

VOL. XIII, No. 124.

THE MARINE OBSERVER

OCTOBER 1936.

TABLE OF PRINCIPAL CONTENTS

	PAGE.		PAGE.
General Distribution of Weather Observing and Reporting Ships over all the Ocean	120	Wireless Weather Signals :— Wireless Stations Detailed to receive Routine Coded Weather Reports from “ A Selected Ships ”	143
Volume XIII	122	Wireless Stations Detailed to intercept Routine Coded Weather Reports from “ B Selected Ships ”	145
The Marine Observer’s Log :— October, November and December	123	South and North America, West Indies and Islands of the North Pacific, eastward of Longitude 180°	147
The Denny-Brown Ship Stabilizer, by Captain Sir BENJAMIN CHAVE, K.B.E.	133	Personnel :— Captain WILLIAM HENRY LEA, Retirement	153
Weather in the North Atlantic, December 11th to 14th, 1934, by Commander J. HENNESSY, R.D., R.N.R.	135	Captain H. F. DAVID } Obituary	153
Currents in the South Pacific Ocean, south of Latitude 34° S., during the Southern Winter and General Summary, by E. W. BARLOW, B.Sc.	138	Captain J. W. HARTLEY }	
Southern Ice Reports :— October, November and December, 1935	140	Lithographic illustrations after page 154 :— Ships’ Wireless Weather Signals, Chart of the World. Currents in the South Pacific— August, September and October Ice Chart of the Southern Hemisphere— October, November and December	155
		Index to Vol. XIII	

GENERAL DISTRIBUTION OF WEATHER OBSERVING AND REPORTING SHIPS OVER ALL THE OCEANS.

THE Selected Ship service being well established and proved as an aid to navigation as prescribed by the Convention for Safety of Life at Sea, the desire, not only to aid navigation but aerial navigation overseas, has all been leading to an extension of voluntary routine weather telegraphy at sea.

For some time there has been published in this Journal and in the pamphlet M.O.329 (published for the convenience of all British ships), guidance for any British ship for reporting weather to all ships and appointed stations in this service, when and where there are not Selected Ships.

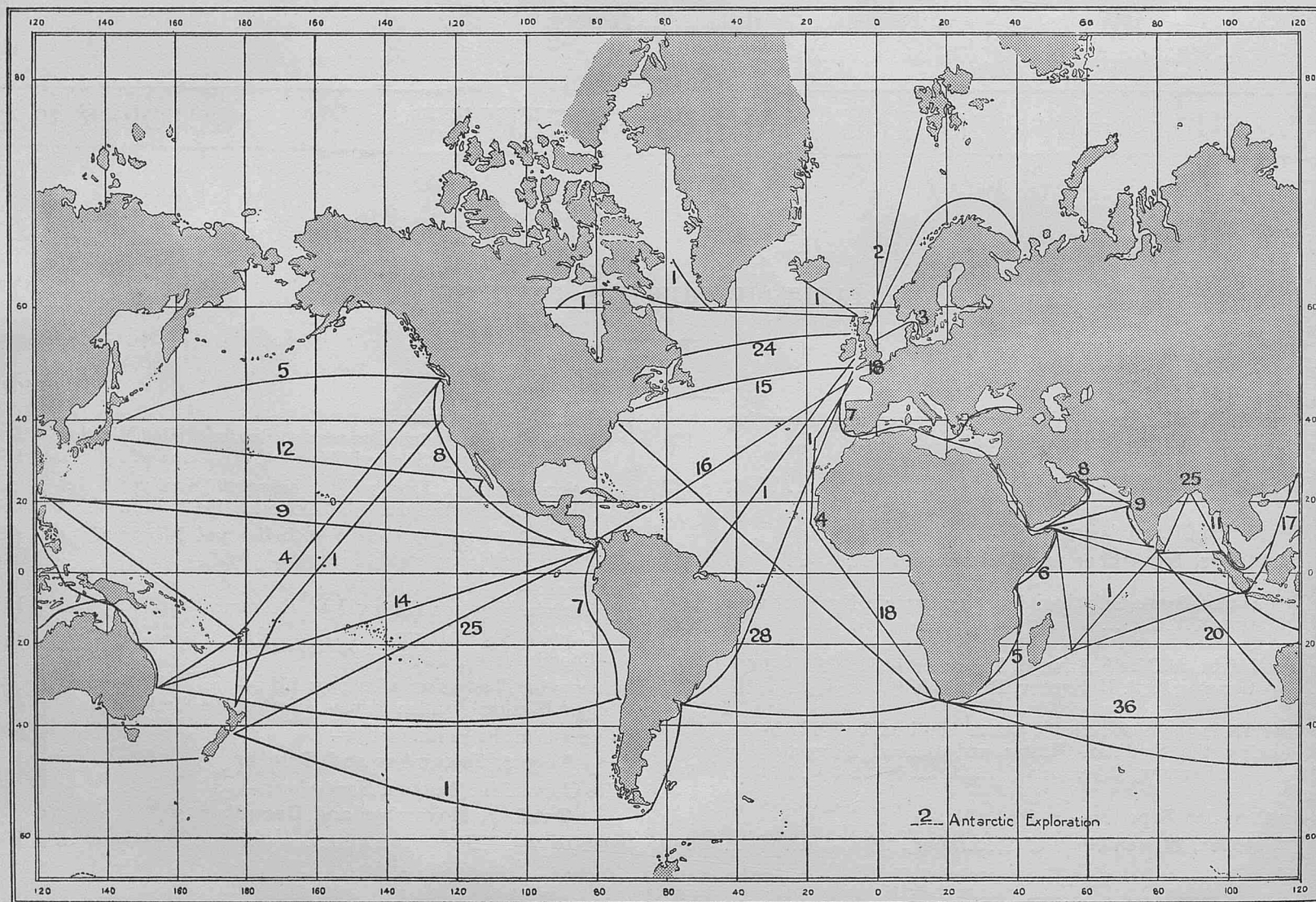
Selected Ships are the backbone of this service. They are the most regular reporting ships in all parts of the world, and deservedly receive first attention from the Port Officers and Merchant Navy Agents.

With the appointment of two more stations in the British Isles to

receive weather reports, the prospect in the near future of flying services over the Atlantic requiring more information, and the desirability of British ships, which are not of the 360 regular observing ships in the fleet list, also receiving more attention and advice, provision is being made for the Merchant Navy Agents to visit such ships as may be particularly desirable to complete the general distribution of reports over the oceans, by carrying on the service when and where desirable.

