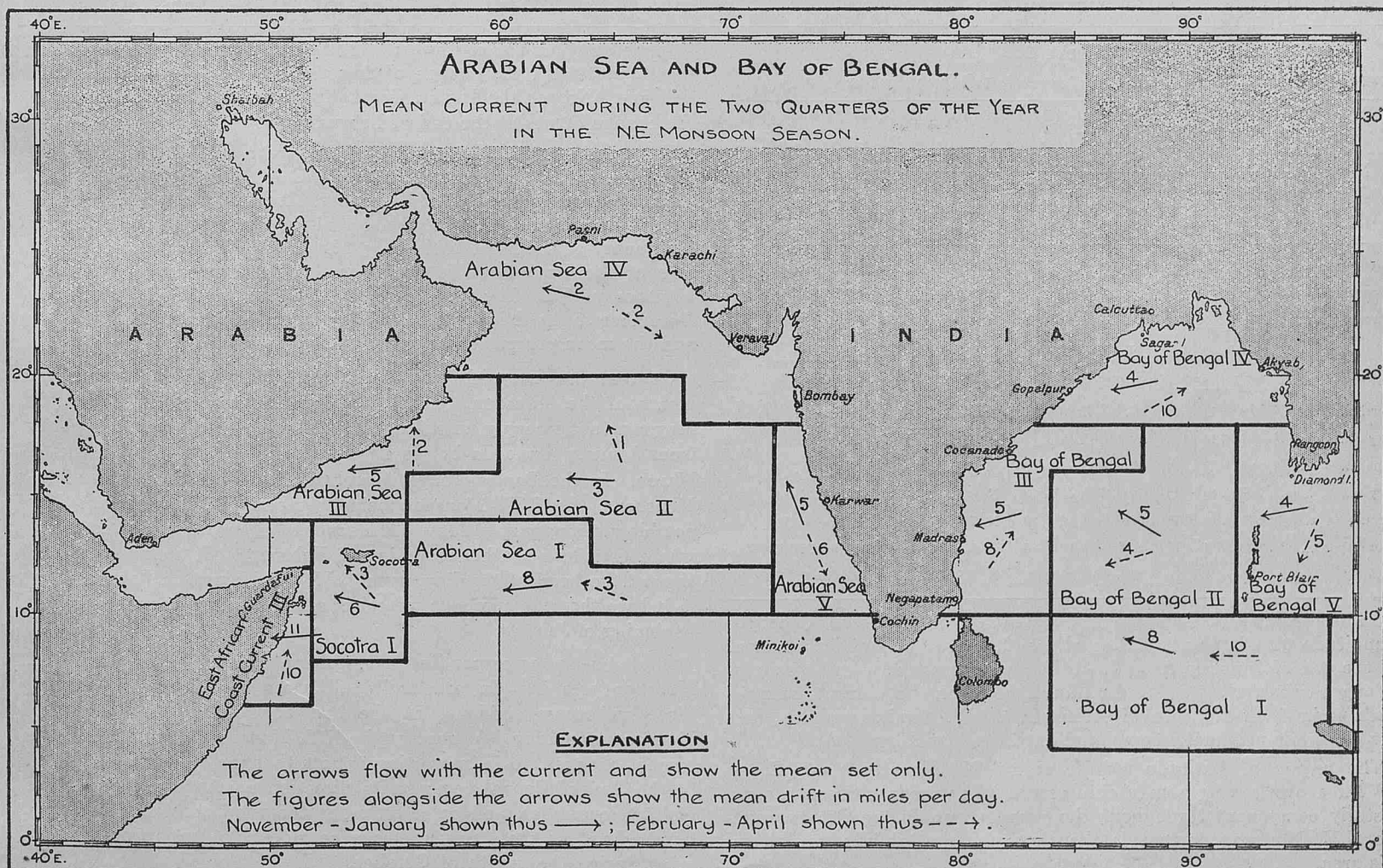


TABLE 1.
Arabian Sea. Mean Monthly Currents (drift in miles per day) and Prevailing Wind.

Month.	East African Coast Current III.			Lat. 12° N. to 14° N. Long. 52° E. to 56° E. Vicinity of Socotra.			Arabian Sea III.			Arabian Sea IV.			Arabian Sea V.		
	Mean Set and Drift.	No. of Obsns.	Prevail- ing Wind.	Mean Set and Drift.	No. of Obsns.	Prevail- ing Wind.	Mean Set and Drift.	No. of Obsns.	Prevail- ing Wind.	Mean Set and Drift.	No. of Obsns.	Prevail- ing Wind.	Mean Set and Drift.	No. of Obsns.	Prevail- ing Wind.
November	S. 86° W. 18	25	N.E.	N. 7° W. 5	9	N.E.	N. 56° W. 4	107	N.E.	N. 66° W. 4	68	N.	N. 19° W. 6	16	Ny. and variable.
December	N. 68° W. 7	7	N.E.	S. 46° W. 3	9	N.E.	S. 68° W. 7	113	N.E.	N. 88° W. 3	92	N.	N. 23° W. 4	22	N.N.E.
January ...	S. 1° E. 2	11	N.E.	N. 60° W. 3	9	E.N.E.	S. 85° W. 5	85	N.E.	N. 58° W. 2	53	N.	N. 23° W. 5	18	N.
February	N. 16° E. 4	18	N.E.	N. 70° W. 1	17	E.N.E.	N. 67° W. 2	74	N.E.	S. 58° W. 1	37	N.	N. 45° E. 4	8	N.N.W.
March ...	N. 8° E. 8	18	E.N.E.	N. 4° E. 3	9	E.	N. 87° W. 3	85	E.N.E. and variable.	S. 28° E. 1	58	Variable N.W. predom- inating.	S. 20° E. 7	16	N.N.W.
April ...	N. 11° E. 15	27	E.N.E.	N. 52° E. 4	15	Variable.	N. 43° E. 7	76	Variable Sy. winds predom- inating slightly.	S. 68° E. 4	71	Variable Wy. predom- inating slightly.	S. 18° E. 8	20	N.W.
May ...	N. 22° E. 13	20	S.W.	N. 16° E. 5	27	S.S.W.	N. 63° E. 15	129	S.W.	S. 86° E. 7	97	W.S.W.	S. 16° E. 9	34	N.W.
June ...	N. 67° E. 31	7	S.W.	N. 54° E. 10	59	S.S.W.	N. 64° E. 19	135	S.W.	S. 81° E. 4	61	S.W.	S. 59° E. 8	23	W.S.W.
July ...	N. 47° E. 25	8	S.W.	N. 54° E. 18	66	S.S.W.	N. 60° E. 14	141	S.W.	East 7	85	S.W.	S. 44° E. 10	29	W.S.W.
August ...	N. 40° E. 31	7	S.W.	N. 57° E. 25	67	S.S.W.	N. 63° E. 14	115	S.W.	N. 82° E. 7	72	S.W.	S. 32° E. 18	20	W.
September	N. 55° E. 39	11	S.S.W.	N. 61° E. 27	41	S.S.W.	N. 60° E. 11	103	S.W.	S. 62° E. 5	65	S.W.	S. 17° E. 10	31	N.W.
October ...	N. 19° E. 18	11	Variable S.W. to S.E. predom- inating.	N. 54° E. 11	23	Variable.	N. 58° E. 8	101	N.E. and variable.	S. 30° E. 3	57	Variable winds between N.W. predom- inating.	S. 18° E. 5	24	N.W. to N. and variable.

TABLE 2.
Arabian Sea, Mean Monthly Currents (drift in miles per day)

Month.	Latitude 18° N. to 22° N., Arabian Coast to Longitude 60° E.		Latitude 20° N. to 22° N., Longitude 60° E. to 68° E.		Latitude 18° N. to 20° N., Longitude 60° E. to 68° E.		Latitude 20° N. to 24° N., Longitude 68° E. to Indian Coast.	
	Mean Set and Drift.	No. of Observa- tions.	Mean Set and Drift.	No. of Observa- tions.	Mean Set and Drift.	No. of Observa- tions.	Mean Set and Drift.	No. of Observa- tions.
November ...	S. 76° W. 6	11	N. 16° E. 3	7	S. 85° W. 8	6	N. 63° W. 8	7
December ...	S. 34° W. 6	19	N. 54° E. 1	8	S. 74° W. 4	9	N. 63° W. 4	14
January ...	S. 45° W. 9	10	N. 21° E. 5	5	N. 84° W. 3	4	S. 20° W. 10	6
February ...	N. 37° E. 9	8	N. 60° E. 22	3	N. 24° E. 8	2	S. 54° W. 9	2
March ...	S. 52° W. 2	8	N. 88° E. 6	3	S. 33° E. 7	4	S. 49° E. 6	6
April ...	N. 44° E. 11	14	N. 87° E. 8	8	—	—	S. 49° E. 8	9
May ...	N. 45° E. 14	21	S. 76° E. 8	7	S. 61° E. 10	7	S. 78° E. 7	7
June ...	N. 50° E. 17	21	S. 10° E. 5	8	S. 88° E. 12	17	N. 43° E. 8	3
July ...	N. 38° E. 15	18	N. 84° E. 11	13	N. 66° E. 13	19	S. 83° E. 10	12
August ...	N. 52° E. 14	13	N. 58° E. 7	10	N. 75° E. 14	30	N. 79° E. 13	9
September ...	N. 56° E. 6	17	S. 56° E. 11	5	East. 8	10	S. 58° E. 7	13
October ...	N. 37° E. 4	10	S. 54° W. 8	9	N. 17° E. 5	3	S. 63° E. 7	8

In the region of Latitude 18° N. to 22° N., Arabian Coast to Longitude 60° E., south of Ras al Hadd, there is a sudden reversal at the end of January, from S. 45° W., 9 miles per day, to an equally strong current, N. 37° E. In March however the current changes back to its N.E. Monsoon direction, S. 52° W., 2 miles per day, and the change is not finally completed until the beginning of April.

The region of Latitude 20° N. to 22° N., Longitude 60° E. to 68° E., shows a very remarkable result. The mean current has an easterly component throughout the year except during October and the N.E. Monsoon current is therefore never established at all in this area.

Immediately to the southward, Latitude 18° N. to 20° N., Longitude 60° E. to 68° E., the change of direction takes place at the end of January. Nearer the Indian Coast, as shown in the fourth column, the change occurs at the end of February.

The figures for the Bay of Bengal are given in TABLE 3. Here the change is earlier than in the case of the Arabian Sea, beginning in all three areas at the end of December. It is complete by the beginning of February on the western side of the Bay and at the beginning of January at the head of the Bay. In Bay of Bengal V, on the east side of the Bay, there is no reversal of current during the N.E. Monsoon period. The mean current is between south and west from December to April inclusive. In May the S.W. Monsoon commences and the mean current changes to S.E.

General Summary.—In the Arabian Sea April is the transition month of the Monsoon. The S.W. Monsoon commences to blow in May, but not strongly until June. The time of current change varies from January onwards but is in all cases complete by the end of March. In the Bay of Bengal March is the transition month of the Monsoons, the S.W. Monsoon being established in April, but does not blow strongly until May. The reversal of mean current is everywhere complete by the beginning of February. It should be noted that at the head of the Bay, some S.W. wind blows in February but it is here that the current reversal is earliest, being complete by the beginning of January.

There is no corresponding reversal of current before the N.E. Monsoon sets in. In practically all areas the change of current direction occurs suddenly at the end of October, the month of Monsoon transition. As soon as the N.E. Monsoon is established, the current changes. It is interesting to note that the current at the head of the Bay of Bengal reverses its direction a month earlier, at the end of September, and on referring to the wind charts we find that at the head of the Bay there is a considerable proportion of N.E. wind during the month of October.

TABLE 3.

Bay of Bengal. Mean Monthly Currents (drift in miles per day) and Prevailing Wind.

Month.	Latitude 8° N. to 10° N. Coast of Ceylon to Longitude 84° E.			Bay of Bengal III.			Bay of Bengal IV.			Bay of Bengal V.		
	Mean Set and Drift.	No. of Obsns.	Prevailing Wind.	Mean Set and Drift.	No. of Obsns.	Prevailing Wind.	Mean Set and Drift.	No. of Obsns.	Prevailing Wind.	Mean Set and Drift.	No. of Obsns.	Prevailing Wind.
November...	S. 17° E. 15	31	N.E. and variable N.E.	S. 80° W. 7	110	N.E. and variable N.E.	S. 79° W. 8	56	N.	N. 4° E. 3	26	N.E.
December...	S. 14° E. 17	43		S. 56° W. 9	93		S. 67° W. 5	52	N.N.E.	S. 89° W. 7	24	N.E.
January...	S. 65° W. 4	32	N.E.	N. 43° W. 2	103	N.E.	N. 49° E. 1	47	N.	S. 32° W. 7	17	N.E.
February...	N. 38° W. 8	19	N.E.	N. 21° E. 6	50	N.E.	N. 57° E. 9	25	S.W. and variable S.S.W.	S. 50° W. 6	20	N.N.E.
March...	N. 48° W. 5	29	N.E.	N. 14° E. 8	76	N.E. & S.W.	N. 64° E. 10	37	S.W.	S. 11° W. 4	30	Variable
April...	N. 43° W. 3	23	Sy. and variable S.W.	N. 61° E. 10	65	S.E. to S.W.	N. 58° E. 10	32	S.W.	S. 13° W. 4	31	Wy. and variable S.W.
May...	S. 19° W. 4	36		N. 49° E. 11	78	S.S.W.	N. 68° E. 4	61	S.S.W.	S. 54° E. 6	28	
June...	S. 2° E. 17	35	S.W.	N. 53° E. 7	73	S.W.	N. 60° E. 5	36	S.S.W.	N. 54° E. 5	25	S.W.
July...	S. 3° E. 12	26	S.W.	N. 71° E. 8	64	S.W.	S. 28° W. 2	38	S.W.	N. 53° E. 8	30	S.W.
August...	S. 25° E. 9	41	W.S.W.	S. 66° E. 8	90	S.W.	S. 51° E. 2	51	S.W. to S.E.	S. 76° E. 6	21	S.W.
September	S. 34° E. 10	32	W.S.W.	N. 84° E. 6	91	S.W.	S. 25° E. 3	37	S.	S. 29° E. 2	24	S.W.
October...	S. 8° E. 6	27	W.S.W. and variable	S. 10° E. 2	85	Variable	S. 61° W. 6	36	Variable	N. 48° E. 1	31	Variable

The region Bay of Bengal V is an exception to the general rule. There is no current reversal there during the N.E. Monsoon period. The flow of the mean current in this region is however not fully in accordance with the general coastal circulation at any time of the year. This is probably due to the much greater irregularities of the coast line, as compared to the west coast of India. Bay of Bengal V is also interesting in another respect. It will be seen from TABLE 3 that the mean current during the S.W. Monsoon period always has an easterly component, as would be expected, though the variations of mean set are considerable. This easterly flow continues, though very weak, throughout the transition month of the Monsoon, October. It flows rather more strongly, N. 4° E., 3 miles per day, in November when the N.E. Monsoon is blowing in this area. Thus the current during November is in opposition to the wind. The change of current takes place at the beginning of December.

A Suggested Explanation of the Reversed Current.—It is evident that during the months of February to April some factor besides the monsoon wind is affecting the flow of current round the coastal areas. In the article on "Currents in the North Atlantic Ocean," published in MARINE OBSERVER, Vol. IV, December, 1927, various methods of current formation were discussed and it was shown that temperature difference in adjacent parts of the ocean might produce a current. It was suggested that the weak south-westerly counter-current which flows south-eastwards of the Gulf Stream was produced entirely by the temperature difference between the warmer waters of the Gulf Stream and the colder water outside it. The mean sea surface temperatures of the Indian Ocean were published monthly in MARINE OBSERVER, Vol. V, 1928, and these have been examined to see whether they afford a possible explanation. The mean temperatures of the southern part of the Arabian Sea and Bay of Bengal between Latitudes 10° N. and 12° N. have been compared with those at the extreme heads of the bays. During the S.W. Monsoon there is not much difference, but the temperature at the head is one or two degrees higher than that in the open sea between Latitudes 10° N. and 12° N. During the N.E. Monsoon the water at the head of the Arabian Sea is relatively cool and the fall of the sea temperature steadily increases until the difference is as much as 6° during the months of January, February and March. The effect of this would be to produce a very slight slope of the sea surface downwards towards the head of the Sea, the level of the warmer water to the south being the highest.

Water would thus tend to flow directly down the slope in a northerly direction towards the coast. It would actually be diverted to eastward along the coast by the effect of the Earth's rotation. The slope would however remain because it would be maintained by the temperature difference due to the cooling effect of the N.E. Monsoon and thus a continuous easterly current would flow round the coast at the head of the Arabian Sea. Thus the pressure gradient caused by the slope, in conjunction with the Earth's rotation, gives rise to a current at right angles to the direction of the slope. In the northern hemisphere if one faces the direction towards which this current is flowing the region of warm water will be on the right hand.

There is also a second slope in the Arabian Sea for it is found that the water in the southern part of the Arabian Sea, for example along the parallels of 10° N. to 12° N. decreases in temperature from the Indian to the African coasts. The difference is 4° or 5° in January to March. This difference would tend to produce a current flowing westwards down the slope, which would be diverted to the northward by the Earth's rotation and would flow as an actual current up the western coast of the Arabian Sea. Thus there is a double slope in the Arabian Sea, downwards to the north and downwards to the west and the combined effect of the two is a current flowing round the coast in a clockwise direction. If this explanation is the correct one the current so produced must be strong enough to flow against the N.E. wind. It must, however, be remembered that in February the N.E. monsoon begins to weaken and that this weakening is specially marked round the coastal areas. The current due to temperature difference is at its maximum during the time the wind is weakening, from February to March. Thus we get a clockwise circulation round the coastal regions of the Arabian Sea while the current in the central part is not reversed, the N.E. monsoon still blowing there with considerable strength. Although the current in the central part of the sea is not reversed it shows a marked change of direction to the northward. As will be seen by the mean quarterly flow of current in Arabian Sea II changes from W., during the height of the N.E. monsoon, to N.N.W. in February to April.

In the Bay of Bengal the temperature difference between the head and southern part is somewhat less and reaches 6° only in January. A temperature difference also exists along the parallels of latitude 10° N. to 12° N., as in the Arabian Sea, but is also somewhat less. The Bay of Bengal, however, is smaller and more enclosed and this

would have the effect of strengthening the current. The weakening of the N.E. monsoon is also rather earlier and more pronounced in the Bay of Bengal than in the Arabian Sea.

To summarise the theory, there is a fall of sea surface temperature produced by the cooling effect of the N.E. monsoon wind blowing in strength during the months of November, December, and January. This fall of temperature is greatest in the northern parts and down the western coasts of the Arabian Sea and Bay of Bengal. It tends to produce a current flowing in the reverse way to that caused by the N.E. monsoon wind. As soon as the N.E. monsoon weakens in the coastal regions, the current due to the fall of sea temperature, which is then at its maximum, becomes manifest and the subsequent effect of the S.W. monsoon is merely to strengthen the flow of this current, which but for the advent of the S.W. wind would have gradually died out.

A point which should not be forgotten is that the current circulations of the S.W. and N.E. monsoon periods off the south-west coast of India are not in accordance with the wind blowing in that region. Owing to the coastal configuration the current is S.S.E. during the S.W. monsoon and N.N.W. during the N.E. monsoon. Down the south-west coast of India the N.E. monsoon blows from north on the average and therefore the current during the height of the N.E. monsoon here flows in opposition to the wind. The reversal of current from N.N.W. to S.S.E. which takes place in February therefore brings the current into agreement with the northerly wind, which does not weaken appreciably in this region. We should therefore expect the wind to enhance the reversed current due to the slope of the sea surface and this appears to be the case, since the reversed current is stronger here than anywhere else, with the exception of the portion of the African coast south of Cape Guardafui.

NOTES ON ASTRONOMICAL PHENOMENA OBSERVED AT SEA.

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

In the course of his duties at night the seaman not infrequently observes certain astronomical phenomena and finds many of these of sufficient interest to put on record in the meteorological log or form. He is indeed a privileged person in this respect for he sees more of the night sky than most people do and certainly more than many astronomers. It is therefore hoped that the present article will be found interesting. There is not space to publish in THE MARINE OBSERVER all astronomical observations received but a selection of the more interesting ones has been given in the Marine Observer's Log. Some of these will be referred to in the present article and some are of real value to astronomical science.