It must be remembered that the Port Meteorological Officers and Merchant Navy Agents have not an easy task to perform, for though it may appear quite straightforward to visit ships, advise the officers, compare instruments, and so forth, much time is often lost to them in making their visits fit the convenience of commanders and their officers.

Chart of the World Indicating the Number of British Observing Ships using the different Trade Routes.



355 Foreign going British Observing ships indicated on routes.
5 Stations and stationary ships not indicated.

Total 360

I have recently visited all the Port Meteorological Officers and Merchant Navy Agents, and I wish here to thank them for all they have done and are doing in attending upon the corps of voluntary marine observers.

All who practise the methods advocated in the *HANDBOOK OF WEATHER, CURRENTS, AND ICE FOR SEAMEN* are aware that numbers of reports without good distribution do not help much, but tend to congestion in communication, whereas wide distribution gives better information and greatly improves forecasting.

It is to ensure that as far as possible reports are well distributed at sea that the system of visiting is now to be extended by the Agents; and we hope that the British Merchant Navy will thereby be enabled to better assist in this organization which is built up upon the regular work of Selected Ships.

The Disposition of the British Voluntary Observing Fleet.

To-day, 21st July, 1936, the number of British regular voluntary observing ships in the Fleet List, and the oceans which they traverse, with the numbers of those which are detailed as Selected Ships, are shown in the following table:—

Oceanic distribution of the Voluntary Observing Fleet.
21st July, 1936.

Ocean.	Form 911.	M.L.	Total.	Selected Ships.
North Atlantic, including Home Waters and the Baltic ...	85	7	92	57
South Atlantic ...	47	0	47	46
North Indian ...	59	0	59	46
South Indian ...	61	0	61	55
North Pacific ...	30	21	51	43
South Pacific ...	41	0	41	37
Arctic ...	2	0	2	0
Antarctic ...	0	2	2	1
Stationary Ships and Stations ...	—	—	5	0
Totals ...	325	30	360	285

The Chart of the World on p. 120 indicates the number of British observing ships doing all branches of the work on the different trade routes.

The total is exact, but the numbers on the different tracks are approximate.

Most observing ships commence and end their voyages in ports of Great Britain. A number are on station in the Pacific, and a few make round the world voyages, only occasionally returning to the British Isles.

The number of observing ships shown on each track does not in all cases indicate the total observing ships using that track. For instance, on the track through the Mediterranean, only seven observing ships are shown; but most of the observing ships shown as using the routes to the eastward of Perim also use the route through the Mediterranean; and the same of course applies to the route from the British Isles to the West Indies, for many ships navigating the Pacific pass through the Panama Canal.

Tonnage.

At present the total number of Selected Ships of all nations agreed upon is 1,000; and the tonnage of steam and motor vessels of over 100 tons is used for calculating the number of Selected Ships which each nation party to the Convention should maintain.

Lloyd's Register of Shipping for 1936-37 is just published and, in accordance with our usual custom, we reproduce, with three additional columns, the revised table below.

It will be seen by the table that the proportion of tonnage registered in the ports of Great Britain and Northern Ireland has fallen from 17,298,432 tons and 28·5 per cent. of the world's tonnage, to 17,182,857 tons and 28·1 per cent. of the world's tonnage.

Decreases of their proportion of the world's tonnage have been also suffered by the United States, four thousandths, Belgium, one thousandth, Holland, one thousandth, Sweden, one thousandth, and other countries, five thousandths. The following countries' proportion of the world's tonnage has increased:—India and Ceylon, Denmark, Greece, and Norway, each one thousandth, Japan and Russia, each two thousandths, Italy, three thousandths, and Panama, five thousandths.

The number of British Selected Ships is accordingly reduced from 285 to a total of 281.

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

(Vessels over 100 tons, Lloyd's Register Book, 1936-37)

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 (July, 1936)
	Number.	Gross Tons.			
Great Britain and Ireland.	6,891	17,182,857	28·1	281	148
Australia and New Zealand.	523	637,504	1·0	10	—
Canada (excluding Lakes).	620	855,842	1·4	14	15
Hong Kong ...	122	311,999	0·5	5	3
India and Ceylon...	167	223,685	0·4	4	1
South Africa and Other Colonies*.	578	525,587	0·9	9	5
British Empire Total.	8,901	19,737,474	32·3	323	172
America (United States)(excluding Lakes).	2,585	9,515,984	15·6	156	364
Argentina ...	286	304,677	0·5	5	1
Belgium ...	179	388,413	0·6	6	8
Brazil ...	283	475,298	0·8	8	12
Chile ...	90	139,197	0·2	2	—
China ...	268	491,580	0·8	8	—
Denmark ...	695	1,134,029	1·9	19	25
Finland ...	303	425,369	0·7	7	—
France ...	1,340	2,972,979	4·9	49	15
Germany ...	2,085	3,708,202	6·1	61	40
Greece ...	606	1,800,850	2·9	29	—
Holland ...	1,408	2,507,354	4·1	41	18
Italy ...	1,072	3,056,753	5·0	50	149
Japan ...	2,367	4,215,690	6·9	69	265
Jugo-Slavia ...	177	372,179	0·6	6	—
Latvia ...	91	169,413	0·3	3	—
Norway ...	1,857	4,053,655	6·6	66	12
Panama ...	81	429,350	0·7	7	13
Portugal ...	198	238,284	0·4	4	13
Russia (Soviet Union).	649	1,214,937	2·0	20	9
Spain ...	861	1,145,531	1·9	19	13
Sweden ...	1,244	1,506,557	2·5	25	3
Turkey ...	175	196,254	0·3	3	—
Other Countries ...	683	898,500	1·4	14	8
Total ...	28,484	61,098,509	100·0	1,000	1,140

* Including Dominion of Newfoundland.

VOLUME XIII.

THIS number completes Volume XIII, save for the two loose Supplements which will be published for November and December.

In it we have endeavoured to suitably mark the passing of KING GEORGE V, which brought out so intensely the devotion of his people; that of the two great Commanders-in-Chief of the Grand Fleet during the Great War, which revived memories of their sterling worth and power to lead in the King's service.

In the January number, we commenced the volume by expressing the hope that contrary to superstition it might be a lucky one. If the review of the Marine Division in co-operation with Voluntary Marine Observers, as it is described on the quarterly cover, has ever been lucky in recording the good work of marine observers and the fine achievements of the officers of the merchant navy in giving voluntary service in weather work and the survey of currents, this volume is a lucky one. Look through its pages to see how the Dominions have been supplied with written records of observations, to say nothing of reports of weather by wireless in all parts of the world, made to services of nearly all maritime countries, as well as to all ships; the interesting information contributed by seamen and the announcement that the data from meteorological logs back to 1855, where necessary, are to be extracted and used.