Certain phenomena which may be observed are of meteorological character as, for example, the phenomena of twilight and the green flash which is sometimes seen at the times of sunrise or sunset or even when a bright planet sets. These will not be considered here. Of the true astronomical phenomena those most frequently observed at sea are meteors or shooting stars and the aurora. The aurora was dealt with in an article on "Northern and Southern Lights" in MARINE OBSERVER, Vol. VIII, 1931, page 170, to which those who are interested may refer. It is perhaps not generally known that there is always a certain amount of faint auroral light in the night sky, at any rate in temperate latitudes. This is called the permanent aurora. There is nothing striking about this phenomenon. It shows itself merely as a very slight luminosity over the whole sky on cloudless, starlit nights which are free from all traces of moonlight and twilight. The actual background of the sky is less dark on some nights than on others, so that the faintest visible stars are less readily seen and the wisps and patches constituting the Milky Way stand out with less contrast to the adjacent sky. This slight difference in the aspect of the night sky has been proved to depend on the varying intensity of the permanent aurora. When the light of an ordinary bright aurora is analysed by the spectroscope it shows a characteristic line in the green portion of the spectrum, known as the auroral line. This line is faintly visible in the light of the ordinary night sky, showing the presence of the permanent aurora. More rarely brighter luminous patches are seen in the night sky, without fluctuation or movement; these have been called "earth-light" and are a form of the permanent aurora. The author has seen them from the south coast of England, but not of recent years. All auroral phenomena vary with the state of the sun's activity as exemplified by the frequency of sunspots and other solar phenomena. In all cases of luminosity of the sky at night care must be taken to ensure that light of terrestrial origin, such as the glow from towns, is absent in the region observed.

Meteors.—Meteors are among the most interesting of natural phenomena, since they consist of actual material objects arriving at

our earth from outside. They are our daily visitors from the outer depths of space. The earth is in fact hourly being bombarded with a great number of projectiles of varying, though usually small, size. If it were not for the protective influence of the earth's atmosphere there would be a continual rain of solid matter upon the land and sea. They are called by several names, such as meteors, shooting stars, fireballs, bolides, meteorites, but are all one and the same phenomenon, the advent of a piece of solid matter which enters the earth's atmosphere at great speed. In spite of the tenuity of the upper part of the atmosphere, this speed causes them to heat up rapidly by friction within a few seconds and it has been calculated that their temperature in this short time may reach 10,000° F. Under this enormous heat all but the very largest are completely burnt up; we see them only by the light of their dissolution into luminous vapour. Occasionally meteors are so large that some portion survives to reach the ground or fall into the sea; these are called meteorites. The name fireball is applied to the meteors of greater brilliance, while those of lesser brilliance are usually called shooting stars. The friction of the atmosphere quickly slows down the initial speed of the meteor and when one survives to reach the earth's surface its speed is usually only that of an ordinary falling body. The fall of a meteorite is rare in any region; in the British Isles twelve are known to have fallen between the years 1795 and 1902. Nevertheless cases are on record where persons or animals have been killed by them and it is possible that on rare occasions they may have caused the loss of ships at sea. The largest one so far found weighs 36½ tons, but the presence of a much greater one buried in the great crater of Coon Butte in Arizona is suspected. A very large meteorite fell on June 30th, 1908, in the forests of Siberia near Vanovara, trees being destroyed or blown down up to a distance of 40 miles from the place. This meteorite, or its fragments, has not yet been actually found. The smallest meteorites weigh only a few ounces. Many of the smallest shooting stars are probably no larger than a grain of sand.

The average speed at which a meteor enters the earth's atmosphere is about 26 miles a second but some are slower and others considerably faster. This is of course the speed relative to that of the earth. The heights of meteors in the atmosphere are calculated from observations made simultaneously at different places, by trigonometrical methods. The average height is 80 miles above the earth's surface at the time of appearance of the meteor and 50 miles at the time of its disappearance, but the larger ones may be seen at a height of 100 miles and may remain visible down to 5 or 10 miles. The great bulk of meteoric matter finally reaches the earth's surface in the form of slowly falling fine dust, specimens of which may be collected if suitable methods are adopted. It has been calculated that

several million meteors enter the atmosphere every day and this must add many tons weight of matter to the earth daily. Continued long enough this process must result in a decrease of the length of the year and an increase of the length of the day, by a modification of the earth's orbit and movements, but so slightly that there would be no appreciable difference over a time of one million years.

The ordinary shooting star flashes quickly across the sky, sometimes leaving a momentarily luminous trail behind it. The larger fireballs may leave trails which remain visible for minutes or in rare cases even for hours. In the accounts so far published in the *Marine Observer's Log*, there are two observations of trails persisting for as long as 25 or 26 minutes (observations of S.S. *Herschel*, Vol. VI, 1929, page 244, and of S.S. *Port Gisborne*, Vol. VII, 1930, page 148). These trails of luminous dust and vapour gradually alter their shape and move among the stars, being borne by the winds of the upper atmosphere. In this connection the observation made by S.S. *Llan-doverly Castle* (Vol. V, 1928, page 205) is of special interest. The meteor was observed near the equator (Latitude $2^{\circ} 14' S$, Longitude $41^{\circ} 40' E$.) and the trail though not visible for very long was observed "with the ship's telescope to be drifting slowly past the stars, in a westerly direction". Here is visible evidence of the great easterly upper air current of equatorial regions.

Many accounts will be found in the *Marine Observer's Log* of meteors of extreme brilliance lighting up the whole ship and the sea with a light equal to, or greater than, that of the full moon. In some cases meteors are bright enough to be quite conspicuous in a clear sky in daylight. A very bright meteor of this kind was observed about the time of sunrise by S.S. *Reventazon* on April 30th, 1927 (Vol. V, 1928, page 62). Fireballs equalling or exceeding the brightness of the planets Jupiter and Venus are relatively frequent. At the other end of the scale are tiny shooting stars quite invisible to unaided sight, but often observed by the astronomer passing across the field of his telescope.

Where the direction of the meteor is straight towards the observer it does not appear to move in the sky, but blazes up and disappears in one spot. A particularly striking example of a fine fireball so observed will be found in Vol. VIII, 1931, page 102, recorded by H.M.S. *Ormonde*. The direction of some meteors will cause them to appear to move upwards. Others have such long paths through the air that they pass below the horizon before disappearing. The brighter meteors often burst with a detonation and perhaps a great flash of light. Sometimes the flash only is seen, the actual bright meteor being entirely invisible below the horizon. A bursting meteor may often be seen to break up into smaller fragments.

Many of the larger fireballs exhibit great variety of brilliant colouring both in the meteor itself and in the luminous trail. The colouring depends upon the chemical constituents of the body. Meteorites which have been picked up form our only means of actually handling matter from outside the earth, and it is interesting to note that no chemical element has been found in them which is not known on the earth. Most meteorites consist essentially either of iron or of stony matter and all bear evidence of the great heat to which they have been subjected. Some contain small diamonds.

Some meteors are seen to pursue sinuous or irregular paths, while others do not move with regular speed but appear to hesitate at times. Such a case was recorded by S.S. *Clan Alpine* (Vol. VI, 1929, page 106). These differences are explained by irregularities in the shape of the meteoric body. It is not possible here to refer to all the peculiarities of meteors, but many of them are to be found in the examples selected for the *Marine Observer's Log*. A good example of a meteor which had exhausted its original speed at the time of its bursting and thereafter fell vertically is that recorded by S.S. *Novara* (Vol. VI, 1929, page 220).

Pairs of meteors travelling on the same path at the same time have been seen. Such a case was observed by S.S. *Dundrum Castle* (Vol. IV, 1927, page 210) and other cases of simultaneous meteors or meteors following one another in procession have been put on record in *THE MARINE OBSERVER*. The relatively small height of meteors makes it impossible to observe even a bright one except in a limited

area, a few hundred miles of the earth's surface at the most. Hence the value of carefully recorded observations when anything unusual is seen.

Prolonged study of meteors over many years has shown that the majority of them belong to families or groups and that the meteors belonging to one group emanate from a definite point among the stars, called the radiant point. They do not necessarily appear to start from the radiant point, but the tracks, if produced backwards, pass through this point. Thus the well-known Perseid meteors, which are plentiful in August, particularly from the 10th to the 13th, radiate from a point in the constellation of Perseus, after which they are named. The radiation of the tracks as seen from the earth's surface is merely a matter of perspective. The Leonids form another family which appear in numbers about November 13th each year and radiate from a point in the constellation of Leo. These showers are comparatively rich; sometimes a single observer, who can only see a part of the sky at one time, will see 30 meteors per hour during the height of the Perseid shower. Occasionally most spectacular displays of meteors occur, such as those given by the Leonids in 1833 and 1866, when meteors appeared at the rate of many thousands per hour. A number of observations of the Perseid and Leonid showers were published in *THE MARINE OBSERVER* for 1930 to 1932 inclusive. Other interesting meteor showers occur during the course of the year. On every night in the year a number of small showers are active but would be quite unrecognisable to the ordinary observer, giving perhaps only an occasional small meteor.

The reason why meteor showers recur on the same night or succession of nights each year is easily explained. The bodies forming them are members of our Solar System. They pursue orbits about the sun, though much more elliptical than those of the earth and other planets. At the time when the earth's orbit crosses the orbit of the meteors we see the shower and this will happen at the same time each year. It can be proved theoretically, however, that many meteors observed move too fast to have any connection with the Solar System. It must be remembered that the whole Solar System, sun, planets, comets and associated meteor groups, is moving through space at the rate of 18 miles a second and therefore the earth will meet meteors from the new regions of space continually being entered. The observations of these fast-moving meteors is a proof that outer space contains great numbers of these small material objects, which are quite invisible till they enter the earth's atmosphere.

Meteors of all kinds are most frequent in August to November and least frequent in February to May, also on any one night the frequency is greater after midnight than before.

It has been found that several of the meteor groups belonging to the Solar System pursue the same orbits as certain comets that have been observed and it is inferred that these meteors form part of the matter or debris of the comet whose orbit they pursue.

Comets.—Comets are bodies which move in orbits under the influence of the Sun's gravitation and appear in the heavens from time to time, passing more or less rapidly through the constellations. A comet may remain visible for weeks or even months. It usually grows brighter as it approaches nearer to the sun and it may throw out a tail in a direction away from the sun. The majority of comets, however, do not become bright enough to be seen without optical assistance. There have been many very bright comets recorded in historical times and the nineteenth century provided some splendid examples. Several fairly bright ones have been seen in the present century and Skjellerup's Comet in 1927 was one of the brightest observed for many years. It was, however, only well visible in the Southern hemisphere. Observations of this comet made by eight ships will be found in *MARINE OBSERVER*, Vol. V, 1928, pages 251 to 253.

Many comets, especially the faint ones, have no tail and appear in the telescope, or if bright enough, in field glasses, as small roundish masses of nebulosity. If comparatively near the earth the comet's motion among the stars is soon apparent and may be obvious in the telescope after an interval of only half an hour. Comets vary

very much in actual size, and the head from which the tail emanates may have a diameter of as much as several thousand miles. The mass of a comet is however extremely small in proportion to its size; it is a kind of celestial ghost of very rarefied structure. The head is probably composed of widely separated meteoric stones. The tail of a comet may extend for several million miles, in some cases a hundred million or more, and is of extreme tenuity. Sometimes several tails are visible at once. They have been divided into three types depending on their curvature. The tail of a comet is probably composed of small particles of matter ejected from the nucleus under the influence of the sun's heat and repelled by the pressure exerted by the sun's light, which for very finely-divided matter is greater than the attraction of the sun's gravitation. Thus a comet is wasting away during the time it is relatively near the sun.

Comets move in very elliptical orbits round the sun, in periods of a few years up to thousands of years. Some thus reappear at fairly short intervals, Halley's Comet being the most famous of these.

Zodiacal Light.—This interesting phenomenon can be well seen in all months at sea in tropical latitudes. In temperate latitudes it is confined to definite seasons, being readily visible only in the evenings of February to March, as soon as the sky is dark, and in the mornings of September to November, before dawn. Though not properly seen except in a really dark, starlit sky, it appears so soon after the twilight that many people who have seen it in the evening probably consider it to be the last of the twilight. Away from the light of towns the elongated ellipse of pearly light is seen reaching high up into the heavens, considerably brighter than the Milky Way and as bright as an aurora of moderate intensity. Its base is near the place where the sun has set and its axis lies along the constellations of the zodiac, very nearly along the ecliptic but probably inclined a few degrees to it. Though comparatively bright it is not easy to determine the axis exactly but if this can be more readily done in tropical latitudes the observations would be valuable. It has no motion among the stars but gradually sets as the adjacent stars set. It is not yet proved whether it really varies in intensity from night to night or in different years. Six observations of the Zodiacal Light have been published in THE MARINE OBSERVER, four from the Indian Ocean, Arabian Sea and Persian Gulf and two from the North Atlantic.

Associated with the Zodiacal Light is a phenomenon requiring keen eyesight and a very good night to observe. The Zodiacal Band

is a very faint band of light a few degrees wide which runs eastward from the apex of the zodiacal light along the ecliptic. It can only be seen if the ecliptic is not lying at a low altitude. Exactly opposite the sun in that part of the ecliptic which is on the meridian at midnight, local time, this band is broadened and brightened into a patch of light which is called the Gegenschein. This is nevertheless very faint and it is not easy to observe its limits, but it is probably about 10° long and 5° or 6° wide. This and any other faint luminosity in the sky is always more readily seen by not looking directly at the region but at a place slightly above or to one side of it. The astronomer frequently makes use of this "averted vision" even when observing through a telescope.

Lunar and Solar Eclipses.—Lunar eclipses are not infrequently observed at sea and the chief interest, other than watching the earth's shadow creep over the bright face of the full moon, lies in the colour of that part of the moon which is within the earth's shadow. Both partial and total lunar eclipses have been recorded in THE MARINE OBSERVER but the most interesting set of observations is that of the total eclipse of the moon on April 2nd, 1931 (Vol. IX, 1932, pages 71 to 72) by twelve ships in widely different parts of the world. The light which renders the moon visible when immersed in the earth's shadow is sunlight refracted through the earth's atmosphere and the quality of this light may vary according to the situation of the observer. This set of observations showed many differences of colour, the most remarkable observation being that of s.s. *Nagpur* in the Mediterranean, when part of the moon was seen to be of an emerald-green colour. So far as the author is aware this colour has not been previously observed during a total eclipse.

There are two observations of total eclipses of the sun in THE MARINE OBSERVER. This is considered to be the grandest of all the phenomena of nature, and is visible only in very restricted areas. H.M.S. *Iroquois* observed the total eclipse of May 9th, 1929, near the coast of Sumatra, with an interesting account of the solar corona and prominences (Vol. VII, 1930, page 104). The total eclipse of August 31st, 1932, was seen by s.s. *City of Harvard* in the North Atlantic (Vol. X, 1933, page 89). This ship was more fortunate than the many eclipse expeditions and other persons, including the author, who crossed the Atlantic only to have the spectacle spoilt by the presence of cloud.

SOUTHERN ICE REPORTS.

During the Year 1933.

January.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1933	22 1	53° 15' S. 57° 05' S.	133° 39' W. 123° 07' W.	Small berg and growlers ... Tabular berg ...	40 feet high, 270 feet long (by sextant angles) ... 500 feet high, 1000 feet long (by sextant angles) ...	S.S. <i>Port Hunter</i> . S.S. <i>Huntingdon</i> .

February.

None received.

March.

1933	22 24	56° 16' S. 56° 10' S.	132° 39' W. 112° 26' W.	Berg ... 2 Bergs ...	300 feet high, 1000 feet long ... One 50 feet high, 100 feet long. Other 200 feet high, 500 feet long.	S.S. <i>Port Napier</i> . do.
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Reports of Ice previous to January, February and March, 1933, will be found in the Marine Observer, Vol. X, No. 109, p. 22.

MARINE METEOROLOGY AND SAFE NAVIGATION.

Extracts from Merchant Shipping (Safety and Load Line Conventions) Act, 1932.

First Schedule.

International Convention for the Safety of Life at Sea, 1929.

Article 33.

Application.

The provisions of this Chapter referring to ships, unless otherwise expressly provided, apply to all ships on all voyages.

Article 34.

Danger Messages.

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

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

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

Article 35.

Meteorological Services.

The Contracting Governments undertake to encourage the collection of meteorological data by ships at sea, and to arrange for their examination, dissemination and exchange in the manner most suitable for the purpose of aiding navigation.

In particular, the Contracting Governments undertake to co-operate in carrying out, as far as practicable, the following meteorological arrangements:—

(a) To warn ships of gales, storms and tropical storms, both by the issue of wireless messages and by the display of appropriate signals at coastal points:

(b) To issue daily, by radio, weather bulletins suitable for shipping, containing data of existing weather conditions and forecasts:

(c) To arrange 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 of the various official meteorological services; and to provide coast stations for the reception of the messages transmitted:

(d) To encourage all ship-masters to inform surrounding ships whenever they experience wind force of 10 or above on the Beaufort scale (force 8 or above on the decimal scale).

The information provided for in paragraphs (a) and (b) of this Article will be furnished in form for transmission in accordance with Article 31, sections 1, 3 and 5, and Article 19, section 25, of the General Regulations annexed to the International Radiotelegraph Convention, Washington, 1927, and during transmission "to all stations" of meteorological information, forecasts and warnings, all ship stations must conform to the provisions of Article 31, section 2, of those General Regulations.

Weather observations from ships addressed to national meteorological services will be transmitted with the priority specified in Article 3, Additional Regulations, International Radiotelegraph Convention, Washington, 1927.

Forecasts, warnings, synoptic and other meteorological reports intended for ships shall be issued and disseminated by the national service in the best position to serve various zones and areas, in accordance with mutual arrangements made by the countries concerned.

Every endeavour will be made to obtain a uniform procedure in regard to the international meteorological services specified in this Article, and, as far as is practicable, to conform to the recommendations made by the International Meteorological Organization, to which organization the Contracting Governments may refer for study and advice any meteorological questions which may arise in carrying out the present Convention.

Article 36.

Ice Patrol. Derelicts.

The Contracting Governments undertake to continue a service of ice patrol and a service for study and observation of ice conditions in the North Atlantic. Further, they undertake to take all practicable steps to ensure the destruction or removal of derelicts in the northern part of the Atlantic Ocean east of the line drawn from Cape Sable to a point in latitude 34° N., longitude 70° W., if this destruction or removal is considered necessary at the time.

The Contracting Governments undertake to provide not more than three vessels for these three services. During the whole of the ice season they shall be employed in guarding the south-eastern, southern and south-western limits of the regions of icebergs in the vicinity of the Great Bank of Newfoundland for the purpose of informing trans-Atlantic and other passing vessels of the extent of this dangerous region; for the observation and study of ice conditions in general; for the destruction or removal of derelicts; and for the purpose of affording assistance to vessels and crews requiring aid within the limits of operation of the patrol vessels.

During the rest of the year the study and observation of ice conditions shall be maintained as advisable, and one vessel shall always be available for the search for, and destruction or removal of derelicts.

Article 37.

Ice Patrol. Management and Cost.

The Government of the United States is invited to continue the management of these services of ice patrol, study and observation of ice conditions, and derelict destruction and removal. The Contracting Governments specially interested in these services, whose names are given below, undertake to contribute to the expense of maintaining and operating these services in the following proportions:—

	Per cent.
Belgium	2
Canada	3
Denmark	2
France	6
Germany	10
Great Britain and Northern Ireland	40
Italy	6
Japan	1
Netherlands	5
Norway	3
Spain	1
Sweden	2
Union of Socialist Soviet Republics	1
United States of America	18

Each of the Contracting Governments has the right to discontinue its contribution to the expense of maintaining and operating these services after the 1st September, 1932. Nevertheless, the Contracting Government which avails itself of this right will continue responsible for the expense of working up to the 1st September following the date of giving notice of intention to discontinue its contribution. To take advantage of the said right it must give notice to the other Contracting Governments at least six months before the said 1st September; so that, to be free from this obligation on the 1st

* See page 26.

September, 1932, it must give notice on the 1st March, 1932, at the latest, and similarly for each subsequent year.

If, at any time, the United States Government should not desire to continue these services, or if one of the Contracting Governments should express a wish to relinquish responsibility for the pecuniary contribution defined above, or to have its percentage of obligation altered, the Contracting Governments shall settle the question in accordance with their mutual interests.

The Contracting Governments which contribute to the cost of the three above-mentioned services shall have the right by common consent to make from time to time such alterations in the provisions of this Article and of Article 36 as appear desirable.

Article 38.

Speed Near Ice.

When ice is reported on, or near, his course, the master of every ship at night is bound to proceed at a moderate speed or to alter his course so as to go well clear of the danger zone.

Article 39.

North Atlantic Routes.

The practice of following recognised routes across the North Atlantic in both directions has contributed to safety of life at sea, but the working of these routes should be further investigated and studied with a view to the introduction of such variations as experience may show to be necessary.

The selection of the routes and the initiation of action with regard to them is left to the responsibility of the steamship companies concerned. The Contracting Governments will assist the companies, when requested to do so, by placing at their disposal any information bearing on the routes which may be in the possession of the Governments.

The Contracting Governments undertake to impose on the companies the obligation to give public notice of the regular routes which they propose their vessels should follow, and of any changes made in these routes; they will also use their influence to induce the owners of all vessels crossing the Atlantic to follow, so far as circumstances will permit, the recognised routes, and to induce the owners of all vessels crossing the Atlantic bound to or from ports of the United States via the vicinity of the Great Bank of Newfoundland to avoid, as far as practicable, the fishing banks of Newfoundland north of latitude 43° N. during the fishing season, and to pass outside regions known or believed to be endangered by ice.