We thank most heartily all who have contributed to the success of THE MARINE OBSERVER, not only those who have written on shore and afloat and whose contributions have been published, but also the many who have contributed by their work in supplying data and remarks which, though not published, have been used or are being used for compilations and so forth.

For all who wish to preserve Volume XIII, a binding cover may be purchased from H.M. Stationery Office.

THE MARINE OBSERVER is so designed, that each year it may be bound into a neat and handy volume.

It is recommended that from each number, the cover, advertisement pages, fleet list and North Atlantic Ice Chart, all containing information which is not permanent, or will be repeated, should be removed.

When these have been removed, there will remain pages numbered in sequence throughout each number, also pages unnumbered containing lithographic charts which follow the numbered pages in the quarterly numbers.

These should be placed in the volume cover, and bound.

MARINE SUPERINTENDENT.

London,
21st July, 1936.



October, November and December.

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.

ERUPTION OF MAUNA LOA.

North Pacific Ocean.

THE following is an extract from the Meteorological Log of M.V. *Aorangi*, Captain J. F. SPRING-BROWN, Suva to Honolulu, observer Mr. J. L. Hughes, 4th officer.

"At 19.00, November 21st, 1935 (Hawaiian Standard Time) as a heavy rain squall passed over the ship, a faint red glow appeared on the eastern horizon. The glow was reminiscent of nothing so much as the reflection on the clouds of a rising moon. Although the illumination was confined to a very small section of the horizon when first observed, it rapidly spread and assumed a darker hue, so that by 19.15 all doubt was removed as to its source. The spectacle continued to gain rapidly in brilliance and detail. By 19.30 a broad expanse of the skyline was defined and the glare rose in a funicular form, broadening towards the top and then extending horizontally. On the northern side, at intervals, a denser and brighter column shot upwards in spasmodic bursts. About 23.00 a faint smell of sulphur was noticeable and this soon increased to a strong smell, but by 02.00 on the 22nd November it had begun to disappear. The wind that had remained constant E.S.E. 2 to 3, fell away to a calm at 02.30. At this time numerous green cane beetles flew aboard, presumably from Hawaii, a distance of 110 miles to the nearest point.

A noticeable feature was the rise in temperature. Normally, a fall of one degree between 8 p.m. and midnight is experienced in similar weather in this locality. However, upon this occasion, temperature rose from 75° F. at 7 p.m. to 77.5° F. at 1 a.m., and then fell to 76° F. at 4 a.m.

At 05.00 the glow rapidly lessened and just before dawn it had assumed about the same intensity as when first observed.

Position at 19.00, 21st November, Latitude 19° 29' N., Longitude 158° 30' W., Mauna Loa bearing 091°, 165 miles. At midnight the volcano bore 112°, 140 miles. All times Hawaiian Standard."

MAGNETIC DISTURBANCE.

South Indian Ocean.

WITH reference to the report of Magnetic Disturbance in the South Indian Ocean from S.S. *Berwickshire*, Captain E. H. EVENS, observer Mr. J. C. ROBERTSON, 2nd officer, published in THE MARINE OBSERVER, Vol. XII, No. 120, the following remarks have been received.

S.S. *Comeric*, Captain W. BROOME, Tyne to Fremantle, observer Mr. J. W. ROBINSON, 3rd officer.

"A similar occurrence was recorded on board this vessel when on a voyage from the Tyne to Fremantle during the period 22nd-28th February, 1933, from Latitude 40° S., Longitude 50° E. to Latitude 40° S., Longitude 78° E., vessel steering 097°-092° throughout."

S.S. *Somerset*, Captain C. R. PILCHER, observer Mr. M. JOHNSON, 3rd officer.

"Confirming the remarks under the above heading appearing in No. 120, Vol. XII, of THE MARINE OBSERVER from S.S. *Berwickshire*, between Latitude 39° S. to 43° S., deviation on successive voyages has been found to commence to increase in about 50° E., reaching its maximum of 7° W. in 65° E., then decreasing to a normal 1° W. in about 90° E.

This increase is now anticipated and attributed to the curves of deviation being wrongly drawn in this locality."

M.V. *Australia Star*, Captain T. WILLIAMS, London to Melbourne, observer Mr. J. DAVIS, 2nd officer.

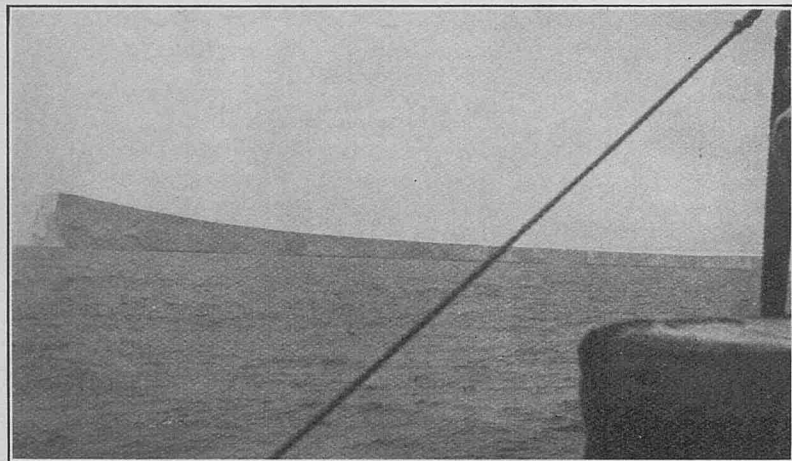
"I quite agree with Mr. J. C. ROBERTSON in his presumption that 'local magnetic attraction' could not be the cause of this increase in westerly deviation. Also it could not be caused by 'induced' magnetism (Gaussian Error) as the deviation increases and then decreases while on the same course. Hence it would seem that the suggestion, that the curves of variation take a deeper curve to the northward, is the only feasible cause. The deviation of the standard magnetic compass in this vessel from 23° 00' E. to 87° 10' E. were:—

Latitude.	Longitude.	True Course.	Deviation.
35° 30' S.	23° 07' E.	092°	3° W.
35° 46' S.	30° 46' E.	094°	3° W.
36° 00' S.	34° 12' E.	094°	4° W.
38° 03' S.	44° 11' E.	104°	4½° W.
38° 35' S.	48° 58' E.	090°	6¼° W.
38° 35' S.	52° 37' E.	090°	6¼° W.
38° 44' S.	55° 02' E.	090°	6¼° W.
38° 44' S.	59° 40' E.	090°	8½° W.
38° 55' S.	63° 08' E.	090°	9° W.
38° 55' S.	68° 30' E.	090°	8° W.
38° 55' S.	73° 00' E.	090°	9° W.
39° 32' S.	83° 00' E.	095°	4½° W.
40° 08' S.	87° 10' E.	095°	4° W.

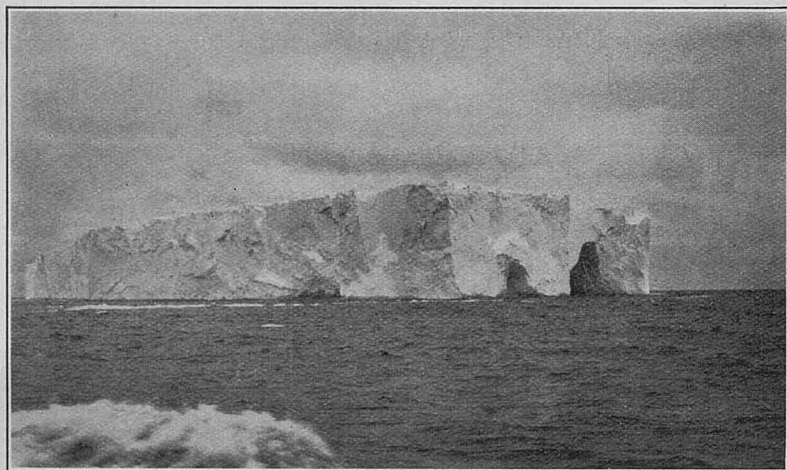
Unfortunately, between Longitude 63° 00' E. and 73° 00' E., we were unable to obtain compass observations owing to overcast conditions. The deviations given were obtained by checking the magnetic course against the gyro course, and are therefore accurate to within ½°. As will be seen by the above, our 'peak' rests between 59° 00' E. and 73° 00' E. I might further add that this vessel's compasses were adjusted last in August, 1935."

PHOTOGRAPHS OF ICE IN THE SOUTHERN OCEAN.

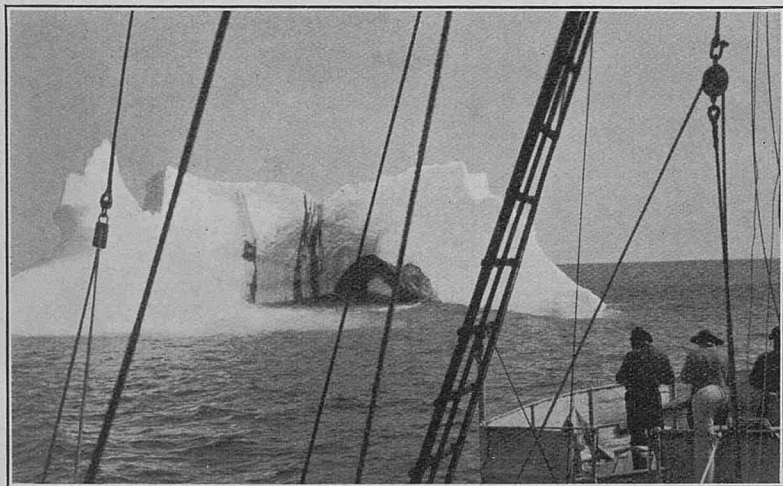
THE following photographs of ice have been received from R.R.S. *William Scoresby*, Captain C. R. U. BOOTHBY, observing officer Mr. R. C. FREAKER.



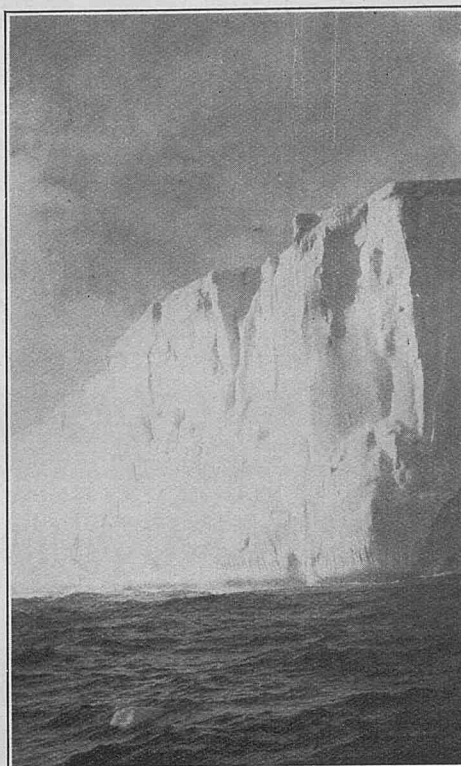
No. 1.
17th December, 1935. Latitude $56^{\circ}08'S.$, Longitude $25^{\circ}02'E.$
Large tabular berg just over 1 mile in length. Greatest height 300 ft.



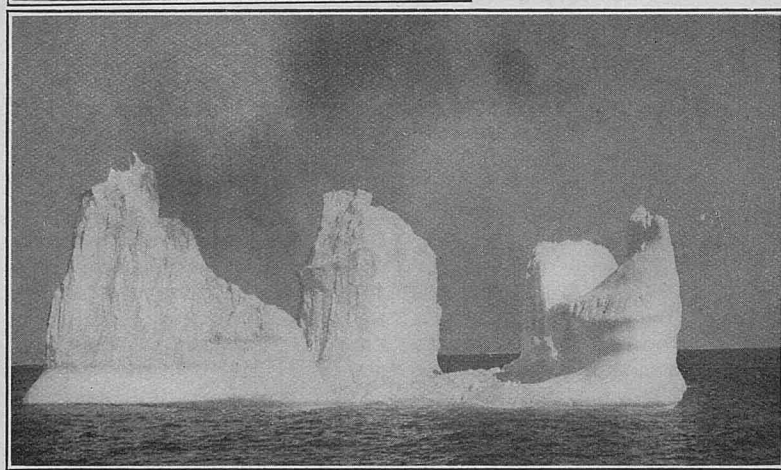
No. 4.
24th January, 1936. Latitude $63^{\circ}30'S.$, Longitude $83^{\circ}20'E.$
Medium sized tabular berg, showing large cavern in one end.