The Administration managing the ice patrol service is requested to report to the Administration concerned any ship which is observed not to be on any regular, recognised or advertised route, or which crosses the above-mentioned fishing banks during the fishing season, or which, when proceeding to or from ports of the United States, passes through regions known or believed to be endangered by ice.

Regulation XLVI.

Transmission of Information.

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

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

Information Required.

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

(a) Ice, Derelicts and other Direct Dangers to Navigation.

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

(b) *Tropical Storms.* (Hurricanes in the West Indies, Typhoons in the China Seas, Cyclones in Indian waters, and storms of a similar nature in other regions.)

(1) *A Statement that a Tropical Storm has been Encountered.*

This obligation should be interpreted in a broad spirit, and information transmitted whenever the master has good reason to believe that a tropical storm exists in his neighbourhood.

(2) *Meteorological Information.*

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

(a) barometric pressure (millibars, inches or millimetres);

(b) change in barometric pressure (the change during the previous two to four hours);

(c) wind direction (true not magnetic);

(d) wind force (Beaufort or decimal scale);

(e) state of the sea (smooth, moderate, rough, high);

(f) swell (slight, medium, heavy) and the direction from which it comes.

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

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

All directions should be true, not magnetic.

(3) *Time and Date and Position of the Ship.*

These should be for the time and position when the meteorological observations reported were made and not when the message was prepared or despatched. The time used in all cases should be Greenwich Mean Time.

(4) *Subsequent Observations.*

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

Examples.

Ice.

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

Derelict.

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

Danger to Navigation.

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

Tropical Storm.

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

TTT Storm. Appearances indicate approach of hurricane. Barometer corrected 29.64 inches falling. Wind N.E., force 8. Swell medium from N.E. Frequent rain squalls. Course 35°, 9 knots. 2200 N., 7236 W. 1300 G.M.T. September 14.

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

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

WIRELESS WEATHER SIGNALS.

UNDER the heading Wireless Weather Signals it is intended to publish particulars and concise descriptions of Signals and Code used for reporting Weather, Ice, and Time, in conformity with the International Convention of Safety of Life at Sea, in four sections.

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

- I. Ships' Wireless Weather Signals.
- II. Wireless Weather Signals made from the shore to ships.
(Weather Bulletins and Storm Warnings.)
- III. Wireless Time Signals.
- IV. Wireless Ice Signals.

The International Ships' Wireless Weather Telegraphy Code which came into force on May 1st, 1930, is given on pp. 35 to 38.

Request for information to Meteorological Services of Maritime Countries.

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

Request for Information to the Weather Services desiring British Selected Ships' Routine Wireless Weather Reports.

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

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

(1) The name of the receiving W/T Station, (C.W.), with call sign, latitude, and longitude and particulars on similar lines to that given on page 31 for Portishead, as far as applicable and with a view to covering the largest area as possible, see Chart of the World.

Reports from "B selected ships" may be intercepted by shore stations as required.—see pp. 33 and 34.

In order that all concerned may know what stations in different parts of the world are detailed to receive reports from "B selected ships", information similar to that given in the list on pages 33 and 34 is desired.

I.—SHIPS' WIRELESS WEATHER SIGNALS.

WORLD WIDE SYSTEM OF VOLUNTARY SELECTED SHIPS ROUTINE WIRELESS WEATHER REPORTS.

(1) FOR the purpose of aiding navigation, in accordance with Article 35, para. (c) of the International Convention for Safety of Life at Sea, 1929, Merchant Shipping (Safety and Load Line Conventions) Act, 1932, First Schedule (see page 25), and to assist the meteorological services of the world with weather intelligence, it is intended that there shall be an agreed number of regularly reporting ships, termed Selected Ships, of all nations, distributed over all oceans, working voluntarily under their national state meteorological institutions.

(2) In order that this work may be fairly distributed amongst the different national merchant navies, and to prevent congestion in wireless communication, it is intended that each national meteorological service should maintain in voluntary service a number of Ships on the register of their own country as Selected Ships, in accordance with their proportion of the world's tonnage of steam and motor vessels of over 100 tons.

At present the number agreed upon is 1,000 of all nations.

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

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

(Vessels over 100 tons, Lloyd's Register Book, 1933-34)

and Number of Selected Ships required for making W.T. Weather Reports,

in all Oceans, World Wide.

Country.	Steamers and Motor Vessels.		Percentage of World Tonnage.	Number of "Selected Ships" required.	Approximate Number of Ships fitted for C.W. Long Wave Transmission (Sept., 1933).
	Number.	Gross Tons.			
Great Britain and Ireland.	7,328	18,592,204	29.2	292	168
Australia and New Zealand.	556	637,757	1.0	10	0
Canada (excluding Lakes).	633	895,255	1.4	14	21
Hong Kong ...	122	303,375	0.5	5	6
India and Ceylon	153	187,142	0.3	3	1
South Africa and Other Colonies*	549	523,457	0.8	8	3
British Empire Total.	9,341	21,139,190	33.2	332	199
America (United States) (excluding Lakes).	2,763	10,186,112	16.0	160	568
Argentina ...	305	318,191	0.5	5	1
Belgium ...	211	454,784	0.7	7	9
Brazil ...	295	488,888	0.8	8	10
Chile ...	99	151,527	0.2	2	3
China ...	257	399,588	0.6	6	0
Danzig ...	42	255,635	0.4	4	0
Denmark ...	705	1,160,233	1.8	18	30
Finland ...	278	351,250	0.6	6	0
France ...	1,511	3,469,538	5.4	54	24
Germany ...	2,071	3,887,987	6.1	61	44
Greece ...	537	1,417,071	2.2	22	0
Holland ...	1,392	2,758,812	4.3	43	25
Italy ...	1,052	3,092,772	4.9	49	75
Japan ...	2,019	4,258,159	6.7	67	232
Jugo-Slavia ...	180	374,467	0.6	6	0
Latvia ...	108	196,733	0.3	3	0
Norway ...	1,965	4,078,133	6.4	64	15
Panama ...	83	287,033	0.5	5	13
Portugal ...	177	242,876	0.4	4	14
Russia (Soviet Union).	441	840,261	1.3	13	12
Spain ...	800	1,217,968	1.9	19	16
Sweden ...	1,339	1,658,148	2.6	26	3
Turkey ...	187	188,461	0.3	3	0
Other Countries	661	843,772	1.3	13	5
Total ...	28,819	63,717,589	100.0	1,000	1,298

* Including Dominion of Newfoundland.

(3) Selected Ships are broadly divided into two types, "A" and "B".

"A" Selected Ships are ships fitted for long range W.T. transmission (Type A.1, C.W. apparatus) mostly mail steamers sailing and arriving at dates fixed by advertised programmes.

"B" Selected Ships are ships fitted for comparatively short range W.T. transmission (Type A.2, I.C.W. apparatus) including passenger and cargo liners sailing according to an advertised programme, as well as a number of vessels whose movements are not advertised and may vary from voyage to voyage.

(4) It is necessary that observations reported by wireless telegraphy should synchronize. The International times of observation for weather telegraphy at sea are 0000, 0600, 1200 and 1800 hours G.M.T.

(5) It is necessary that weather reports made for the information of all ships and the meteorological services of the different countries should be in one code, simple and concise, giving only essential information.

Selected Ships use the International Ships' Wireless Weather Telegraphy Code, 1929.

British Selected Ships.

(6) When British ships become regular voluntary observing ships to the Meteorological Office, London, their Commanders volunteer to carry out the duties of Selected Ships when required.

The names of all British observing ships are published in a fleet list at the end of THE MARINE OBSERVER, corrected monthly by supplement.

(7) Selected Ships are selected from this list, according to their sailing schedules and trades to provide distribution, according to their wireless apparatus to ensure efficient communication, and according to the capacity and keenness of their officers to ensure the most accurate information.

(8) When observing ships are detailed as Selected Ships, their commanders are specially notified; and each Selected Ship is identified by a number placed before her name in the fleet list, with symbols indicating the nature of her wireless telegraphic apparatus.

(9) There are 3,533 British ships at present fitted with wireless telegraphy. The proportion fitted with Type A.1 is about 1 to every 20 fitted with Type A.2 or Type B apparatus.

Of the total of 3,533 British ships fitted with W/T.—

168 are fitted for sending Long Wave, C.W.

151 " " " Short Wave, C.W.

76 " " " Long and Short Wave, C.W.

Of the above, 75 can send on short wave only and 92 on long wave only.

(10) A fairly long range with reliability being desirable, at present long wave, C.W. is the most satisfactory, and British "A" Selected Ships are at present confined to ships so fitted.

Times of Observation.

(11) The following Chart indicates the zones for which the International watch keeping periods are fixed for wireless operators, all four times of meteorological observation being indicated in each zone.

(12) Many Selected Ships only have one officer in each watch. The first essential for safe navigation is a good look out kept by the officer of the watch, as well as the lookout man. The officer of the watch is responsible for meteorological observation, and the accuracy of reports. If the officer of the watch at night goes into the lighted chart house to read meteorological instruments and record them, not only does he leave his post of lookout, but he returns to the bridge momentarily blinded.

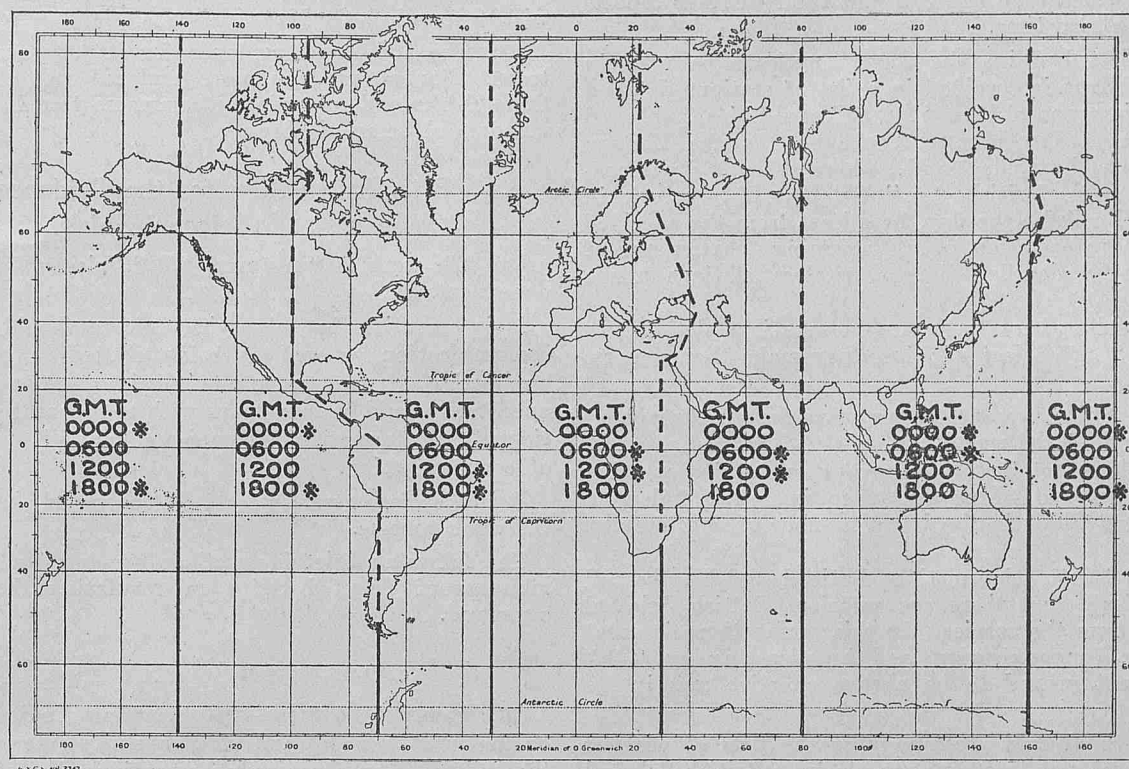
(13) Wireless meteorological reports are not asked for in British Selected Ships during the hours of darkness in which there is only one officer in each watch.

The times of observation which are starred on the chart are those which generally fall during daylight in the different zones, and at these times all British Selected Ships are requested to record observations for reporting by wireless.

(14) In certain parts of the world "A" Selected Ships having two officers in each watch are requested to record observations at all four times, and report them to certain meteorological services.

International Observation Times for Weather Telegraphy at Sea.

* Indicates usually daylight.



Communication.

(15) In order that communication may be effective (that is, that the reports may reach as many ships as possible as well as the appropriate meteorological centres), British Selected Ships work a time schedule for transmitting their reports and use prescribed wavelengths, both when addressing specified stations or all ships.

(16) Generally "A" Selected Ships address their reports to specified meteorological centres, making them to specified coast stations, so that they may be intercepted by all ships within range. In parts of the world where coast stations are not detailed to receive routine reports from "A" Selected Ships they broadcast their reports to C.Q. (all ships).

(17) The reports of "B" Selected Ships are primarily intended in all parts of the world for the information of all ships.

Generally "B" Selected Ships address and make their reports to C.Q. (all ships) so that they may be intercepted by shore stations within range as well as by other ships.

In parts of the world where there may be insufficient "A" Selected Ships, "B" Selected Ships are requested to address their reports to meteorological centres, making them to coast stations.

(18) Great importance is attached to the S.O.S. periods of silence. Therefore the times of transmission for "A" Selected Ships are fixed to commence immediately at the end of the appropriate S.O.S. silence period.

This allows a sufficient interval from the time of observation for recording and coding the observations carefully, and sending the coded messages from the bridge to the wireless house.

(19) Usually the times of commencement of transmission for "A" and "B" Selected Ships are fixed at 18 minutes and 30 minutes respectively after observation time; but for ships with only one W.T. operator in certain zones, special commencing periods are fixed to accord with wireless watch.

(20) The schedule which follows indicates the times of observation, and commencement of times of transmission for both "A" and "B" Selected Ships in the different zones.

Schedule.

All times are G.M.T.

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

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

In working this schedule, Selected Ships should be careful not to jam each other.

It may be advantageous for "B Selected Ships" generally—and for "A Selected Ships" beyond the region of the Eastern North

Atlantic, regulated by Roll Call, and when not reporting to a shore station—when in W/T communication previous to reporting time to arrange the order in which they will transmit their weather reports to **C.Q.** at the next scheduled time.

(21) For "A" Selected Ships the wave length to be used in reporting to shore stations is specified in a list of stations detailed to receive coded weather reports from "A" Selected Ships, published in the latest number of *THE MARINE OBSERVER*. In the Eastern North Atlantic, north of Latitude 38° N., where there is great congestion of wireless traffic, British "A" Selected Ships work in accordance with a roll call for the day, broadcast from the specified W/T station for the information of all shipping, particulars of which are given in the detailed list of wireless stations above mentioned.

In parts of the world where there are not stations detailed to receive reports from "A" Selected Ships, they make their reports to **C.Q.** on 2100 metres.

(22) "B" Selected Ships use 600 metres wave length throughout the service in all parts of the world.

The names of stations detailed to intercept or receive weather reports from "B" Selected Ships are given in a list following that for "A" Selected Ships in the latest number of *THE MARINE OBSERVER*.

In the Eastern North Atlantic, north of Latitude 38° N., the roll call will usually indicate that there are sufficient British Selected Ships detailed to perform the service. In this region there is great congestion of I.C.W. communication and broadcasting by "B" Selected Ships has not proved to be always effective and is not generally advocated.

(23) The Chart of the World accompanying the lists of wireless stations detailed to receive or intercept reports from British Selected Ships, at the end of *THE MARINE OBSERVER* is revised and kept up to date quarterly. It is intended to illustrate the foregoing description by indicating graphically the stations and their approximate range, or the limits of the areas for which they should be used by British Selected Ships, and for which the details are given in the aforementioned lists.

(24) In order that all ships should know when Selected Ships make their reports, and be able to decode them, a pamphlet M.O. 329, entitled *DECODE FOR USE WITH THE INTERNATIONAL CODE FOR WIRELESS WEATHER MESSAGES FROM SHIPS* has been published since May, 1930. This has been placed on board British ships by their owners, and the schedule of communication is now so well known throughout the sea service that jamming and confusion have been much reduced.

All are asked to help in making this voluntary scheme a success.

(25) No communication charges are made to the ship for Selected Ships' routine wireless weather reports broadcast to all ships, or addressed to meteorological centres specified in the lists in the last number of *THE MARINE OBSERVER*. Wireless weather reports addressed by ships to meteorological centres not conforming to these instructions may be liable to charges.

(26) The number of messages required for this service is comparatively small, when effectively organized.

Relaying on wave lengths specified in (21), (22), and in the lists of stations in *THE MARINE OBSERVER* (that is to say, wave lengths used for Selected Ship weather reporting) should not be resorted to.

Every endeavour should be made for the reports in areas in which International W/T link or collective ships, such as the French S.S. *Cuba*, are working, to reach those ships, who will relay them to special shore stations for the information of meteorological centres on a special short wave (long range).

The main object of this system is to make one transmission serve as many ships as possible and the appropriate meteorological centre with the information reported.

(27) While there is congestion in the Eastern North Atlantic and only those Selected Ships indicated by roll call should report, in other parts of the world there may often be insufficient Selected Ships to provide an adequate service of routine reports.

In the regions of heavy weather on the less frequented routes of the Southern Ocean, and particularly in the Hurricane regions during the Hurricane season, British ships other than Selected Ships are asked to assist in this service.

This will be dealt with in (34).

Observation and Coding.

(28) Guidance in observing and recording meteorological elements will be found in the *MARINE OBSERVER'S HANDBOOK*, Fifth Edition.

(29) The code, and guidance for its use are given on pages 35 to 38. For working purposes a glazed code card Form 138A with Code Tables and schedule for communication is supplied to the commanders of Selected Ships.

Brief Instructions for the Guidance of British Selected Ships.

(30) The work of "A" and "B" Selected Ships is largely inter-dependent.

It is essential that observing officers should be conversant with communication as well as being skilled in observation, and the application of the meteorological information; and that wireless operators should be conversant with the general purpose and application of the information communicated as well as skilled in this system of communication.

It is therefore essential that all concerned should be familiar with the whole scheme.

The following brief instructions are intended to assist the Commanders of Selected Ships in regulating the work under their command.

All Selected Ships.

(31) **Observing Officers.**—At the times indicated for observation on the chart, see (13) and (14), carefully enter your observations in the record of synchronized observations, Form 911 or 916.

In the Eastern North Atlantic ascertain if the ship is on the roll call for the day or not before proceeding further.

Code these observations on to the Register, Form 138.

If the message is to be broadcast to **C.Q.** the weather information may be conveniently abbreviated to the four universal groups of figures; and instead of using supplementary groups, information of Ice or Set and Drift of current may be given briefly in plain language.

If the message is to be sent to a meteorological centre, ascertain from the list in the latest *MARINE OBSERVER* what groups are desired, and make out the message accordingly.

Write out the message on Form 139 and address carefully to **C.Q.** Weather or the specified meteorological centre for the part of the world given in the lists in the latest number of *THE MARINE OBSERVER*. Send it to the wireless operator just before the commencement of the S.O.S. period following the observation time.

Example. For Meteorological centre.—From **GMLJ.** to **GKU.** Weather London 20506, 13106, 18603, 88660, 35x08, 54528, 65825.

Example. For all ships.—**C.Q.** Weather 13167, 55106, 00000, 16979. Current from 15N. 52E. to 16N. 54E. 58 degrees one knot Dalgoma.

"A" Selected Ships.

(32) **Wireless Operator.**—Consult the list of stations detailed to receive reports in *THE MARINE OBSERVER*.

In the Eastern North Atlantic, when on the roll call transmit the weather report to **GKU.** accordingly on the appointed wave length, following the order of the roll call at the schedule time. The reports for 0000 and 1800 hours G.M.T. should be made as soon as convenient after the silence period.

In parts of the world other than the Eastern North Atlantic where the message is addressed to a meteorological centre call the station detailed in *THE MARINE OBSERVER* at schedule time, see (20), and on the wavelength specified, and transmit the report, which will be acknowledged in the ordinary way, remembering that this message is intended for ships within range as well as the shore station.

The message will be addressed to **C.Q.** in parts of the world where there is no station detailed in *THE MARINE OBSERVER*. Send it out at schedule time on 2100 metres.

Make your transmissions as above with due consideration to circumstances.

"B" Selected Ships.

(33) **Wireless Operator.**—If the message is addressed **C.Q.**, broadcast it at or following schedule time given in (20) on 600 metres. When in range of stations indicated in the list given in **THE MARINE OBSERVER** as detailed to intercept wireless weather reports, the message may be intercepted.

If the message is addressed to a meteorological centre, call the appropriate station indicated in **THE MARINE OBSERVER** and transmit the message to that station in the usual way.