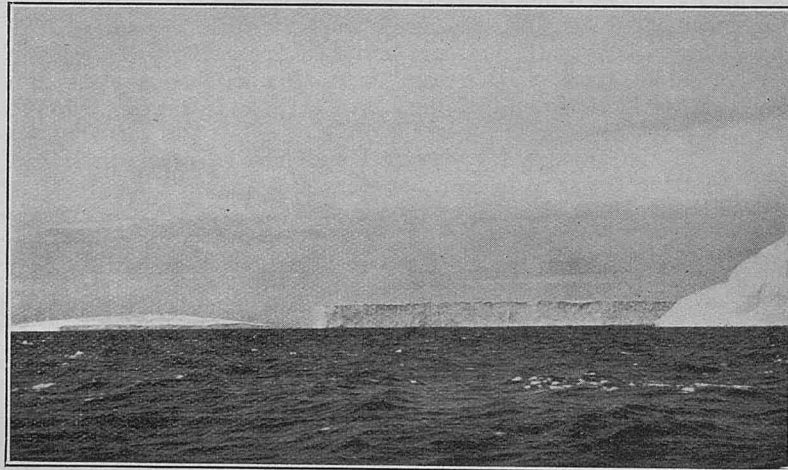
No. 6.
2nd February, 1936. Latitude $62^{\circ}05'S.$, Longitude $89^{\circ}51'E.$
Very small old tabular berg (85 ft. high and 330 ft. across), showing portion of dark-coloured ice in interior of cavern and also vertical veins of discoloured ice. Samples of discoloured ice were obtained from amongst the brash alongside this berg.



No. 2.
19th December, 1935.
Latitude $58^{\circ}S.$, Longitude $29^{\circ}E.$ Face of tabular berg 300 ft. high. This berg was 2,600 ft. long by 1,300 ft. broad, and of a mean height of about 200 ft., rising to a height of 300 ft. at one end. Similar in shape and appearance to berg illustrated opposite, but of less than half the length. Note well-defined and worn water line.



No. 5.
2nd February, 1936. Latitude $62^{\circ}S.$, Longitude $89^{\circ}E.$ Small pinnacle berg, probably broken down remains of small tabular berg. A penguin was seen standing near the centre of low portion of this berg but is obscured in photograph.

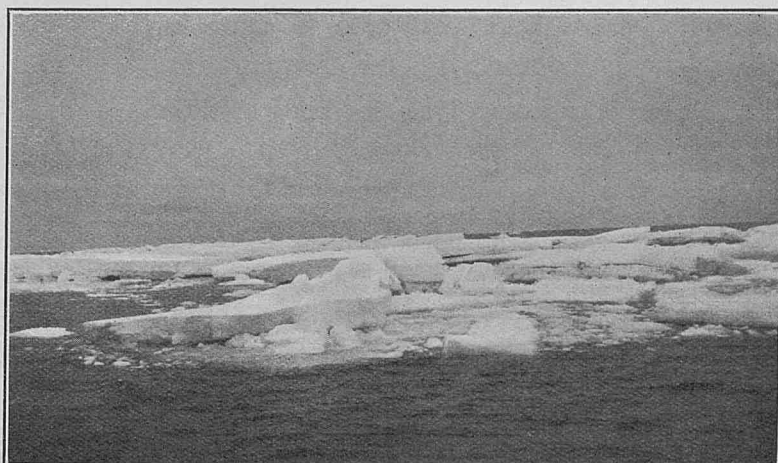


No. 8.
12th February, 1936. Latitude $64^{\circ}43'S.$, Longitude $102^{\circ}00'E.$ This photograph was taken when between numerous bergs, mostly tabulars of large and medium size, and shows two distinct types. Berg in centre is a regular tabular of uniform height with perfectly flat top, while berg to left has a cambered or slightly convex top, higher in the centre and sloping down to low wall sides. Top also shows many hummocks. Numerous bergs of this type were seen in this region, many of large size.



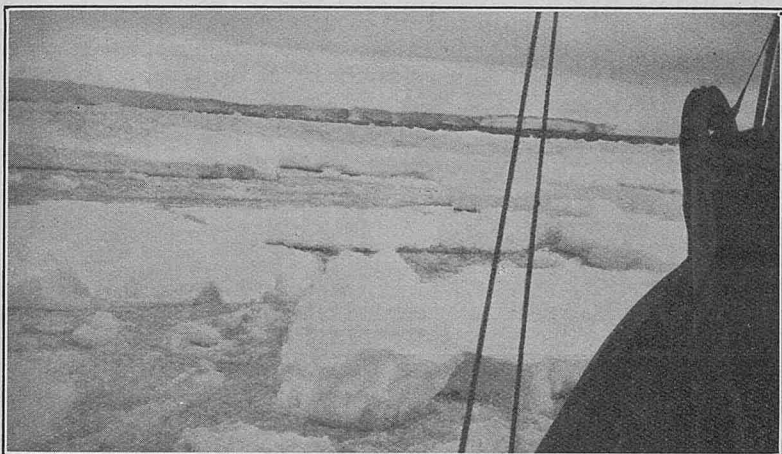
No. 3.

19th January, 1936. Latitude $65^{\circ} 36' S.$, Longitude $55^{\circ} 12' E.$ In open pack off Enderby Land. Pack composed mainly of small tight floes with much brash, but many pieces of old heavy floes, much honeycombed and mostly hummocked.



No. 7.

5th February, 1936. Latitude $63^{\circ} 43' S.$, Longitude $93^{\circ} 38' E.$ Showing detached stream of loose pack ice comprising the broken and rafted remains of heavy floes (some being about 15 ft. high).



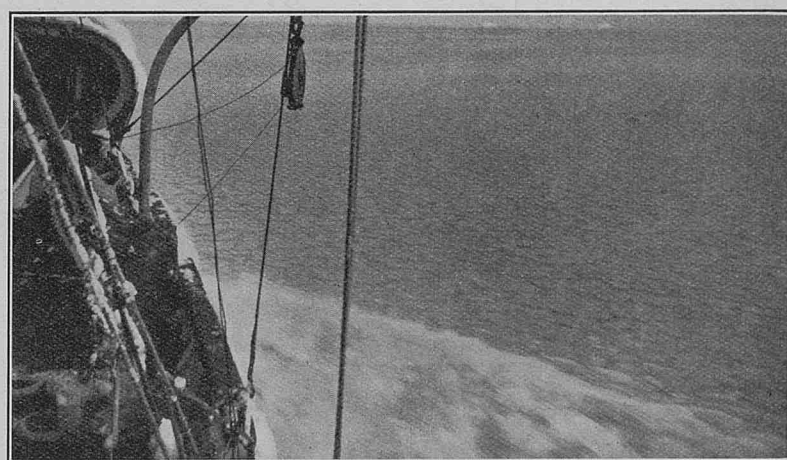
No. 9.

12th February, 1936. Latitude $64^{\circ} 45' S.$, Longitude $101^{\circ} 31' E.$ In extensive pack to the north of Bowman Island, showing clear water in lee of very low berg. Pack becoming fairly close and heavy about 1 mile from its northern edge and extending as far as visible to the southward, with no openings except in lee of bergs.

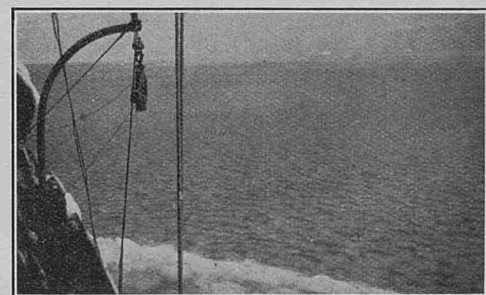


No. 10.

These three photographs were taken on 26th February in 1936 Latitude $67^{\circ} 44' S.$, Longitude $69^{\circ} 00' E.$, and show sea surface entirely covered with newly-formed pancake ice. In No. 10 the coast of MacRobertson Land can be seen, showing featureless snow slopes and low ice cliff. Vessel was able to steam through this ice at full speed with no hindrance, but surface of sea was kept quite smooth, although a wind of gale force was blowing off shore at the time.



No. 11.



No. 12.

FALCONS AT SEA.**North Pacific Ocean.**

THE following is an extract from the Meteorological Record of M.V. *Tantalus*, Captain D. E. EVANS, Yokohama to Vancouver, observer Mr. G. DRAKE, 3rd officer.

"October 16th, 1935, at a little after 4 p.m. the ship being 110 miles from the nearest land (in Latitude 39° N., Longitude 148° E. approx.), a pair of hawks was seen circling the ship. After careful inspection they alighted on the fore crosstrees, when I was able to identify them as gerfalcons (*Falco gyrfalco*).

They remained in their eyrie until close upon sunset, preening their plumage, and then set off upon a successful hunt, their prey appearing to be a stormy petrel. They roosted in the crosstrees and departed about 4 a.m. with a journey of 200 miles to the nearest point of land."

CURRENT RIPS.**West Coast of Africa.**

THE following is an extract from the Meteorological Record of S.S. *Port Auckland*, Captain C. A. ROBINSON, Durban to Dunkirk, observer Mr. E. C. READ, 3rd officer.

"On December 30th, 1935, from 8.30 a.m. A.T.S. (Latitude 9° 48' N., Longitude 16° 32' W.) to 1.0 p.m. A.T.S. (Latitude 10° 34' N., Longitude 17° 01' W.), vessel steering 325°, approximately along the hundred-fathom line, the sea surface showed marked signs of current or tidal disturbance. Strong rips were constantly experienced, the sea surface assuming an agitated and prickled appearance alternating with smooth patches, and the vessel proved difficult to steer, sheering quickly from one to two points either side of her course line. Also, during

this time large shoals of fish and flocks of sea birds were observed in the vicinity, although none were near enough to classify.

Current experienced between a.m. and p.m. stellar observations was found to be:—Set 139°, drift 5.3 miles, thus seeming to indicate that the rips were caused by conflicting currents rather than a strong set in any particular direction.

Moderate N.E. breeze, slight sea and moderate short northerly swell, fine and clear weather. Air 81° F., Sea 78° F., Barometer steady."

PHOSPHORESCENCE.**South Pacific Ocean.**

THE following is an extract from the Meteorological Record of M.V. *Rangitata*, Captain E. HOLLAND, Wellington to Balboa, observer Mr. W. J. GLASSBOROW, 2nd officer.

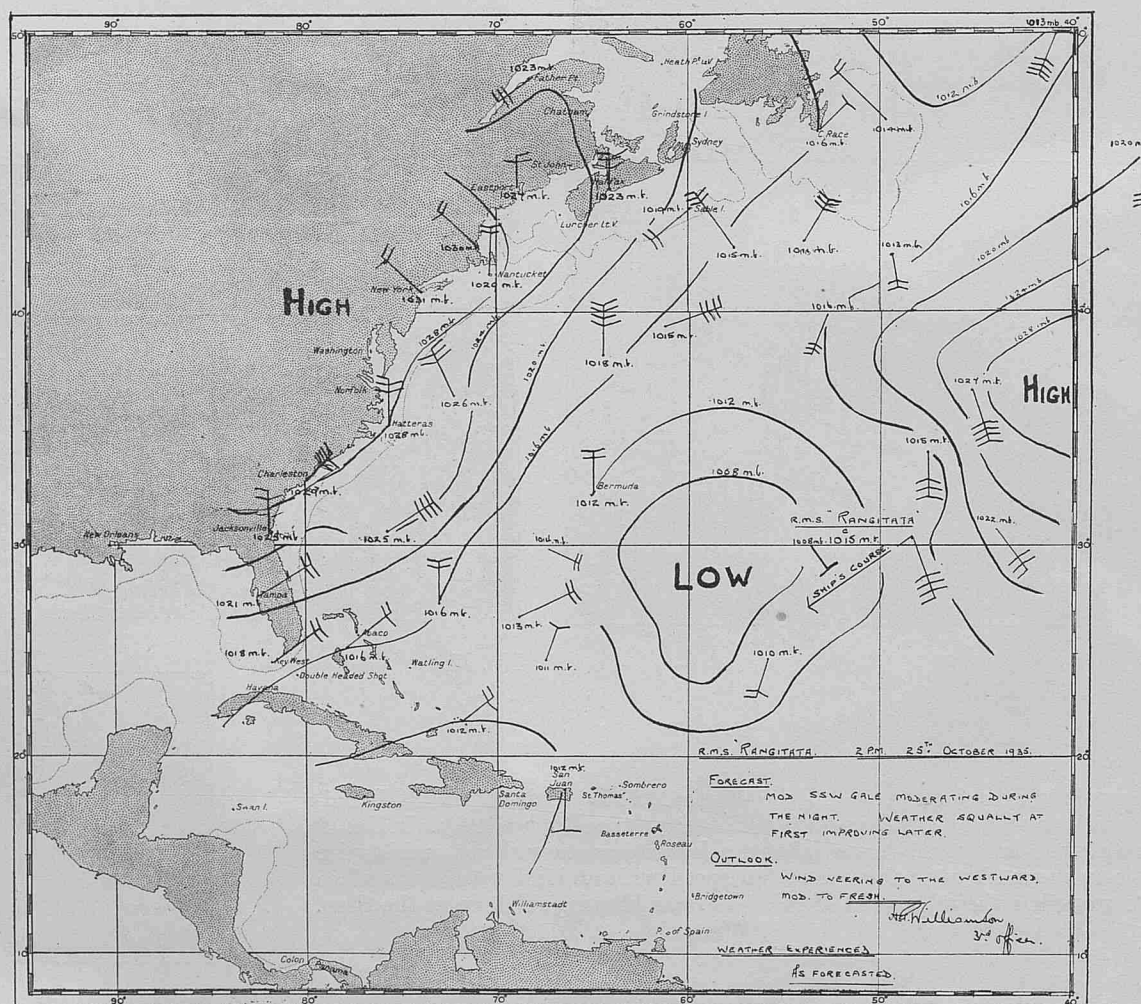
"23rd December, 1935, 1230 G.M.T., 2 a.m. at ship, observed numerous phosphorescent objects on sea surface. In a few minutes these were so numerous that the sea resembled the appearance of the sky on a clear starry night.