As far as possible, reports from "B" Selected Ships addressed to a meteorological centre should be made at schedule times, so that they may be intercepted by all ships within range.

If for local reasons these reports addressed to meteorological centres are not made at schedule times and on 600 metres wavelength, they should be made also in accordance with schedule to all ships.

Ships' Wireless Weather Reports in Parts of the World where there are not sufficient Selected Ships to provide an adequate Service.

(34) Under Article 34 of the Convention for Safety of Life at Sea, the master of every ship meeting a dangerous tropical storm, is

bound by law to report to ships in the vicinity, and to the first point of the coast with which he can communicate (see page 25), but routine wireless weather reporting is **voluntary**.

It is desirable that ships and meteorological centres should as far as possible have routine wireless weather reports in fine as well as in bad weather, so that they may be forewarned.

In the Southern Ocean and in the regions and seasons of tropical revolving storms, British ships which are not Selected Ships are asked to assist in this service, when there are not Selected Ships present to perform it.

As far as possible the International Ships' Wireless Weather Telegraphy Code should be used and the procedure for Selected Ships should be carried out. British ships which are not Selected Ships should only make routine wireless weather reports to the shore through stations which they have been notified will receive weather reports without charge to the ship. Notification of these stations is given from time to time in Notice to Mariners published for the meteorological services concerned by the appropriate maritime authorities.

The masters of all British ships are advised to procure the pamphlet, **M.O. 329, DECODE FOR USE WITH THE INTERNATIONAL CODE FOR WIRELESS WEATHER MESSAGES FROM SHIPS**, published and sold by H.M. Stationery Office, through any bookseller, price 3d.

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 THIS NUMBER.

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 this number.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 11" E.	VPS.	—	125 kc/s. (2400 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.
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 this 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.

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.			
	Juncçao	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.	Weather only, 4 universal groups and first group of No. 6 Supplementary groups.	
	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.

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			

INTERNATIONAL SHIPS' WIRELESS WEATHER TELEGRAPHY CODE

Adopted by the International Meteorological Organization at Copenhagen, September, 1929.

Code and Instructions for Coding Messages.

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

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

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

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

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

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

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

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

Universal Groups.

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

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

From the Code Card Form 138A.

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

KEY
LETTERS.

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

No. 3 Supplementary Groups.

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

KEY
LETTERS.

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

No. 6 Supplementary Groups.

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

KEY
LETTERS.

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

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

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

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

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

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

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

Write out the message on the signal pad (Form 139) provided and send to the wireless operator for despatch in accordance with instructions given in World Wide System of Voluntary Selected Ship Routine Wireless Weather Reports, pages 27 to 31, schedule for which is also given on Code Card Form 138A.

CODE TABLES.

Day and Position.

Table I.

P.—Day of the Week.									
Code Figure.				Code Figure.					
Sunday	...	...	...	1	Thursday	...	...	...	5
Monday	...	...	...	2	Friday	...	...	...	6
Tuesday	...	...	...	3	Saturday	...	...	...	7
Wednesday	...	...	...	4					

Table II.

Q.—Octant of the Globe.						
Longitude.				Code Figure.		
North Latitude.	{	0° W. — 90° W.	...	...	...	0
		90° W. — 180° W.	...	...	...	1
		180° E. — 90° E.	...	...	...	2
		90° E. — 0° E.	...	...	...	3
South Latitude.	{	0° W. — 90° W.	...	...	...	5
		90° W. — 180° W.	...	...	...	6
		180° E. — 90° E.	...	...	...	7
		90° E. — 0° E.	...	...	...	8

Compass.

Table III.

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

Table IV.

d and d _s .—Compass Table to Half Cardinal Points.			
True Direction.	Code Figure.		
No Sea or Swell; or Ship hove to	0
N.E.	1
E.	2
S.E.	3
S.	4
S.W.	5
W.	6
N.W.	7
N.	8
No observation or no information	9

Wind.

Table V.

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

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

Weather.

Table VI.

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

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

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

Table VII.
W.—Past Weather.

Code
Figure.

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

Barometer.

Table VIII.

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

(Adapted for British Ships.)

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

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

Table IX.

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

(Adapted for British Ships.)

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

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

Barograph.

Table X.

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

(Adapted for British Ships.)

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

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

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

Table XI.

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

(Adapted for British Ships.)

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

Visibility.

Table XII.

V.—Visibility.

Code
Figure.

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

Clouds.

Table XIII.

C_L.—Form of Low Cloud.

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

Table XIV.

C_M.—Form of Middle Cloud.

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

Table XV.

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

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

Table XVI.

C.—Predominating Form of Cloud.

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

Table XVII.

N. and (N₁).—Amount of Cloud.

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

Temperatures.

Table XVIII.

t_a.—Difference between Air and Sea Surface Temperature.

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

Swell.

Table XIX.

K.—Swell.

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

Speed.

Table XX.

f.—Speed of Ship.

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

PERSONNEL.

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

Lieutenant R. A. B. Ardley, R.N.R.

Lieutenant R. A. B. ARDLEY, R.N.R., 2nd officer of R.R.S. *Discovery II* was appointed, and took over the duties of Port Officer at Haifa on November 7th, 1933. Trained in H.M. School Ship *Conway* in 1921 to 1923, Mr. ARDLEY served his time in the Royal Mail Steam Packet Company's service and upon obtaining his 2nd mate's certificate in February, 1926, joined S.S. *Zingara*, owned by Messrs. Turner and Brightman as 3rd Mate and later was promoted to 2nd mate of that ship.

From 1927 to 1929 he was 3rd and 2nd mate of Messrs. Andrew Weir & Co.'s S.S. *Alynbank*.

In August, 1929, he obtained a commission as Sub-Lieutenant, R.N.R., and in December of the same year was appointed 3rd officer of *Discovery II*.

Passing for Master in Cape Town in July, 1930, he was promoted to 2nd officer of *Discovery II*, and in August, 1932, to Lieutenant in the Royal Naval Reserve. Mr. ARDLEY first became a member of the Corps of Voluntary Marine Observers in 1926 when an apprentice in S.S. *Nariva*, since when he has done much useful work, particularly in the Antarctic seas and Southern Ocean, and his name has appeared for several years in the lists of Excellent awards. Twelve years from joining a training ship to becoming captain of the port,

and a port with the possibilities in prospect at Haifa, is an achievement upon which the Corps of Voluntary Marine Observers will join in heartily congratulating Lieutenant ARDLEY.

Captain H. Sibbons.

Captain H. SIBBONS, Commander of the R.M.S. *Duchess of Bedford*, has retired from active service afloat.

Commencing his sea career at the age of 15 he served his apprenticeship in the *Scottish Locks* owned by Messrs. H. Ross & Co. of Liverpool. On completing his time he served for some years as an officer in the four-masted barque *Moreton* and the ship *Garnet Hill*. In 1895 he transferred to steam and after serving for three years in cargo vessels as 2nd and Chief Officer joined the Castle Line and remained with them nine years. Captain SIBBONS joined the Canadian Pacific Steamships Ltd. in 1907, since when he has served as an officer in most ships of their fleet and has commanded several including the *Pretorian*, *Minnedosa*, *Montcalm*, *Montroyal* and *Duchess of Bedford*.

A member of our Corps since 1922, Marine Observers join with the Marine Division in wishing Captain SIBBONS long life and happiness in his retirement.

OBITUARY.

THE death of Mr. W. G. JAMES, which took place on August 24th, 1933 at the age of 82 is noted with regret.

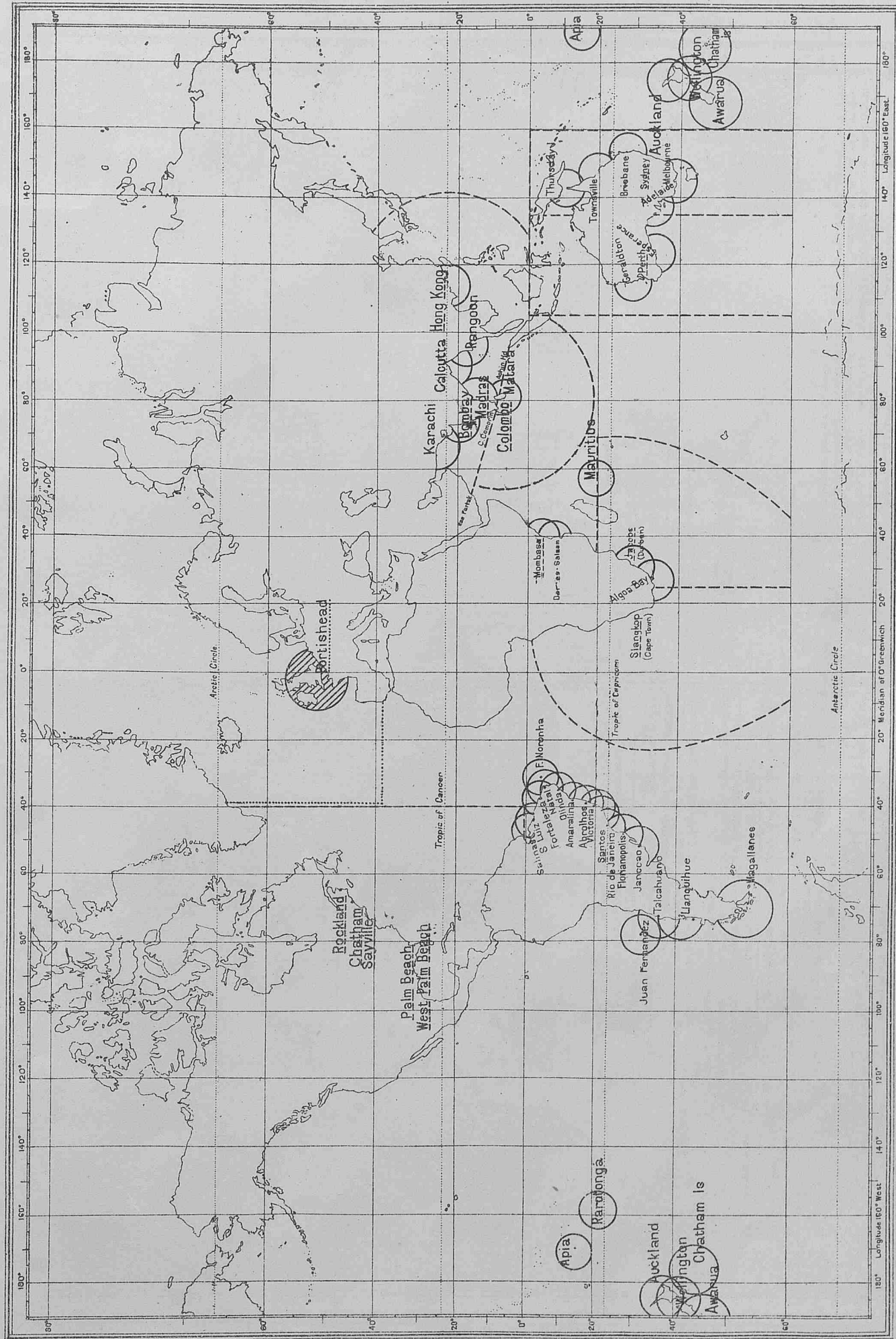
Mr. JAMES entered the service of the Meteorological Office in 1869, and served continuously in the Marine Division until his retirement in December, 1919.

A great deal of his time was spent in Marine cartographical work for which he had special aptitude, and he was responsible for the drawing work in connection with the atlases of meteorological charts published during his 50 years' service, and for the Monthly Meteorological Charts of the North Atlantic Ocean and East Indian Seas. He also assisted in the extraction of the marine data used in the compilation of those atlases.

His patience and attention to detail in this exacting work were remarkable, and he was a very valued member of the Marine Division.

SHIPS' WIRELESS WEATHER SIGNALS. CHART OF THE WORLD.

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



The dotted line indicates the area in which British & 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 "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 "Selected Ships" reports made to CQ on 600 metres.

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

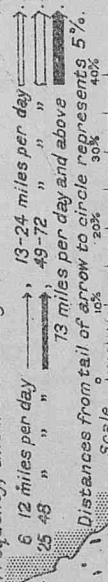
EXPLANATION OF CURRENT ARROWS.

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 in miles per day; the figures below the arrows the number of observations.

MAXIMUM DRIFTS REPORTED.						
Name of Ship	Date Day Year	Lat.	Long.	Currents Set Drift	Wind Dir. Force	
Licestershire	24	19 10	23° 09' N 37° 05' E	N 38° W	NE 1	
H.M.S. Dahlia.	16	19 29	22° 25' N 37° 00' E	N 55° W	NNW 5	
Malta.	28	19 14	20° 51' N 18° 12' E	S 7° E	NNW 5	

EXPLANATION OF CURRENT ROSES.

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



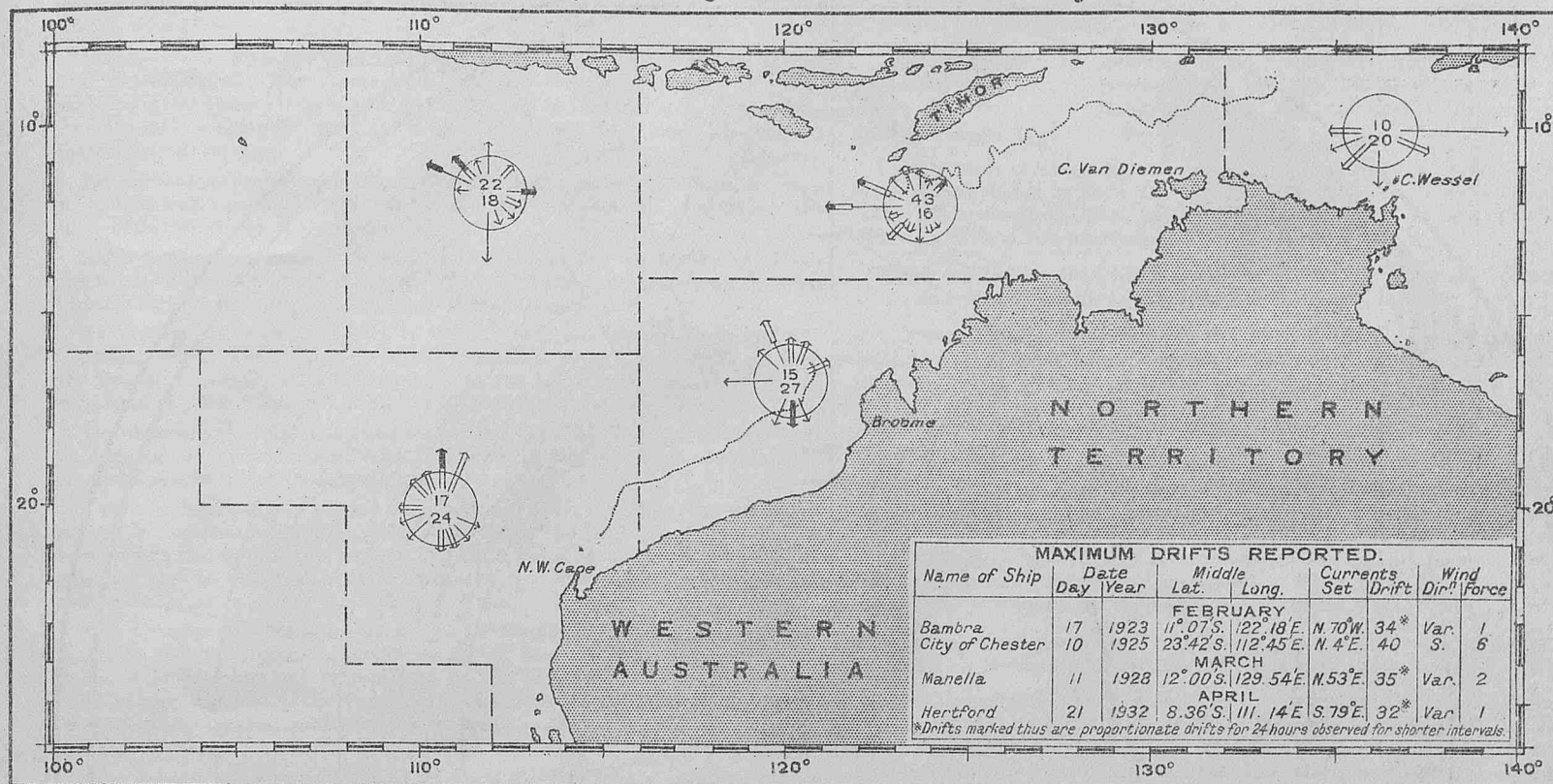
The upper figure in centre of rose gives total number of observations, the lower figure the percentage frequency of currents less than 5 miles per day.

MAXIMUM DRIFTS REPORTED.						
Name of Ship	Date Day Year	Middle Lat.	Long.	Currents Set Drift	Wind Dir Force	
South of Latitude 20° N.						
Sheaf Spear	18 1922	6° 12' N.	41° 18' E.	N 31° W. 39*	SSE 5	
MARCH						
Arcean	15 1928	15° 16' N.	43° 07' E.	N 20° W. 49*	SW 6	
Onoua	13 1931	14° 48' N.	43° 30' E.	N 30° W. 46*	—	

* Drifts marked thus are proportionate drifts for 24 hours observed for shorter intervals.

CURRENTS IN THE PORTION OF THE INDIAN OCEAN NORTH OF AUSTRALIA. FEBRUARY MARCH and APRIL.

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



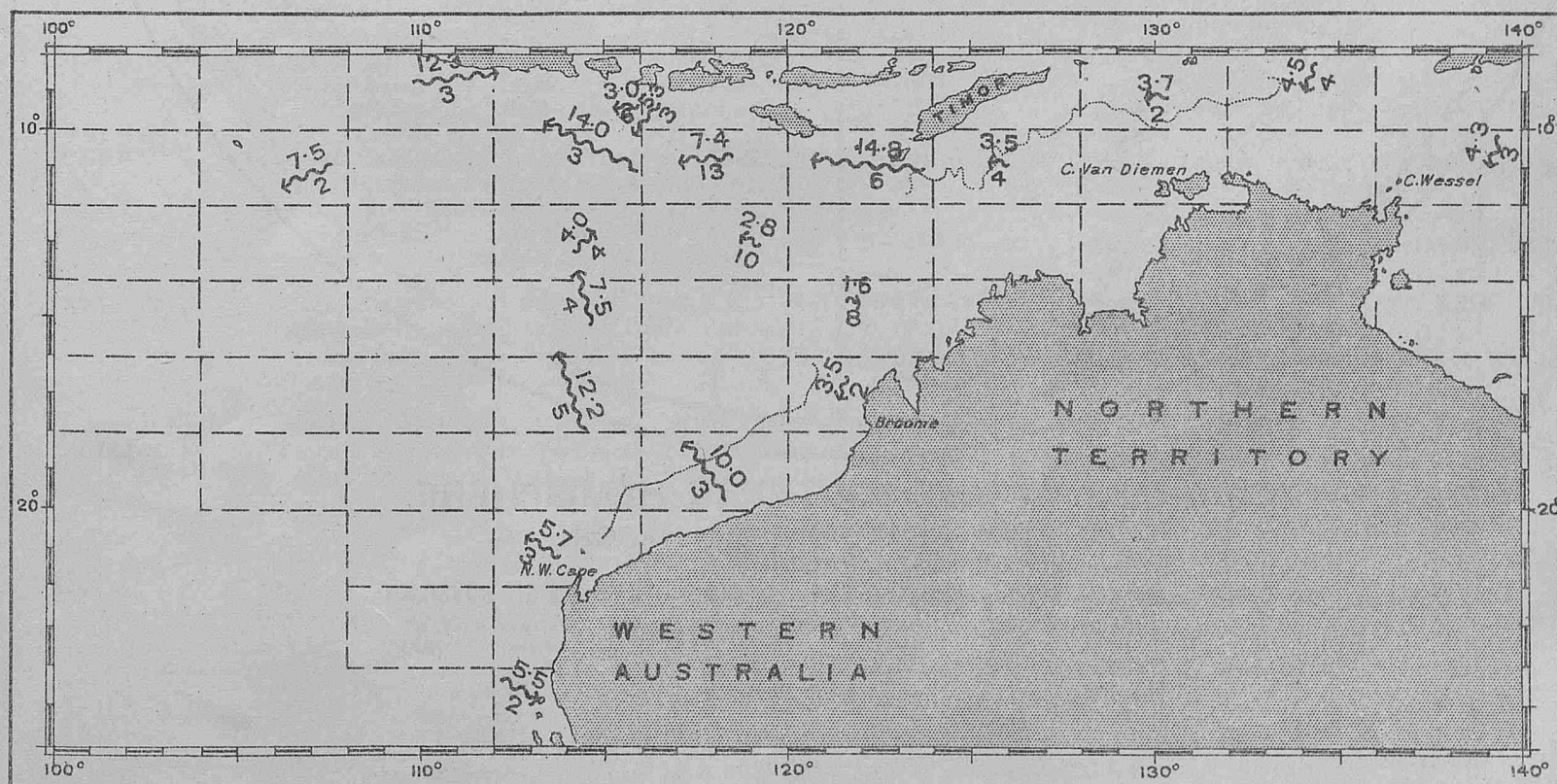
EXPLANATION OF CURRENT ROSES.