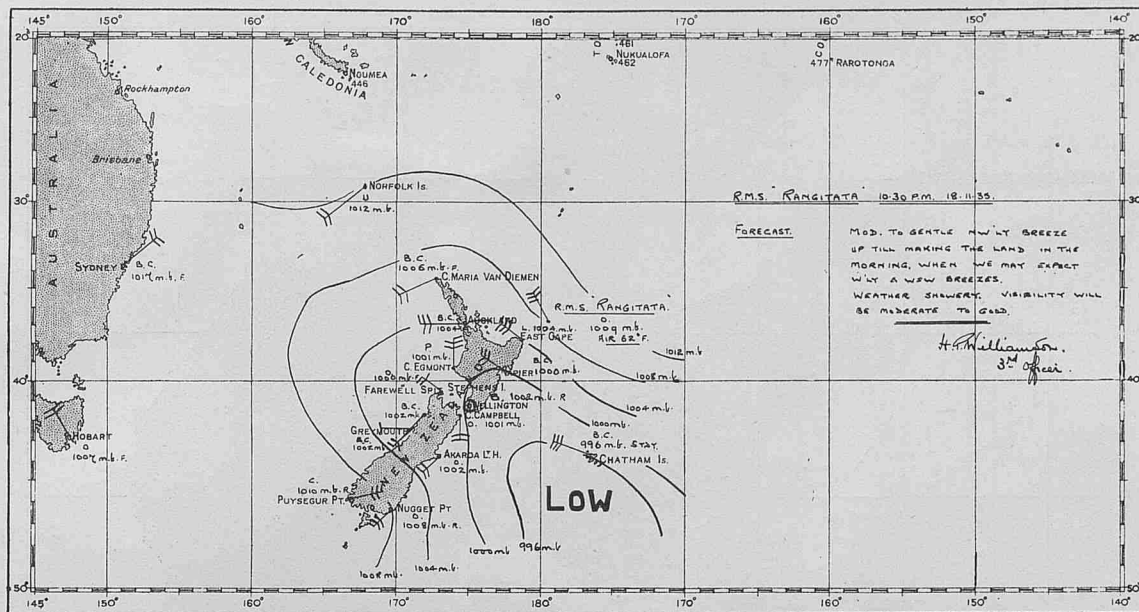
These objects were sausage-shaped and all about 18 inches to 2 feet in length. They were sufficiently close to the surface to be rocked by wave motion, yet they retained both shape and character when disturbed by one bow wave and the phosphorescent light was merely diffused by the broken water. Their size was determined by comparison with a piece of wood dropped overboard at the time, attempts to trap them being unsuccessful. At 2.25 a.m. they were less numerous and at 2.35 a.m. they had disappeared astern. The temperature of the sea water was 58° F. throughout.

Position of ship, Latitude 40° 47' S., Longitude 158° 33' W."

WEATHER FORECASTING AT SEA.**Western North Atlantic and South Pacific.**

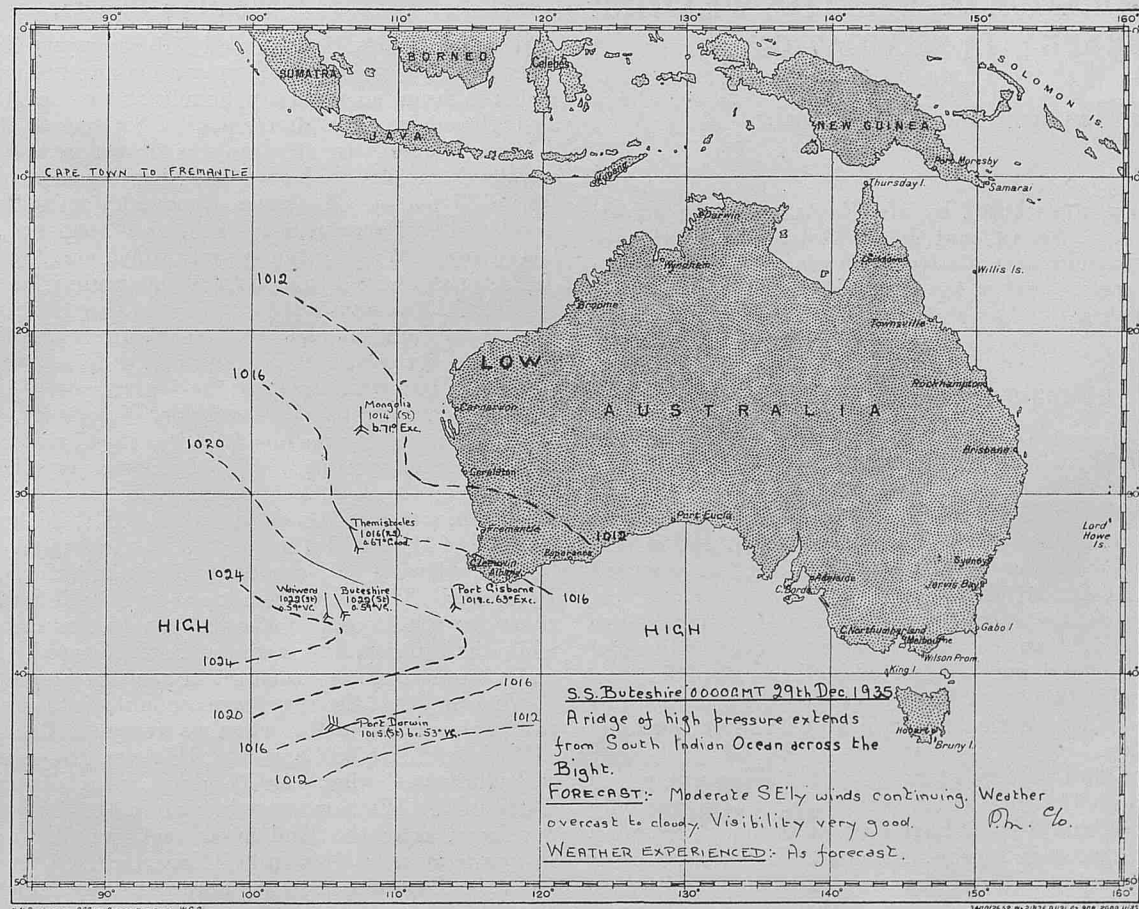
R.M.S. *Rangitata*, Captain E. HOLLAND, observing officer, Mr. H. P. WILLIAMSON, 3rd officer.