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

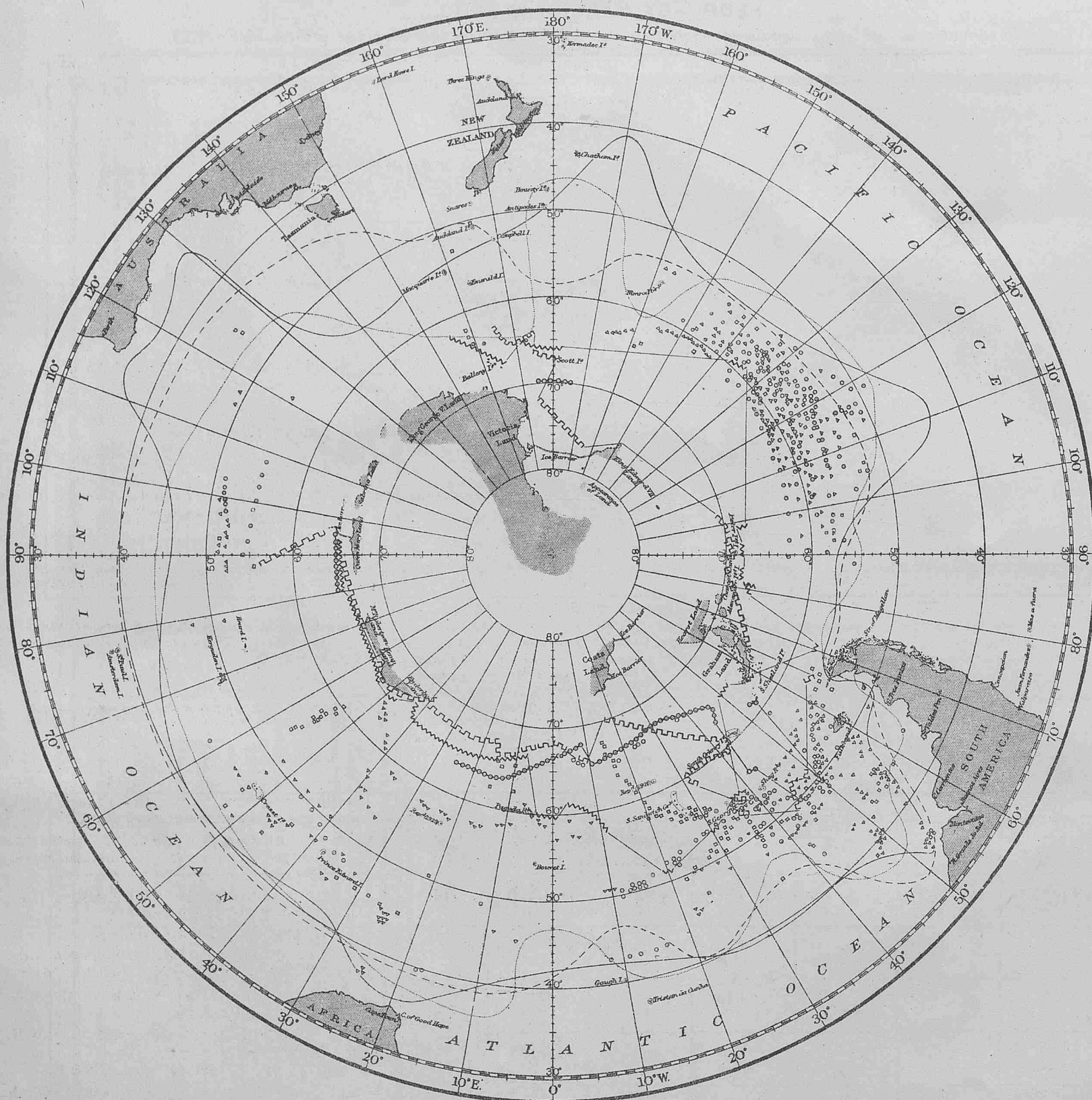
Distance from tail of arrow to circle represents 5% Scale. 10 20 30 40 50

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.



ICE CHART OF THE SOUTHERN HEMISPHERE, **JANUARY, FEBRUARY and MARCH.** 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
January.	△	~~~~~	---
February.	□	~~~~~	---
March.	○	~~~~~	---

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 No 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 366 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.

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Agents (contd.).

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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.	
ENGLISH CHANNEL.			Large red cylindrical object, floating about 3 feet high.	North Atlantic—contd.			Big red conical buoy lower part black. Spar, about 6" in diameter, floating 6 to 8 feet above surface, dangerous to navigation.
15.12.33	50°30'N.	1°10'W.		16.12.33	49°37'N.	15°30'W.	
ST. GEORGE'S CHANNEL.			<i>S.S. Gloria</i> abandoned on fire.	17.12.33	47°48'N.	5°55'W.	
2.12.33	52°36'N.	5°29'W.					
NORTH ATLANTIC.			MEDITERRANEAN.			Buoy, painted red, with a white spar; adrift.	
4.12.33	43°10'N.	48°50'W.	4.12.33	35°39'N.	15°48'E.		
6.12.33	49°50'N.	7°56'W.	Derelict Seh. <i>Edward VII</i>	GULF OF MEXICO.			Large log, dangerous to navigation.
7.12.33	35°33'N.	75°15'W.	Supposed derelict schooner, dangerous to navigation. Rafts of timber, apparently a ship's deck load.	6.12.33	18°50'N.	87°13'W.	

CHART OF THE WESTERN NORTH ATLANTIC.

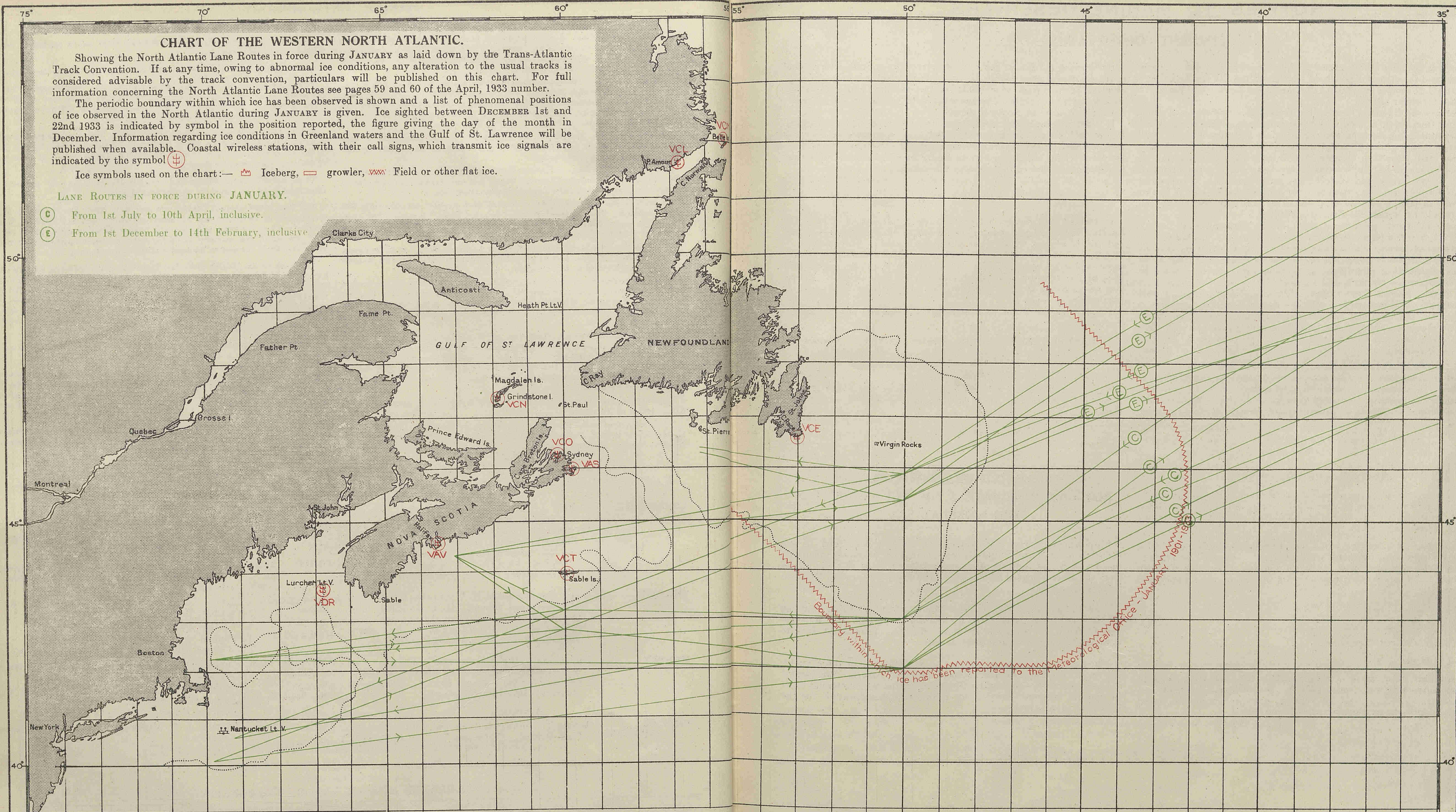
Showing the North Atlantic Lane Routes in force during JANUARY as laid down by the Trans-Atlantic Track Convention. If at any time, owing to abnormal ice conditions, any alteration to the usual tracks is considered advisable by the track convention, particulars will be published on this chart. For full information concerning the North Atlantic Lane Routes see pages 59 and 60 of the April, 1933 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 JANUARY is given. Ice sighted between DECEMBER 1st and 22nd 1933 is indicated by symbol in the position reported, the figure giving the day of the month in December. 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, wavy Field or other flat ice.

LANE ROUTES IN FORCE DURING JANUARY.

- (C) From 1st July to 10th April, inclusive.
- (E) From 1st December to 14th February, inclusive.



PHENOMENAL POSITIONS OF ICE.

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

LATEST ICE REPORT FROM CANADA.

The following cablegram, dated 22nd December, 1933, was received from the Canadian Signal Service, Quebec:—
Montreal to middle Lake St. Peter, river solid; eastward to Pointe des Monts, heavy open ice everywhere; expect ice now down to east end of Anticosti; Belle Isle Strait, some slob ice.

NOTICES TO MARINE OBSERVERS.

CURRENT OBSERVATION.

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

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

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

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

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

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

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

It is not only records of strong or abnormal currents that are desired. Records of the state of the current, no set, small sets, moderate sets and great sets at all times when the information can be obtained with reliability are necessary for completing current charts for all oceans and providing the information desired in the sailing directions.

Selected Ships.

In making their routine wireless weather reports to all ships (C.Q.) Selected ships may give material aid to navigation by including the set and drift of current found when considered reliable. This practice of broadcasting the set and drift of current found between Stellar fixes at sunset and dawn twilight in the next routine W/T weather report also helps in our investigation of the currents in all parts of the world and may be the means of improving knowledge of the causes, variations and peculiarities of currents.

When the set and drift is included the code message may be conveniently shortened thus:

C.Q. WEATHER 13167 55106 00000 16979 Current
From 15N. 52E. To 16N. 54E.
58° one knot. *Dalgoma*.

Example taken from Selected Ships' Register Form 138 of M.V. *Dalgoma* for March 5th, 1933, supplementary groups of code figures being omitted.

POSTAL ARRANGEMENTS.

The quarterly numbers of the MARINE OBSERVER are published on the last Wednesdays of December, March, June and September, while the monthly supplements are published on the last Wednesday of the intervening months.

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

S.S. Captain
Port of Call
Date of Homeward Departure
Postal Address

When this information is not given The MARINE OBSERVER or Supplement will be addressed to the Commanding Officer, S.S., c/o the owners, and captains are requested to make their own arrangements for forwarding.

DESPATCH OF INFORMATION

REQUIRED IMMEDIATELY FOR THE CONDUCT OF THE WORK AT SEA.

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

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

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

LATE NOTICES.

The special attention of all concerned, afloat and ashore with the service of Ships Wireless Weather Reports in all parts of the World is invited to "World Wide System of Voluntary Selected Ships Routine Wireless Weather Reports" published on pages 27 to 31 in this number.

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. 7.9.33 to 6.12.33.	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 23.8.33 to 26.11.33	4.12.33
055 *† <i>Actor</i> ...	T. Chapman ...	E. Pearce, C. P. Vaughan, G. Penston.	C. P. Mason ...	M.	Harrison ...	" " 24.7.33 to 14.9.33	29.9.33
123 †† <i>Adda</i> , M.V. ...	J. H. Lawson ...	E. Moore, J. E. Clarke.	A. J. L. Edwards	M.-S.	Elder Dempster	" " 7.9.33 to 14.10.33	18.10.33
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
090 *† <i>Aeneas</i> ...	J. Hatfield ...	C. H. Whitehouse, F. H. Barley, H. Munday.	I. E. Jones ...	S.	" ...	Fms. 911 & 138 19.7.33 to 7.10.33	10.10.33
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 ...	"	"	" " 13.11.33 to 21.11.33	1.12.33
<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	"	Shaw Savill ...	" 20.5.33 to 30.8.33	6.9.33
<i>Alban</i> ...	R. B. Furneaux ...	F. R. Holman, R. Parry, F. M. Lyons.	" ...	"	Booth ...	" 7.12.33 to 17.9.33	21.9.33
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. Caldwell ...	S.	Royal Mail ...	" " 4.6.33 to 20.11.33	22.11.33
012 †† <i>Almeda Star</i> ...	H. C. Howard ...	R. T. Hales, D. R. Rassall, R. Mellwraith.	R. N. Austin ...	M.	Blue Star ...	" " 24.7.33 to 8.11.33	15.11.33

THE MARINE OBSERVER

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
022 *† <i>Alynbank</i> ...	D. Gillies ...	S. Morris, A. Hunter, E. Binfield.	... ..	M.L.	A. Weir ...	Fm. 915 ... 26.11.32 to 22.4.33	19.6.33
103 †† <i>Amarapoora</i> ...	W. C. C. Plage ...	G. G. McPherson, R. M. Thorne, M. B. M. Tallack.	W. Dawson ...	S.	Henderson ...	Fms. 911 & 138 4.9.33 to 18.10.33	25.10.33
209 †† <i>Aorangi</i> , M.V. ...	J. F. Spring-Brown ...	J. W. S. Madden, G. M. Power, L. P. Bourke.	G. M. Power ...	M.L.	Canadian-Australasian.	Fm. 915 2.2.33 to 20.5.33	1.8.33
120 †† <i>Apapa</i> , M.V. ...	T. Spence ...	C. V. Evans, R. Mercer ...	J. Rea ...	M.-S.	Elder Dempster	Fms. 911 & 138 26.7.33 to 28.10.33	3.11.33
029 †† <i>Appam</i> ...	J. M. Draper ...	W. M. M. Hutchings, R. K. Palmer, B. C. Haigh.	R. J. Dowling ...	S.	" "	" " 9.8.33 to 13.11.33	14.11.33
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 ...	" " 27.8.33 to 7.11.33	9.11.33
115 †† <i>Arandora Star</i> ...	E. W. Moulton ...	H. F. Partridge, R. S. Hopper.	C. W. Herbert ...	M.-S.	Blue Star	" " 20.8.33 to 2.11.33	4.11.33
114 *† <i>Ariguani</i> ...	J. H. H. Scudamore, D.S.C., R.D., Commr., R.N.R.	W. E. Grant, T. Crane, R. S. Howlett.	E. M. Evans ...	S.	Elders & Fyffes	" " 22.8.33 to 4.11.33	8.11.33
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 ...	" " 10.9.33 to 22.10.33	25.10.33
091 †† <i>Armada Castle</i> ...	H. B. Harvey ...	W. R. Andrews, G. W. Lloyd.	E. P. Haslam ...	"	Union Castle ...	" " 5.8.33 to 23.9.33	26.9.33
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 ...	" " 15.8.33 to 3.12.33	5.12.33
280 *† <i>Astronomer</i> ...	J. Richards ...	W. P. Baker, B. Williams, E. B. Stephens.	"	M.	Harrison ...	" " 10.1.33 to 8.4.33	22.4.33
062 †† <i>Asturias</i> , M.V. ...	B. Shillitoe, R.D., Commr., R.N.R.	H. H. Treweek, C. C. Prosser, J. Rous.	J. T. Williams ...	S.	Royal Mail ...	" " 2.8.33 to 6.11.33	11.11.33
061 †† <i>Atlantis</i> ...	A. Purvis ...	F. E. C. Cox, C. Collinson ...	T. Bradfield ...	M.-S.	"	" " 7.9.33 to 9.11.33	18.11.33
281 *† <i>Auditor</i> ...	G. R. Windsor ...	A. H. Thompson, W. A. Pemberton.	A. Gregg ...	M.	Harrison ...	" " 23.5.33 to 25.7.33	2.8.33
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	" " 13.8.33 to 29.11.33	1.12.33
124 †† <i>Avila Star</i> ...	R. J. Thomas ...	F. N. Johnson, W. Hall, E. Lowndes.	B. King ...	M.	"	Fms. 911 & 138 13.8.33 to 29.11.33	1.12.33
068 †† <i>Balmoral Castle</i> ...	J. Attwood ...	A. C. G. Price, G. F. Oakley, H. Bunn.	J. Sharp ...	S.	Union Castle ...	" " 9.9.33 to 29.10.33	31.10.33
179 *† <i>Balranald</i> ...	C. E. Short ...	J. C. Davies, F. W. J. Pearce, C. S. Pirie.	F. Arthurs ...	M.	P. & O. Branch	" " 8.7.33 to 9.9.33	15.9.33
248 *† <i>Banffshire</i> ...	A. W. P. Gibb ...	R. F. Buckley, F. H. Petherbridge, J. O. H. Kirkwood.	W. M. Ewing ...	"	Turnbull Martin	" " 4.8.33 to 16.9.33	28.9.33
180 *† <i>Baradine</i> ...	W. D. C. Smith ...	R. G. Wood, G. W. Wood, A. E. Clay.	J. S. Skinner ...	"	P. & O. Branch ...	" " 8.8.33 to 7.11.33	11.11.33
037 *† <i>Baronesa</i> ...	R. W. Compton ...	J. R. Faulkner, F. G. Kent, J. G. Freeman.	J. G. Seatter ...	"	Houlder ...	" " 3.7.33 to 7.9.33	11.9.33
181 *† <i>Barraboo</i> ...	J. S. Sheepwash ...	J. D. Strike, A. Gething, T. Watkins.	R. Rowley ...	"	P. & O. Branch ...	" " 15.5.33 to 13.8.33	23.8.33
070 †† <i>Bayano</i> ...	A. W. Legge ...	J. Cameron, W. P. Page, W. Dodd.	R. E. Blizzard ...	S.	Elders & Fyffes	" " 14.9.33 to 25.11.33	28.11.33
183 †† <i>Bendigo</i> ...	F. N. Wyatt ...	H. T. Ridgen, T. Hopkins ...	F. W. Rose ...	M.-S.	P. & O. Branch ...	" " 9.7.33 to 10.10.33	12.10.33
237 †† <i>Berengaria</i> ...	E. T. Britten, R.D., Capt., R.N.R.	R. H. C. Crawford, E. R. Taylor, S. St. G. Tayne.	J. N. Cragg ...	S.	Cunard ...	" " 3.9.33 to 4.12.33	6.12.33
145 *† <i>Bervickshire</i> ...	E. H. Evans ...	E. Coulthart, J. C. Robertson, S. R. J. Wood.	F. Smith ...	"	Turnbull Martin...	Fm. 912 " 3.9.33 to 4.12.33	6.12.33
<i>Birchbank</i> ...	E. M. Skelly ...	J. Stewart, L. Warner, J. Mountain.	"	M.L.	A. Weir ...	Fms. 911 & 138 20.7.33 to 4.10.33	9.10.33
007 *† <i>Bradfyne</i> ...	J. O'Neill ...	P. Evans, F. W. Burn, O. E. Brown.	C. K. Castle ...	S.	Reardon Smith	Fm. 915 23.12.32 to 13.8.33	12.9.33
<i>Brighton</i> ...	A. Hill ...	E. Balcombe ...	"	"	"	Fm. 911 23.5.33 to 26.10.33	21.11.33
057 †† <i>Britannic</i> , M.V. ...	C. P. Freeman, R.D., Commr., R.N.R.	A. J. Fisher, O. V. Lucas, A. E. Harvey.	S. Wood ...	"	Southern Rly. ...	Telegraphic Report 5.12.33 ...	5.12.33
269 *† <i>British Admiral</i> ...	F. I. Taylor ...	W. Steele, J. Aitken ...	J. B. Stone ...	"	White Star ...	Fms. 911 & 138 11.9.33 to 25.11.33	28.11.33
<i>British Corporal</i> ...	R. O. Puff ...	W. Hill ...	"	"	British Tankers ...	Fms. 911 & 138 25.7.33 to 23.11.33	28.11.33
<i>British Enterprise</i> ...	H. S. McMichael ...	J. T. Hamlyn ...	"	"	"	"	"
249 *† <i>Buteshire</i> ...	C. A. I. Laird ...	J. D. Elvish, P. McMillan, W. V. Storey.	E. B. Place ...	S.	Turnbull Martin	Fms. 911 & 138 14.4.33 to 12.10.33	26.10.33
031 †† <i>Caledonia</i> ...	A. Collie ...	R. Blake, T. K. McMillan, A. C. Johnston.	— Wilkie ...	S.	Anchor ...	" " 20.8.33 to 12.11.33	15.11.33
139 †† <i>California</i> ...	R. W. Smart ...	J. F. Adams, R. L. Adamson, B. Manfield.	W. Thompson ...	"	"	" " 25.7.33 to 26.11.33	4.12.33
<i>Cambria</i> ...	E. B. Turner ...	Y. A. Phillips ...	J. Pritchard ...	"	L.M. & S. Rly. ...	Telegraphic Report 6.12.33 ...	6.12.33
190 *† <i>Cambridge</i> ...	R. Williams ...	W. Redwood, T. E. Davies, V. Canton.	P. Fleming ...	M.L.	Federal ...	Fm. 915 22.5.33 to 12.9.33	20.9.33
266 †† <i>Cameronia</i> ...	W. Gemmel ...	D. Blair, E. Stormont, L. Taylor.	J. Fleming ...	S.	Anchor ...	Fms. 911 & 138 7.9.33 to 26.11.33	28.11.33
086 †† <i>Camito</i> ...	D. A. Jack ...	T. H. Bull, J. McIntyre, C. K. Horrocks.	L. H. Fudge ...	"	Elders & Fyffes ...	" " 28.9.33 to 30.10.33	10.11.33
259 *† <i>Canonesa</i> ...	W. H. Brodie ...	E. J. L. Stone ...	J. W. Rawlin ...	M.	Houlder ...	Fm. 911 5.5.33 to 31.8.33	2.9.33
117 *† <i>Cape of Good Hope</i> ...	T. A. Jacobson ...	D. W. Taylor, A. Peacock ...	F. Groves ...	S.	Lyle S.S. Co. ...	Fms. 911 & 138 28.7.33 to 3.10.33	14.10.33
092 †† <i>Carnarvon Castle</i> , M.V. ...	C. E. Stuart, R.D., Capt., R.N.R.	H. L. Shaw, G. L. Clarke, D. D. Mackenzie.	B. Ferguson ...	"	Union Castle ...	" " 17.9.33 to 5.11.33	7.11.33
155 †† <i>Carthage</i> ...	H. M. Jack ...	H. J. Cholerton, G. Sparks, H. J. Mann.	A. Macbeth ...	M.-S.	P. & O. ...	" " 9.7.33 to 11.10.33	23.10.33
184 †† <i>Cathay</i> ...	H. Elliot Smith, R.D., Lt.-Commr., R.N.R.	A. J. McHattie, E. Cowell, H. C. C. Forsyth.	S. W. Sharp ...	"	"	" " 11.8.33 to 2.11.33	4.11.33
011 †† <i>Ceramic</i> ...	W. J. Saunders ...	R. G. Roberts, J. Farrus ...	W. M. Ross ...	S.	White Star ...	" " 11.4.33 to 15.5.33	24.5.33
191 *† <i>Chindwin</i> ...	G. Paterson ...	C. C. Weir ...	A. C. Headley ...	"	Henderson ...	" " 2.7.33 to 13.9.33	18.9.33
067 *† <i>Chinese Prince</i> ...	W. Irvine ...	B. J. Jenkins, I. P. Ellis, J. H. C. Torr.	D. T. Roberts ...	M.L.	Furness Withy ...	Fm. 915 " 26.4.33 to 6.9.33	16.10.33
192 †† <i>Chitral</i> ...	O. Siggers ...	G. L. Bateman, F. D. Shaw, J. Stansfield.	E. L. Boyce ...	M.-S.	P. & O. ...	Fms. 911 & 138 17.6.33 to 21.9.33	25.9.33
051 *† <i>City of Auckland</i> ...	W. Rowlands ...	A. G. Freeman, J. W. Cubbon, B. Walker.	P. J. McKeon ...	S.	Ellerman ...	" " 23.7.33 to 2.10.33	30.10.33
<i>City of Barcelona</i> ...	W. Hill ...	J. McK. Amot ...	"	M.	"	Fm. 911 " 25.9.33 to 16.10.33	14.11.33
265 *† <i>City of Baroda</i> ...	H. Percival ...	R. H. Broadbent, R. E. Harnsford, J. C. Barnes.	H. Shaw ...	S.	"	Fms. 911 & 138 10.9.33 to 11.11.33	15.11.33
<i>City of Cairo</i> ...	E. G. Hoppins ...	L. Herman ...	"	M.	"	Fm. 911 " 8.5.33 to 1.6.33	14.6.33
013 *† <i>City of Cambridge</i> ...	R. E. Teague ...	J. T. Keith ...	"	S.	"	" " 10.7.33 to 20.10.33	13.11.33
<i>City of Canton</i> ...	H. Lloyd ...	R. A. Foort, J. H. Willox, L. Boundy.	"	M.	"	" " 5.8.33 to 18.11.33	27.11.33

FLEET LIST

iii

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
157 *† <i>City of Delhi</i> ... <i>City of Dieppe</i> ...	A. Hogg ... S. C. Gardner ...	A. Travis, F. H. Revel ... J. Hudson, J. P. A. Arthur, N. F. Ayres.	S. Connell ...	S. M.L.	Ellerman...	Fms. 911 & 138 2.5.33 to 14.7.33 Fm. 915 13.5.33 to 24.10.33	18.8.33 6.11.33
220 †† <i>City of Evansville</i> ... <i>City of Exeter</i> ...	W. Keasley ... D. M. Bremner ...	F. W. Woods ... J. W. Wotherspoon, E. A. Davidson, W. Gibb.	T. Fleetwood ...	M. S.	"	Fm. 911 1.8.33 to 6.10.33 Fms. 911 & 138 27.8.33 to 30.10.33	18.10.33 18.11.33
089 *† <i>Clan Farquhar</i> ... <i>City of Hereford</i> ...	R. M. Robertson ... C. V. Avery ...	H. G. Spalton ... F. A. Waters, J. W. Nesbitt, R. S. Webber.	J. Murray ...	M.	"	Fms. 911 & 138 6.7.33 to 20.9.33	25.9.33
028 †† <i>City of London</i> ...	J. G. Brown ...	B. E. Hooper, E. W. Gillies, W. H. Charlton ...	L. J. Hadler ...	S.	"	" 29.9.33 to 28.11.33	4.12.33
<i>City of Lyons</i> ...	H. Johnston ...	— Potter ...	"	M.	"	"	"
066 †† <i>City of Nagpur</i> ...	N. McNeil, O.B.E.	"	"	"	"	"	"
074 †† <i>City of Paris</i> ...	W. S. Jackson ...	A. Hamilton, A. Macfie, — Morrison.	V. Murphy ...	"	"	Fms. 911 & 138 12.10.33 to 3.11.33	4.12.33
<i>City of Perth</i> ...	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 *† <i>City of Roubaix</i> ...	W. Gray ...	C. Collard, W. H. Dalton, J. H. Owen.	J. W. Alexander ...	M.	"	Fms. 911 & 138 27.7.33 to 24.11.33	4.12.33
272 *† <i>City of Singapore</i> ...	T. Cooper ...	D. G. Lister ...	J. W. Carroll ...	"	"	" 7.8.33 to 17.10.33	30.11.33
035 *† <i>City of Sydney</i> ...	F. McKay ...	J. Kirby, R. W. May, R. A. Jones.	L. C. Cox ...	"	"	" 9.8.33 to 17.10.33	23.10.33
167 *† <i>City of Tokio</i> ...	R. R. Spurring ...	W. L. Butler, G. R. Jackson, G. R. Gill.	J. Fallon ...	S.	"	Fm. 915 22.3.33 to 27.8.33	20.9.33
125 *† <i>City of Windsor</i> ...	N. G. Oswald ...	A. E. King, E. H. Lynes, R. W. A. Johns.	W. M. R. Aspin ...	"	"	Fms. 911 & 138 11.8.33 to 8.10.33	9.10.33
160 *† <i>City of Winnipeg</i> ...	R. J. Ricketts ...	F. Tibbett, G. Longfield, D. W. Penberthy.	"	"	"	Fm. 911 8.8.33 to 1.11.33	4.12.33
<i>City of Yokohama</i> ...	J. A. Singleton ...	"	"	"	"	"	"
050 *† <i>Clan Macalister</i> ...	F. J. Stenson, R.D., A.D.C., Capt., R.N.R.	H. Duncan, S. J. Strange ...	E. Hervey ...	"	Clan	Fms. 911 & 138 17.9.33 to 7.10.33	31.10.33
241 *† <i>Clan Macbeth</i> ...	H. Andrews ...	H. Whitehead, A. V. Howard, P. N. Colepeper.	G. L. Brown ...	"	"	" 25.3.33 to 23.10.33	30.10.33
222 *† <i>Clan Macdougall</i> ...	R. F. Redford ...	T. W. Ellis, D. F. Sutton, G. Snelgrove.	A. Robson ...	"	"	" 10.7.33 to 9.11.33	21.11.33
287 *† <i>Clan Macfarlane</i> ...	W. J. Hughes ...	J. H. Wright, J. R. Moss, C. W. B. Mitchell.	W. Findlay ...	"	"	" 17.8.33 to 14.9.33	19.9.33
118 *† <i>Clan Macindoe</i> ...	H. E. G. Scott-Smith, O.B.E., R.D., Lt.-Commr., R.N.R.	J. B. Dunphy, C. R. Wheat, H. D. Neil.	J. C. Hodgkin ...	"	"	" 16.8.33 to 26.10.33	31.10.33
233 *† <i>Clan Mackellar</i> ...	N. J. Haynes ...	J. J. Stormont ...	E. Woolhouse ...	"	"	Fm. 911 5.1.33 to 30.1.33	13.3.33
<i>Clan Macnair</i> ...	W. G. Holman ...	A. W. Daish ...	A. Huey ...	"	"	" 3.11.33 to 26.11.33	6.12.33
255 *† <i>Clan Macneil</i> ...	A. Low ...	B. A. Hardinge, H. F. Town, B. H. Magill.	"	"	"	" 22.7.33 to 13.10.33	18.10.33
001 *† <i>Clan Macphee</i> ...	W. Calderwood ...	J. Dulton, R. G. Bagnall, H. Hind.	J. B. Allan ...	"	"	Fms. 911 & 138 1.10.33 to 8.11.33	4.12.33
168 *† <i>Clan Mactaggart</i> ...	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 *† <i>Clan Macwhirter</i> ...	P. Macfarlane ...	A. S. Palethorpe ...	"	"	"	" 14.7.33 to 14.11.33	30.11.33
003 *† <i>Clan Malcolm</i> ...	H. Cater ...	K. Banks, D. Sutton ...	J. Cruickshank ...	"	"	" 12.3.33 to 30.5.33	8.6.33
233 *† <i>Clan Morrison</i> ...	R. P. Galer, R.D., Commr., R.N.R.	A. Hambley, E. Croucher, J. Brodie.	W. Cracknel ...	"	"	" 12.10.33 to 21.10.33	25.10.33
279 *† <i>Clan Urquhart</i> ...	G. Young ...	J. Millar, N. Graham, J. Higgins.	"	M.	"	Fm. 911 5.8.33 to 3.9.33	9.10.33
<i>Colonial</i> ...	W. E. Harraden ...	W. S. Eustace ...	"	"	Harrison	" 11.7.33 to 26.9.33	30.9.33
187 *† <i>Comedian</i> ...	A. Cadogan ...	E. Whitehouse, T. Glover, S. Richardson.	J. H. Fewster ...	"	"	Fms. 911 & 138 28.2.33 to 8.5.33	12.5.33
016 *† <i>Comliebank, M.V.</i> ...	S. Currie ...	C. R. Aiken, L. St. J. French, W. A. McMoreland.	M. Timlin ...	S.	A. Weir ...	" 23.8.33 to 15.11.33	4.12.33
185 †† <i>Comorin</i> ...	C. W. Cartwright, D.S.C.	R. E. Tucker, D. Meikle, D. S. Charles.	E. Habicht ...	M.-S.	P. & O. ...	" 21.5.33 to 23.8.33	25.8.33
198 *† <i>Contractor</i> ...	D. L. Whyte ...	W. F. O'Neill, L. Seddon, R. Myles.	T. Cartwright ...	M.	Harrison	" 22.5.33 to 20.9.33	11.10.33
<i>Coptic, M.V.</i> ...	D. Christie ...	P. Saville, G. A. Harvey, S. Wallis.	D. M. Edwards	M.L.	Shaw Savill & Albion.	" 8.5.33 to 5.8.33	12.8.33
258 †† <i>Corfu</i> ...	E. M. Coates, Lt. Commr., R.N.R.	C. S. Cooke, H. M. Askin, J. T. Sheffield.	A. S. Fraser ...	M.-S.	P. & O. ...	" 17.8.33 to 9.11.33	11.11.33
100 *† <i>Cornwall</i> ...	A. E. Lettington ...	G. Dibley, T. M. Devitt, N. Baddeley.	"	M.L.	Federal ...	Fm. 915 12.12.32 to 15.4.33	19.4.33
008 †† <i>Coronado</i> ...	R. A. Thorburn, R.D., Commr., R.N.R.	G. E. Milner, J. T. H. Hillman	W. Oakley ...	S.	Elders & Fyffes ...	Fms. 911 & 138 17.8.33 to 10.11.33	18.11.33
214 *† <i>Counsellor</i> ...	J. Jackson ...	A. A. Heaton, J. Davidson, G. Roderick.	N. L. Hainsworth	M.	Harrison	" 4.6.33 to 14.10.33	23.10.33
<i>Cressado</i> ...	A. Jackson ...	"	"	M.L.	Ellerman...	"	"
036 *† <i>Cumberland</i> ...	T. L. Maltby ...	H. H. Mackillican, W. G. Evans, R. A. Bellfield.	J. Yorstan ...	S.	Federal ...	Fms. 911 & 138 9.4.33 to 17.7.33	22.7.33
285 *† <i>Custodian</i> ...	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 *† <i>Dalgoma</i> ...	P. H. Beeching ...	H. E. Evans, J. G. Bishop, R. D. Macfadyen.	C. F. Coward ...	M.	British India ...	Fms. 911 & 138 11.9.33 to 5.10.33	30.10.33
<i>Deebank</i> ...	J. Robertson ...	D. I. C. Robertson, W. Olding, S. Eperon.	"	M.L.	A. Weir ...	Fm. 915 24.2.33 to 18.7.33	6.9.33
260 *† <i>Defender</i> ...	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 †† <i>Deseado</i> ...	O. V. Schlanbusch ...	R. Hey, F. A. C. Thacker, A. Ballardie.	A. W. Davey ...	M.-S.	Royal Mail	" 27.8.33 to 19.10.33	23.10.33
138 *† <i>Designer</i> ...	W. A. Hansen ...	G. J. Crispin ...	"	M.	Harrison	Fm. 911 9.7.33 to 19.9.33	3.10.33
252 *† <i>Devon</i> ...	P. B. Clarke, D.S.C.	G. Chaplin, G. Shepherd, R. Coen.	J. J. McCarthy...	"	Federal ...	Fms. 911 & 138 7.5.33 to 11.6.33	20.6.33
<i>Diplomat</i> ...	H. A. Brown ...	J. H. Roberts ...	"	"	Harrison	Fm. 911 30.4.33 to 3.6.33	7.7.33
284 *† <i>Director</i> ...	B. Worthington ...	A. E. Rogers, H. W. Jones...	D. Mackoe ...	"	"	Fms. 911 & 138 14.8.33 to 6.9.33	23.11.33
<i>Discoverer</i> ...	W. Rowberry ...	E. P. Simmons ...	"	"	Fm. 911 27.5.33 to 19.7.33	25.7.33	"
251 *† <i>R.R.S. Discovery II.</i> ...	A. L. Nelson ...	L. C. Hill ...	"	M.L.	Falkland Is. Govt.	"	"
136 *† <i>Doric Star</i> ...	S. N. Capon ...	A. F. Day, E. P. S. Lewis, G. McIntyre.	H. Glover ...	"	Blue Star ...	Fms. 911 & 138 5.3.33 to 18.6.33	4.7.33
275 *† <i>Dramatist</i> ...	A. J. Meek ...	R. L. Bryde, G. H. Howard, C. V. Watts.	M. Canty ...	"	Harrison	" 3.9.33 to 18.11.33	22.11.33
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 3.9.33 to 17.11.33	21.11.33

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
152 †† <i>Duchess of Bedford.</i>	H. Sibbons ...	L. Outram, F. Stell, S. W. Sharp.	H. G. Hill ...	M.-S.	Canadian Pacific	Fms. 911 & 138 3.9.33 to 2.11.33 Fm. 912 3.9.33 to 2.11.33	4.11.33 6.11.33
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 ...	"	"	Fms. 911 & 138 27.8.33 to 9.11.33	11.11.33
143 †† <i>Duchess of York</i>	R. N. Stuart, V.C., D.S.O., R.D., Commr., R.N.R.	T. L. Gillett, S. W. Keay, J. Stewart.	J. Potts ...	"	"	Fms. 911 & 138 20.8.33 to 25.11.33 Fm. 912 20.8.33 to 30.10.33	28.11.33 30.10.33
290 *† <i>Dumana</i> ...	H. T. Hudson, R.D., Commr., R.N.R.	W. M. Bain ...	... ..	M.	British India	... ..	...
098 †† <i>Dunbar Castle,</i> M.V.	C. N. Bickford ...	L. H. Farrow, J. Trayner ...	P. P. Williams...	S.	Union Castle	Fms. 911 & 138 22.7.33 to 24.9.33	26.9.33
052 *† <i>Dunster Grange,</i> M.V.	R. Smiles ...	E. G. Raynor, D. Murray, R. G. Williams.	S. K. Alston ...	M.	Houlder ...	" " 19.6.33 to 24.8.33	26.8.33
102 *† <i>Duquesa</i> ...	C. R. Frost ...	A. McEwan, R. F. Martin, H. W. Bammall.	H. Croker ...	"	Furness Withy ...	" " 31.7.33 to 3.10.33	10.10.33
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
<i>Eastern Coast</i> ...	W. Quirk ...	... ..	... ..	M.L.	Coast Lines	... ..	...
077 †† <i>Edinburgh Castle</i>	A. Barron ...	H. Close, R. F. Bayer, J. D. Crombie.	A. Blow ...	S.	Union Castle	Fms. 911 & 138 23.7.33 to 12.11.33	14.11.33
107 *† <i>El Argentino,</i> M.V.	F. Ellis, D.S.C. ...	W. Findlay, G. Brighton, C. G. Adlard.	E. Lovelock ...	M.	Houlder ...	" " 17.7.33 to 19.9.33	27.9.33
009 *† <i>Elmucorth,</i> M.V.	J. Dick ...	R. Newlands ...	K. A. Allington	"	R. S. Dalgleish ...	" " 7.8.33 to 8.10.33	2.11.33
158 *† <i>Elpenor</i> ...	R. J. Wilson ...	F. Stott, A. J. Peard, W. Stanger.	D. T. Perks ...	S.	A. Holt ...	" " 3.9.32 to 22.12.32	29.12.32
108 *† <i>Elstree Grange...</i>	W. E. Williams ...	P. A. Hawkesworth, W. F. Heritage.	R. Tilzey ...	M.	Houlder ...	" " 20.6.33 to 22.7.33	7.9.33
109 *† <i>El Paraguay</i> ...	R. Owen ...	F. G. Rice, R. L. Aldridge, W. E. Heworth.	C. Donaldson ...	"	"	" " 10.7.33 to 13.9.33	23.9.33
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
034 †† <i>Empress of Britain.</i>	R. G. Latta ...	D. Dunn, N. W. Duck, N. B. Stapleton.	L. B. Cleary ...	"	Canadian Pacific	Fm. 912 27.8.33 to 14.11.33 Fm. 915 27.8.33 to 17.9.33	16.11.33 17.9.33
154 †† <i>Empress of Canada.</i>	A. J. Hailey, Lt.-Commr., R.N.R.	F. Poole, W. C. Halliday, G. E. Morrell.	R. D. Thomas ...	M.L.	"	" " 11.3.33 to 11.7.33	13.9.33
153 †† <i>Empress of Japan</i>	L. D. Douglas, R.D., Lt.-Commr., R.N.R.	A. Kennedy, A. Alltree, R. Wolfenden.	J. McClure ...	"	"	" " 11.12.32 to 31.5.33	10.7.33
134 *† <i>Esperance Bay</i>	R. McKenzie ...	A. J. Tillott ...	... ..	M.	Aberdeen Commonwealth.	... ..	...
049 *† <i>Fordsdale</i> ...	J. Avera, Commr., R.N.R.	L. B. Miller ...	... ..	S.	Shaw Savill	... ..	...
239 *† <i>Foylebank</i> ...	C. S. Newton ...	... ..	... ..	"	A. Weir ...	... ..	...
030 †† <i>Franconia</i> ...	J. C. Townley, R.D., Capt., R.N.R.	P. G. Britten, W. B. Tanner, J. Ashcroft.	J. Harvey ...	"	Cunard ...	Fms. 911 & 138 12.10.33 to 15.10.33	18.10.33
159 *† <i>Fresno City</i> ...	D. Davies ...	B. E. Duffield, R. E. Shilstone, F. W. P. Davies.	E. Torr ...	"	Reardon Smith	Fm. 915 9.12.32 to 21.4.33	2.5.33
186 †† <i>Georgic</i> ...	F. F. Summers, R.D., Commr., R.N.R.	W. G. Jones, J. H. Walker, J. Law.	H. S. Reid ...	S.	White Star	Fms. 911 & 138 25.8.33 to 10.11.33 Fm. 912 25.8.33 to 17.10.33	14.11.33 17.10.33
234 *† <i>Glaucus</i> ...	G. Leslie ...	S. G. Ellams, F. O. Browning	J. C. Wilson ...	M.L.	A. Holt ...	Fm. 915 9.3.33 to 26.7.33	6.9.33
126 *† <i>Glengarry,</i> M.V.	J. Angier ...	R. W. Brooks, P. G. Neill, S. W. Bell.	C. N. Lawrence	M.	Glen ...	Fms. 911 & 138 31.7.33 to 11.11.33	16.11.33
085 *† <i>Governor</i> ...	D. Flynn ...	A. Watson, J. Stanhope, H. Collins.	A. W. Sparrow...	"	Harrison	" " 23.5.33 to 21.8.33	25.8.33
111 *† <i>Hardwicke Grange</i>	W. H. Fowler ...	W. L. Baker, A. O. Seybold, W. E. Ellis.	C. O'Sullivan ...	M.	Houlder ...	" " 10.4.33 to 8.6.33	17.6.33
218 *† <i>Harmonides</i> ...	F. R. Elwell ...	E. E. Avery, C. Hare, T. G. Mitchell.	F. McCarthy ...	S.	R. P. Houston	" " 10.7.33 to 25.10.33	4.12.33
262 *† <i>Hauraki,</i> M.V.	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
253 *† <i>Hertford</i> ...	J. Burton Davies	A. V. Pearce, W. H. Timberlake, N. L. Warren.	P. Moroney ...	S.	Federal	Fms. 911 & 138 30.5.33 to 7.10.33	24.11.33
<i>Hibernia</i> ...	J. R. Bulmer ...	R. Woodall ...	... ..	"	L.M. & S. Railway	Telegraphic Report 11.11.33	11.11.33
182 †† <i>Highland Brigade</i>	C. A. Cocks ...	C. K. Brown, F. W. Harvey.	G. Grieve ...	M.-S.	Royal Mail	Fms. 911 & 138 17.9.33 to 7.11.33	11.11.33
116 †† <i>Highland Chieftain</i> M.V.	A. E. Turner ...	G. Spalding, H. Chamberlain, G. J. James.	J. Malcolm ...	"	"	" " 24.8.33 to 8.10.33	13.10.33
099 †† <i>Highland Monarch</i> M.V.	R. G. Clayton, D.S.C., R.D., Commr., R.N.R.	R. N. Fletcher, E. V. Scullard, R. E. Slinn.	M. J. Carpenter	"	"	" " 7.8.33 to 26.9.33	5.10.33
230 †† <i>Highland Patriot</i>	R. A. Robinson ...	G. Taggart, F. Dawson, W. B. Tennent.	J. Hilton ...	"	"	" " 27.7.33 to 19.11.33	25.11.33
250 †† <i>Highland Princess</i> M.V.	D. Collings ...	W. Paine, T. Stevens, H. Davies.	H. Morgan ...	"	"	" " 7.9.33 to 22.10.33	9.11.33
075 *† <i>Hobson's Bay</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
026 †† <i>Homeric</i> ...	F. A. Frank, D.S.O., R.D., Commr., R.N.R.	B. Harrison, H. Morgan, J. Waltaire.	F. A. Bradley ...	S.	White Star	" " 31.8.33 to 17.10.33	20.10.33
261 *† <i>Huntingdon</i> ...	H. G. B. Field ...	C. W. Roberts, T. K. MacDonald, E. Rae.	A. Mugridge ...	"	Federal	" " 24.6.33 to 21.10.33	30.10.33
200 *† <i>Huntsman</i> ...	H. Russell ...	J. Richardson, D. Goddard.	J. J. Smith ...	M.	Harrison	" " 1.5.33 to 5.9.33	9.9.33
235 *† <i>Hurunui</i> ...	F. C. Pretty, D.S.C. ...	R. Dunning, T. Farrar, J. C. Cordran.	C. Beadell ...	S.	New Zealand Shipping.	" " 4.3.33 to 26.5.33	10.6.33
289 *† <i>Inanda</i> ...	W. H. Gibbings ...	T. B. Littlechild, W. S. Eustance, G. McGuiness.	E. J. Cook ...	M.	Harrison	" " 20.8.33 to 22.11.33	29.11.33
<i>Ingoma</i> ...	J. T. Ling ...	D. Douglas-Kerr ...	... ..	"	"	Fm. 911 17.9.33 to 25.10.33	8.11.33
189 *† <i>Ionic</i> ...	W. H. P. Jackson ...	R. H. Shaw ...	S. A. Sorrell ...	S.	White Star	Fms. 911 & 138 12.8.33 to 23.11.33	1.12.33
<i>Ixion</i> ...	T. B. Marsham...	P. L. Pallot, H. E. Readshaw, G. H. Smith.	... ..	M.L.	A. Holt ...	Fm. 915 3.8.33 to 18.10.33	22.11.33
226 *† <i>Javanese Prince,</i> M.V.	J. Smith ...	W. M. Henry, R. Scott, E. S. Oberdorf.	A. Norrie ...	M.L.	Prince ...	" " 24.2.33 to 11.8.33	18.9.33

FLEET LIST

v

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received
188.†† <i>Kaisar-i-Hind</i> ...	W. A. Cotching ...	J. Travis, F. M. Squire, H. Toon.	R. V. McCrath	M.-S.	P. & O. ...	Fms. 911 & 138 12.8.33 to 21.11.33	25.11.33
041 *† <i>Karama</i> , M.V.	W. Dawson ...	W. Hill, N. S. Milne, C. W. Sendall.	J. F. G. Sendall	S.	Shaw Savill & Albion.	Fm. 912 22.6.33 to 11.9.33	26.9.33
<i>Kemmendine</i> ...	R. B. Reid ...	A. R. McPherson ...	...	M.	Henderson ...	Fm. 911 15.7.33 to 27.9.33	2.10.33
147 †† <i>Laconia</i> ...	B. B. Oram, R.D., Commr., R.N.R.	E. W. Connell, E. Gleave, J. D. Archer.	W. McArdle ...	S.	Cunard ...	Fms. 911 & 138 22.8.33 to 2.12.33	5.12.33
193 *† <i>Lahore</i> ...	J. H. Hollow ...	F. Hull, D. I. Spencer, S. R. Eva.	R. C. Lobb ...	M.	P. & O. ...	9.7.33 to 2.9.33	6.10.33
082 *† <i>La Paz</i> , M.V. ...	R. J. Hough ...	G. Pattison, R. Roberts, S. E. Ayland.	A. B. Carr ...	„	Pacific S.N. Co.	1.11.32 to 21.2.33	1.3.33
076 *† <i>Largs Bay</i> ...	W. M. Jermyn ...	C. Meyer, N. Miller, H. Clark	S. P. Lewis ...	„	Aberdeen Commonwealth.	22.6.33 to 21.9.33	27.9.33
112 *† <i>La Rosarina</i> ...	C. Webb ...	W. S. Hamblin, T. C. Towns- end, S. W. Howell.	J. Hunt ...	„	Houlder ...	7.8.33 to 13.10.33	19.10.33
267 *† <i>Lassell</i> ...	V. G. Hickman ...	T. J. Sweeney, W. Gillespie, W. Kimmings.	S. Foster ...	S.	Lamport & Holt	20.8.33 to 2.11.33	9.11.33
083 *† <i>Lautaro</i> , M.V. ...	J. H. Kirkwood ...	J. Williams, G. B. Wardale...	D. Irwin ...	M.	Pacific S.N. Co....	17.7.33 to 7.11.33	11.11.33
254 *† <i>Limerick</i> ...	P. L. Molyneux ...	T. Devitt, D. Chadwick, T. Windus.	E. K. Roberts ...	„	Federal ...	1.5.33 to 30.9.33	10.10.33
093 *† <i>Llandaff Castle</i> ...	C. Le Brocq ...	R. E. H. Partington	...	S.	Union Castle ...	17.7.33 to 13.9.33	25.9.33
094 *† <i>Llandocery Castle</i>	A. O. Morgan, R.D., Commr., R.N.R.	H. S. Warren, N. Willcox ...	A. E. Hunter ...	„	„ „ ...	12.9.33 to 9.11.33	30.11.33
097 †† <i>Llangibby Castle</i> , M.V.	H. Linklater ...	H. L. Hollands ...	J. Gilbert ...	„	„ „ ...	11.8.33 to 14.10.33	2.11.33
216 *† <i>Llanstephan Castle</i>	W. Weller ...	H. Cambridge ...	...	„	„ „ ...	3.9.33 to 14.9.33	11.11.33
084 *† <i>Lobos</i> , M.V. ...	R. E. Dunn, O.B.E. ...	E. F. Potter, H. Matthews ...	W. Armstrong	M.	Pacific S.N. Co....	24.9.33 to 11.10.33	28.10.33
137 *† <i>Logician</i> ...	R. J. Herschel ...	E. L. Stockley, W. Moore, W. R. Mackenzie.	W. G. Sharpe ...	„	Harrison ...	20.6.33 to 24.7.33	7.9.33
008 *† <i>Losada</i> , M.V. ...	A. Ridyard ...	D. W. Hutchison ...	G. McArthur ...	„	Pacific S.N. Co....	28.4.33 to 10.7.33	14.7.33
232 *† <i>Madura</i> ...	J. A. Wright ...	R. H. O'Neil, K. R. C. Letts.	H. O. Francis ...	M.	British India ...	Fms. 911 & 138 11.6.33 to 20.8.33	23.9.33
078 *† <i>Magician</i> ...	E. R. Bury ...	W. E. Shotton, R. F. Hart...	L. Millington ...	„	Harrison ...	11.4.33 to 18.8.33	2.10.33
<i>Mahana</i> ...	J. M. Cameron ...	...	...	M.L.	Shaw Savill & Albion	...	...
<i>Mahia</i> ...	C. M. Andrews ...	...	...	S.	...	...	...
140 *† <i>Mahratta</i> ...	F. L. Adamson ...	H. F. Scoins, W. J. Wilson.	H. Henshaw ...	M.	Brocklebank ...	Fms. 911 & 138 28.8.33 to 24.10.33	21.11.33
140 *† <i>Mahrona</i> ...	R. G. Hanna ...	J. B. Leigh, H. Willington, M. Melville.	W. Ritch ...	„	„ ...	14.8.33 to 26.10.33	2.11.33
242 *† <i>Mahseer</i> ...	T. A. Tyson ...	J. W. Robertson, R. Humble, J. Henshaw.	J. Caddy ...	„	„ ...	10.4.33 to 5.7.33	31.7.33
015 *† <i>Mahsud</i> ...	R. W. Kershaw ...	H. Gillespie, J. R. Paisley, C. A. Jackson.	G. D. Plant ...	„	„ ...	23.5.33 to 28.9.33	2.10.33
042 *† <i>Maimoa</i> ...	H. P. Thurston ...	J. A. McNab, W. A. Rogers, A. S. Anthes.	R. T. Farrell ...	S.	Shaw Savill & Albion.	4.5.33 to 5.9.33	16.9.33
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 ...	Fms. 911 & 138 24.8.33 to 20.11.33	23.11.33
018 *† <i>Makalla</i> ...	J. W. Maughan ...	A. C. Hocking, J. Richardson, A. Hill.	E. P. Hopkins	M.	Brocklebank ...	26.9.33 to 27.11.33	20.11.33
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>	J. Holloway ...	R. M. Dennis, G. P. Freeman, J. Baird.	F. W. Williams...	„	Prince ...	5.12.32 to 12.6.33	10.8.33
219 *† <i>Malda</i> ...	F. Caffyn ...	V. R. Christmas, J. Duncan, L. A. Wintle.	L. Hugo ...	M.	British India ...	Fms. 911 & 138 8.5.33 to 27.7.33	9.8.33
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 ...	12.6.33 to 28.8.33	3.9.33
064 *† <i>Manela</i> ...	F. G. V. Stovell ...	D. W. Speirs...	...	„	British India ...	...	...
177 *† <i>Mantola</i> ...	D. F. James ...	J. Small, J. Duncan, L. J. Kew.	H. H. Tanner ...	„	„ „ ...	Fms. 911 & 138 28.8.33 to 2.10.33	27.11.33
197 †† <i>Mantua</i> ...	J. M. Legg ...	J. E. Heath, G. A. Wild, G. du Fosse.	F. Harvey ...	M.-S.	P. & O. ...	19.8.33 to 23.11.33	25.11.33
104 *† <i>Marquesa</i> ...	F. Stephenson ...	J. Wetherall ...	F. Babbage ...	M.	Furness Houlder	12.9.33 to 15.11.33	18.11.33
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. H. Galgey ...	L. G. Martin, R. A. White- head.	W. C. Kerr ...	M.	„ „ ...	21.6.33 to 1.9.33	21.9.33
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 ...	S.	Shaw Savill & Albion.	Fm. 915 15.7.33 to 16.10.33	24.10.33
023 *† <i>Matheran</i> ...	H. D. Fulcher ...	E. C. Shore, R. Penston, A. Maxwell.	A. Ryland ...	M.	Brocklebank ...	Fms. 911 & 138 3.9.33 to 4.10.33	10.10.33
223 *† <i>Matiana</i> ...	L. D. Patterson ...	A. H. Baird, J. Bridgman.	H. O. Wilson ...	„	British India ...	31.7.33 to 21.10.33	15.11.33
024 *† <i>Matra</i> ...	N. P. Cornish ...	G. Shaw, W. Robertson, A. E. Austin.	H. Parsons ...	„	Brocklebank ...	24.4.33 to 30.8.33	2.9.33
032 †† <i>Mauretania</i> ...	R. V. Peel, R.D., Capt., R.N.R.	J. V. Locke, T. W. Caurie, H. V. Clarke.	G. H. Sellars ...	S.	Cunard ...	11.9.33 to 2.10.33	5.10.33
278 *† <i>Middlesex</i> ...	J. G. Almond ...	F. Bishop, J. R. Ricketts, E. G. Williams.	E. Lawrence ...	„	Federal ...	5.2.33 to 20.5.33	26.5.33
194 †† <i>Moldavia</i> ...	C. H. C. Allin ...	J. K. Crone, E. J. Kerridge, W. H. Wood-Roe.	J. Ormiston ...	„	P. & O. ...	24.7.33 to 20.9.33	23.10.33
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 ...	F. W. Roberts, G. C. Geddes.	J. Biggins ...	„	Canadian Pacific	3.9.33 to 12.10.33	14.10.33
149 †† <i>Montclare</i> ...	J. Turnbull, C.B.E., R.D., Commadore, R.N.R.	J. R. Bubb, J. Soames, A. Tibbett.	G. M. Pott ...	M.-S.	„ „ ...	1.9.33 to 29.10.33	31.10.33
150 †† <i>Montrose</i> ...	G. F. McCombie, R.D., Commr., R.N.R.	A. C. Harrison, E. J. Oatridge	J. Hewitt ...	„	„ „ ...	Fm. 912 1.9.33 to 29.10.33	31.10.33
164 †† <i>Mooltan</i> ...	A. J. Morton ...	J. M. Sinclair, A. D. Dennis, N. Thompson.	J. E. Marsh ...	„	P. & O. ...	26.10.33 to 11.11.33	18.11.33
196 †† <i>Mulbera</i> ...	P. Taylor ...	P. M. Wilson, E. J. Studart, E. Reed.	J. D. Lovelock	„	British India ...	4.6.33 to 6.9.33	11.9.33
						25.7.33 to 8.11.33	17.11.33

THE MARINE OBSERVER

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
073 *† <i>Nagara</i> ...	S. Weller ...	F. Crankshaw, J. L. Smith ...	— Stanton ...	M. ...	Royal Mail ...	Fms. 911 & 138 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.	R. T. Soans ...	S. ...	P. & O. ...	„ „ 10.8.33 to 22.10.33	28.10.33
291 *† <i>Nankin</i> ...	M. B. Skinner ...	B. W. Dun, F. O. Colvin, A. H. Krummel.	E. Bovel ...	M.L. ...	Eastern and Australian.	Fm. 915 2.5.33 to 24.7.33	9.10.33
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. S. de L., R. D., Commr., R.N.R.	J. O. V. Young, G. Randall, G. Copeland.	W. Banbery ...	M.-S. ...	P. & O. ...	„ „ 1.8.33 to 5.10.33	9.10.33
286 *† <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, S. T. Whiteside, M. A. Murch.	L. Hooper ...	M. ...	Royal Mail ...	Fms. 911 & 138 14.7.33 to 6.9.33	12.9.33
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>Nellore</i> ...	H. J. Bright ...	G. E. Smith, A. A. Stevenson, A. G. Rose.	C. Williams ...	M.L. ...	Eastern and Australian.	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 ...	Fm. 911 11.9.33 to 13.10.33	13.11.33
162 *† <i>Nestor</i> ...	F. Adcock ...	P. Elder, W. Pearce, N. P. Smith.	C. F. Townsend ...	S. ...	A. Holt ...	Fms. 911 & 138 13.8.33 to 19.9.33	27.11.33
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
256 *† <i>Norfolk</i> ...	R. L. H. McNish, D.S.O., Lt.-Commr., R.N.R.	H. N. Lawson, G. D. Lyver, W. E. Reeves.	B. C. Wheeler ...	„ ...	Federal ...	„ 7.3.33 to 29.6.33	14.7.33
217 *† <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> ...	M. Cockburn ...	H. Stewart, D. A. Jones, B. Emmerson.	A. Wells ...	M. ...	British India ...	Fms. 911 & 138 2.12.32 to 9.5.33	6.6.33
Observer ...	J. Lowe ...	J. Harnden, W. J. Wearing, G. Greaves.	„ „ „	M. ...	Harrison ...	Fm. 911 5.6.33 to 18.8.33	22.8.33
004 †† <i>Olympic</i> ...	J. W. Binks, R.D., Lt.-Commr., R.N.R.	W. Tugwell, G. Brooks, A. T. Anson.	N. Clarke ...	S. ...	White Star ...	Fms. 911 & 138 22.9.33 to 25.10.33	27.10.33
243 *† <i>Opawa</i> , M.V. ...	F. W. Robinson ...	H. D. Horwood, H. P. Williamson, J. C. Grose.	F. W. Fowler ...	M. ...	New Zealand Shipping.	Fm. 912 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.	J. Willson ...	S. ...	Orient ...	Fms. 911 & 138 24.7.33 to 24.10.33	1.11.33
080 *† <i>Orari</i> ...	J. G. Almond ...	C. R. Brown, A. G. Robinson, R. G. Bush.	W. E. Fordham ...	M. ...	New Zealand Shipping.	„ „ 31.7.33 to 18.11.33	27.11.33
246 †† <i>Orbita</i> ...	D. R. Morgan ...	F. W. Hockey, W. Vickers, R. D. Eckford.	W. G. Sutherland ...	M.-S. ...	Pacific S.N. Co.	Fms. 911 & 138 7.10.33 to 25.10.33	24.11.33
087 †† <i>Orduna</i> ...	M. Galloway ...	P. Sargent, W. Hamilton, Banks.	H. Cheese ...	„ ...	Orient ...	„ „ 27.8.33 to 15.9.33	18.9.33
171 †† <i>Orford</i> ...	A. L. Owens, R.D., Capt., R.N.R.	T. L. Shurrock, C. E. Coles, B. Paul.	C. T. Seaton ...	S. ...	„ „	„ „ 20.8.33 to 21.11.33	1.12.33
174 †† <i>Ormonde</i> ...	M. J. Sarson ...	C. W. Pinckney, G. B. M. Jones, E. M. Mackay.	B. Baxter ...	„ ...	„ „	„ „ 26.6.33 to 26.9.33	2.10.33
172 †† <i>Oronsay</i> ...	C. G. Matheson, D.S.O., R.D., Capt., R.N.R.	F. S. Gray, J. M. Swanson, W. L. Mackay.	S. G. Boons ...	M.-S. ...	„ „	„ „ 23.1.33 to 25.4.33	3.5.33
173 †† <i>Orontes</i> ...	F. R. O'Sullivan ...	N. W. Smith, J. D. Birch, G. H. Hayes.	R. B. Knights ...	S. ...	„ „	„ „ 29.5.33 to 29.8.33	5.9.33
105 †† <i>Orsova</i> ...	R. L. F. Hubbard, R.D., Commr., R.N.R.	D. Campbell, M. G. Stuart, A. S. Marshall.	L. W. Farnfield ...	M. ...	Shaw Savill & Albion.	„ „ 26.4.33 to 17.8.33	22.8.33
206 *† <i>Otira</i> ...	W. Thompson ...	A. Addison, J. M. Swanson, L. L. Lloyd Jones.	H. Curry ...	M.-S. ...	Orient ...	„ „ 30.4.33 to 1.8.33	8.8.33
156 †† <i>Otranto</i> ...	L. V. James, D.S.C. ...	„ „ „	„ „ „	„ „ „	„ „	„ „	„ „
Pacific Exporter ...	C. E. Holland, R.D., Commr., R.N.R.	W. Edmonds ...	C. North ...	S. ...	Furness Withy ...	Fm. 911 9.8.33 to 2.11.33	4.12.33
277 *† <i>Pakeha</i> ...	W. J. Williams ...	P. Last, T. H. Davies, R. S. Mackenzie.	J. W. McGrouther ...	„ ...	Shaw Savill & Albion.	Fms. 911 & 138 12.10.33 to 27.10.33	4.12.33
Paris ...	B. Shaw ...	E. W. Smith ...	A. H. Jones ...	M. ...	Southern Rly. ...	Telegraphic Report ... 9.10.33	9.10.33
058 †† <i>Patrician</i> ...	J. Lowe ...	S. Diamond, W. E. Williams	„ „ „	M. ...	Harrison ...	Fm. 911 30.10.32 to 11.5.33	17.5.33
058 †† <i>Pennland</i> ...	H. Harvey ...	C. Otterson, F. Chilman, F. Good.	R. Hammond ...	S. ...	Red Star ...	Fms. 911 & 138 27.8.33 to 11.11.33	13.11.33
204 *† <i>Pennyworth</i> ...	A. W. Gofton ...	T. C. Triscott, G. V. Legasick, J. H. Anderson.	A. H. Garbett ...	M.L. ...	Dalglish ...	Fm. 912 27.8.33 to 15.10.33	17.10.33
282 *† <i>Phemius</i> ...	E. P. Parfitt ...	„ „ „	„ „ „	M. ...	P. & O. ...	Fms. 911 & 138 2.10.33 to 21.10.33	14.11.33
238 *† <i>Piako</i> ...	C. A. Lakin ...	C. A. Cremin, J. F. Clement	L. H. Leggett ...	S. ...	A. Holt ...	Fms. 911 & 138 3.1.33 to 22.4.33	3.6.33
039 *† <i>Planter</i> ...	E. P. C. Aslin ...	„ „ „	„ „ „	M. ...	New Zealand Shipping.	„ „ 15.5.33 to 4.8.33	9.6.33
040 *† <i>Port Adelaide</i> ...	J. T. Ling ...	J. C. Sinclair, F. R. Hill ...	P. J. Aherne ...	S. ...	Harrison Commonwealth & Dominion.	„ „ 3.7.33 to 16.11.33	8.8.33
Port Alma ...	R. Williams ...	G. Puttick ...	F. Amott ...	„ ...	„ „	„ „	2.12.33
128 *† <i>Port Auckland</i> ...	S. W. Hayter ...	J. C. Goddard, W. B. Hopkins, A. L. Walton.	L. Rees ...	M.L. ...	„ „	„ „ 5.4.33 to 19.7.33	27.7.33
268 *† <i>Port Bowen</i> ...	C. A. Robinson ...	W. Easton, C. E. Midwinter, P. Bradnell.	S. Adams ...	S. ...	„ „	„ „ 9.2.33 to 21.5.33	11.7.33
130 *† <i>Port Caroline</i> ...	A. H. Brown ...	R. Bettess, W. Craig, E. N. Howard.	„ „ „	„ ...	„ „	Fm. 911 15.6.33 to 8.10.33	23.10.33
131 *† <i>Port Darwin</i> ...	G. S. Hall ...	A. C. Cooper, J. S. Moate, V. N. Ford.	J. P. B. Jeffery ...	„ ...	„ „	Fms. 911 & 138 14.4.33 to 29.7.33	8.8.33
072 *† <i>Port Denison</i> ...	J. J. Hudson ...	K. D. Morgan, G. W. Horton, L. B. Philpotts.	H. A. Palmer ...	„ ...	„ „	„ „ 25.2.33 to 23.6.33	8.7.33
Port Dunedin, M.V. ...	W. L. Lynd ...	E. Wheeler, H. B. Walker, A. G. Russell.	T. J. S. Manson ...	„ ...	„ „	„ „ 14.4.33 to 12.8.33	22.8.33
010 *† <i>Port Fremantle</i> ...	A. G. Rhind ...	L. C. Asser, F. W. Elgar, H. Duckling.	G. H. Syer ...	M.L. ...	„ „	Fm. 915 9.6.33 to 17.9.33	21.9.33
Port Gisborne, M.V. ...	W. Gilling ...	G. Langford, A. Brown, C. J. Gorley.	H. West ...	„ ...	„ „	Fm. 912 9.6.33 to 17.9.33	21.9.33
Port Hardy, M.V. ...	W. G. Higgs ...	R. B. Linklater, N. Muzzell, D. Watson.	H. Olding ...	„ ...	„ „	Fm. 915 25.2.33 to 10.6.33	19.6.33
135 *† <i>Port Hunter</i> ...	J. Jack ...	D. F. Morgan ...	„ „ „	S. ...	„ „	„ „ 17.5.33 to 29.8.33	8.9.33
129 *† <i>Port Wellington</i> ...	R. S. Durham, D.S.C.	C. R. Townshend, P. G. M. Lee, L. E. Craven.	„ „ „	M.L. ...	„ „	Fm. 915 12.8.33 to 19.11.33	23.11.33
106 *† <i>Princesa</i> ...	R. Needham ...	A. J. Knell, E. Rogerson, R. E. Garner.	A. Clark ...	S. ...	„ „	Fms. 911 & 138 5.5.33 to 21.8.32	26.8.33
163 *† <i>Protesilaus</i> ...	A. B. Friend ...	E. Loughed, O. S. Sheard, F. Poulson.	R. Shackleton ...	M. ...	Houlder ...	„ „ 25.9.33 to 29.11.33	2.12.33
„ „	J. G. Reynard ...	J. A. Russel, H. C. Shinn, A. S. Brotherton.	N. F. Brierley ...	M.L. ...	A. Holt ...	Fm. 915 3.11.32 to 5.7.33	10.8.33

FLEET LIST

vii

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteoro-logical Instrument Equip-ment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
<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. Nankivell, S. H. Baldwin, K. W. Richardson.	A. F. Edwards...	M.-S.	P. & O. ...	Fms. 911 & 138 10.6.33 to 16.11.33	22.11.33
063 *† <i>Rancher</i>	J. McCullum ...	D. Bryant, G. Harvey, A. O. Lewis.	R. C. Law ...	M.	Harrison ...	" " 20.2.33 to 9.5.33	12.5.33
228 †† <i>Ranchi</i> ...	A. H. Hignett, R.D., Commr., R.N.R.	R. S. Kerridge, J. P. McArthur, C. B. Holmes.	H. S. Horn ...	M.-S.	P. & O. ...	" " 27.7.33 to 28.9.33	30.9.33
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	" " 1.7.33 to 2.10.33	9.10.33
257 †† <i>Rangitata</i> , M.V.	J. L. B. Hunter ...	R. L. Warren, G. H. Hocart, M. Johnson.	C. E. Terry ...	"	" " "	" " 29.7.33 to 30.10.33	6.11.33
240 †† <i>Rangitiki</i> , M.V.	H. Barnett ...	S. F. Marchington, L. F. Malcouronne, R. Vincent.	L. V. Horn ...	"	" " "	" " 5.6.33 to 4.10.33	23.10.33
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. Roll ...	"	" ...	" " 14.5.33 to 15.8.33	22.8.33
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, J. K. Campbell, E. C. Hicks.	A. O'Sullivan ...	"	Pacific S.N. Co....	" " 5.9.33 to 25.10.33	31.10.33
<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>Rother</i> ...	T. H. Woodhead ...	H. Robinson, A. Hiley ...	P. Hornby ...	"	Goole Steam Shipping	... ..	...
<i>Rotorua</i> ...	C. B. Lamb ...	W. J. Glassborow, N. Baddeley, H. V. Hastings.	E. Lawrence ...	"	New Zealand Shipping	Fm. 915 6.5.33 to 14.8.33	23.8.33
203 *† <i>Royal Star Ruahine</i> ...	W. Walsh ... G. Kinnell ...	F. R. F. Wilson, A. Hocken, D. S. R. Martin.	F. G. Bedford ...	M. M.L.	Blue Star New Zealand Shipping	Fm. 915 21.7.33 to 15.11.33	21.11.33
<i>St. Helier</i> ...	R. Pitman ...	H. D. Freeman ...	... ..	S.	G.W. Railway ...	Telegraphic Report 5.12.33	5.12.33
<i>St. Julien</i> ...	T. Richardson ...	V. Newton, T. E. Martin ...	... ..	"	" " "	" " 14.9.33	14.9.33
<i>St. Keverne</i> ...	A. Hatton ...	... ..	... ..	A.	Bunch Steam Fishing Co.	... ..	...
038 †† <i>St. Patrick Samaria</i> ...	C. W. Sanderson ... R. G. Malin, Lt.-Commr., R.N.R.	T. D. Thomas ... E. Gleave, J. F. Drake, R. H. C. Crawford.	T. F. Wyatt ...	S.	G.W. Railway ...	Telegraphic Report 6.9.33	6.9.33
<i>Scotia</i> ...	W. Hughes ...	W. H. Hughes ...	... ..	"	L.M. & S. Railway	Telegraphic Report 2.12.33	2.12.33
033 †† <i>Scythia</i> ...	G. Gibbons, R.D., A.D.C., Capt., R.N.R.	W. M. Stewart, A. B. Fasting, A. D. McCallum.	F. H. Williams...	"	Cunard ...	Fms. 911 & 138 4.9.33 to 19.11.33	21.11.33
211 *† <i>Shropshire</i> , M.V.	R. P. Mann ...	D. Hetherington, J. K. Gemmel, H. B. Peate	D. McLellan ...	"	Bibby ...	" " 17.9.33 to 23.11.33	27.11.33
121 *† <i>Siamese Prince</i> , M.V.	E. E. Jones ...	J. P. Wedgwood, R. A. Brock	J. Hanlon ...	M.L.	Prince ...	Fm. 915 25.1.33 to 8.7.33	14.8.33
141 *† <i>Somerset</i> ...	E. R. Pilcher ...	H. M. Knight, B. C. Hamilton, J. N. A. Low.	A. E. Howard ...	S.	Federal ...	" 6.7.33 to 20.10.33	8.11.33
<i>Spero</i> ...	H. Montgomery ...	H. D. Vickers, A. Kirk ...	H. V. Chamberlain.	M.L.	Ellerman Wilson	" 14.1.33 to 24.6.33	1.7.33
020 *† <i>Stirlingshire Stephen</i> ...	F. T. Mee ... O. J. P. Lee, R.D., Capt., R.N.R.	H. Sapworth, L. A. Sayers ...	... ..	S. M.L.	Turnbull Martin 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 28.7.33 to 16.11.33	4.12.33
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 ...	"	" ...	" " 8.10.33 to 28.10.33	20.11.33
274 *† <i>Sultan Star</i> ...	W. Bevan ...	G. T. Riley ...	... ..	M.	Blue Star ...	... ..	...
044 *† <i>Tacoma City</i> ...	H. Paul ...	T. J. Paull, J. M. Hughes, J. L. Barry.	A. R. Magridge	M.L.	Reardon Smith...	Fm. 915 8.1.33 to 9.6.33	19.6.33
<i>Tacoma Star</i> ...	T. Williams ...	J. O. W. Davies, C. L. Williamson, L. N. Mates.	... ..	S.	Blue Star ...	Fm. 911 12.4.33 to 6.7.33	14.7.33
229 *† <i>Tactician</i> ...	F. Trinick, O.B.E. ...	A. Frew, S. Leyland, L. J. Sharman.	J. Bunbury ...	M.	Harrison ...	Fms. 911 & 138 23.7.33 to 17.10.33	19.10.33
045 †† <i>Tainui</i> ...	A. McIntosh ...	P. Campbell, H. Winyard, D. Pickersgill.	A. Bloxham ...	M.L.	Shaw Savill & Albion	Fm. 915 17.6.33 to 30.9.33	9.10.33
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>Tamara</i> ...	G. Williams ...	A. S. Masters, J. G. Allen, D. A. Emik.	A. Lund ...	M.-S.	" " "	" " 23.4.33 to 26.7.33	1.8.33
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, E. Saville, J. MacArthur.	J. Clarkson ...	S.	A. Holt ...	Fms. 911 & 138 17.7.33 to 25.10.33	13.11.33
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.	H. F. C. Wilkinson, L. W. Fulcher, A. B. Goord.	F. Gardiner ...	M.	New Zealand Shipping	" " 19.1.33 to 6.5.33	9.6.33
048 †† <i>Themistocles</i> ...	C. Wood, D.S.C.	R. Pattison, R. Hamilton, W. Hart.	F. G. Lord ...	M.-S.	Aberdeen Commonwealth	" " 4.6.33 to 28.9.33	5.10.33
161 *† <i>Titan</i> ...	G. G. Rundle ...	G. Roberts, G. Alder, C. B. L. Wren.	J. H. Nightingale	S.	A. Holt ...	" " 28.7.33 to 29.10.33	8.11.33
244 *† <i>Pongariro</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. Edgcombe, H. G. Letts, J. Reeve.	N. Hallett ...	"	New Zealand Shipping.	" " 20.5.33 to 29.8.33	1.9.33
276 †† <i>Tuscania</i> ...	W. B. Rome ...	J. Lefevre J. Noble, D. Barr	J. Reid ...	S.	Anchor ...	Fm. 912 31.8.33 to 17.9.33 31.8.33 to 17.9.33	20.9.33 20.9.33

Name of Vessel.	Captain.	Observing Officers.	Senior Wireless Operator.	Meteorological Instrument Equipment.	Line.	Logs, Registers, or Records Contributed. 7.9.33 to 6.12.33.	Date Last Return Received.
113 *† <i>Upwey Grange</i> , M.V.	H. P. Goodrich ...	A. Bradbury, G. T. Hurst, P. J. Walker.	W. Jarvis ...	M.	Houlder ...	Fms. 911 & 138 31.8.33 to 30.10.33	4.11.33
176 *† <i>Vancouver City</i> ...	H. E. Egerton ...	H. David, A. C. Holden ...	S. W. Sloan ...	S.	Reardon Smith ...	Fms. 911 & 138 25.9.33 to 6.10.33	23.10.33
292 †† <i>Viceroy of India</i>	T. W. Hartley ...	F. E. Cox, R. H. Turner, M. F. Shute.	V. A. K. Smith	M.-S.	P. & O. ...	" " 19.9.33 to 23.10.33	27.10.33
053 †† <i>Voltaire</i> ...	W. S. Heasley ...	... ..	... ..	S.	Lampont & Holt ...	... ..	...
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 ...	S. W. D. Roach, J. H. Wilson, P. Clissold.	W. Olliver ...	S.	Union Castle ...	Fms. 911 & 138 2.9.33 to 22.10.33	23.10.33
060 †† <i>Westernland</i> ...	W. A. Morehouse ...	H. H. Grace, W. E. Hesketh, T. F. Wills.	J. C. R. Eustice	"	Red Star	Fm. " " 10.9.33 to 26.11.33	29.11.33
056 *† <i>Westmoreland</i> ...	J. H. Wilde ...	F. T. Renny, J. Trotter, H. Forster.	R. Glover ...	"	New Zealand Shipping.	Fms. 911 & 138 17.5.33 to 23.6.33	3.7.33
208 †† <i>Winchester Castle</i> , M.V.	J. H. Kerbey ...	G. F. Moon, R. F. Pembry ...	W. A. Smith ...	"	Union Castle ...	" " 29.7.33 to 19.11.33	21.11.33
096 †† <i>Windsor Castle</i>	E. F. Gilbert ...	A. G. Bidwell, F. A. G. Hunter.	G. Scurr ...	"	" "	" " 26.8.33 to 14.10.33	18.10.33
<i>Worthing</i> ...	W. Lidbetter ...	H. Smith, E. W. Smith ...	C. Kelley ...	"	Southern Railway	Telegraphic Report 5.12.33	5.12.33
<i>Yoma</i> ...	D. A. Meek ...	J. Crawford, P. D. Barr ...	... ..	M.	Henderson ...	Fm. 911 3.6.33 to 16.8.33	20.10.33
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 Fm. 912 20.6.33 to 13.10.33	20.10.33 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. 7.5.33 to 25.7.33	31.7.33
<i>Pangbourne Nautical College</i> .	A. F. G. Tracy, Commr., R.N.	" " ...	... ..	"	... ..	" " 27.4.33 to 25.7.33	3.8.33
<i>Worcester</i> , H.M.S.	G. C. Steele, V.C., Commr., R.N.	" " ...	... ..	"	... ..	" " 5.5.33 to 26.7.33	28.7.33
<i>Watling Island</i>	... ..	The Keepers ...	... ..	Lighthouse Register	... ..	Lighthouse Register 23.7.32 to 31.12.32	6.11.33
<i>Cape Pembroke</i> ... (Falkland Is.)	... ..	" " ...	... ..	"	... ..	Lighthouse Register 1.1.33 to 30.6.33	4.8.33

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, 30.8.33.
<i>Darian</i> ...	J. Trickey, D.S.O. ...	F. Steventon ...	" ...	" " " "
<i>Davision</i> ...	R. Thomas ...	A. F. Wood ...	" ...	30 " " 29.9.33.
<i>Hilary</i> ...	W. C. H. Jones, R.D., Commr., R.N.R.	G. E. Freeman ...	Booth ...	60 " " 4.10.33.

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>Carnarvonshire</i> ...	W. J. Ings ...	I. A. Evans ...	Glen ...	
<i>Castalia</i> ...	G. B. Kelly ...	H. D. Campsie ...	Anchor ...	
<i>Cheshire</i> ...	G. L. English ...	T. Holden ...	Bibby ...	
<i>Clan Mackay</i> ...	J. Willits, R.D., Capt., R.N.R.	J. Jones ...	Clan ...	
<i>Clan Macvicar</i> ...	M. H. Jones ...	L. S. Jones ...	" ...	
<i>Clan Ogilvy</i> ...	T. Brocklebank ...	T. B. Fairweather ...	" ...	
<i>Clan Skene</i> ...	C. C. Parfitt ...	S. W. Brown ...	" ...	2 cases of Water Samples, 21.11.33
<i>Elysia</i> ...	F. M. Henderson ...	R. B. Clements Mitchell	Anchor ...	
<i>Gloucestershire</i> ...	C. A. Griffiths ...	W. F. Collins ...	Bibby ...	
<i>Maidan</i> ...	W. Robertson ...	L. Jeans ...	Brocklebank	
<i>Oxfordshire</i> ...	H. Lyon ...	C. R. Lovell ...	Bibby ...	
<i>Sagaing</i> ...	E. Esslemont ...	C. Ferguson ...	Henderson ...	
<i>Staffordshire</i> ...	W. L. Forster ...	W. B. Boyer ...	Biddy ...	
<i>Taranita</i> ...	J. B. Cathness ...	J. M. Cherry ...	Anchor ...	
<i>Worcestershire</i> ...	F. W. Beckett ...	A. Thomson ...	Bibby ...	
<i>Yorkshire</i> ...	F. W. L. Midgeley ...	J. F. Reed ...	" ...	

January, 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) (22½ × 18 in.) (Published by the Admiralty.)

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

ATLANTIC (NORTH):—

Atlas of Currents on the Main Trade Routes of the North Atlantic. (No. 323, 1930. 6s. 6d.) (29½ × 19½ 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 × 22½ in.). Sold by J. D. Potter, 145, Minories, E.1.

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

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

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

ATLANTIC (SOUTH):—

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

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

CHARTS:—continued.

BAFFIN BAY AND DAVIS STRAIT:—

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

INDIAN OCEAN:—

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

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

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

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

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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.)

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LIST OF STAFF OF THE COMMISSIONERS APPOINTED BY THE GOVERNMENT OF THE UNITED STATES OF AMERICA TO THE INTERIOR DEPARTMENT

BY THE COMMISSIONERS

1871-1872

Commissioners of the Interior Department, U.S. Department of the Interior, Washington, D.C.

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