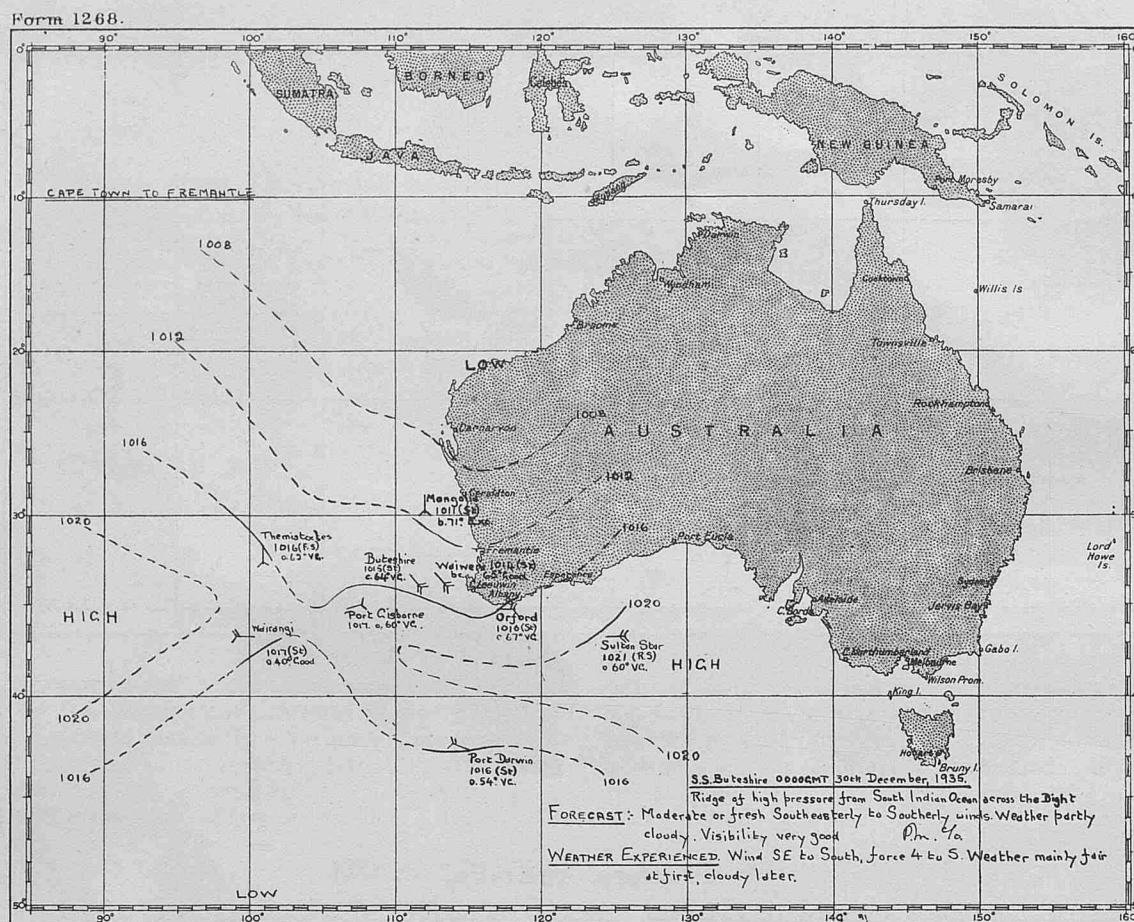




Western Australia.

S.S. *Buteshire*, Captain C. A. I. LAIRD, observing officer, Mr. P. MACMILLAN, chief officer.





PRACTICAL APPLICATION OF WIRELESS WEATHER TELEGRAPHY IN NAVIGATION.

China Sea and Bay of Bengal.

THE following notes are contributed by Mr. E. ALLEN, chief officer, S.S. *Cepolis*, Captain J. F. ALLAN, and they afford welcome evidence of the benefits which are now being derived following the organization of the Selected Ship service; and in the British Merchant Navy to its extension to any British ship when and where there are not Selected Ships.

Ocean Currents.

During our recent passage from Balik Papan to Madras we used the usual direct route from Pulo Weh south of the Great Nicobar Island, thence to Madras breakwater.

On the evening of 24th October, 1935, the routine CQ weather report made by the Bibby Liner *Worcestershire* was intercepted, and in it it was stated that a current setting 044° one knot had been experienced from 8° N., 84° E., to 11° N., 88° E.

We were quite close to the *Worcestershire* at the time, our course crossing his roughly at right angles, and we were naturally interested in his information. A deep depression existed at the head of the Bay of Bengal just about this time, and it may be that the strong winds set up in its circulation had some effect in accelerating the ocean currents in the centre of the Bay.

From p.m. stars on 23rd to a.m. stars on 24th the current set us 190° one knot. (I admit that my observation on p.m. 23rd was only moderate, but I do not think it could have been more than three miles in error.) Now from a.m. stars to p.m. stars on 24th we had 035° at 1.2 knots, which fully endorses *Worcestershire's* experience and shows that this body of moving water was of considerable extent. We were drawing 25 feet at the time, and I imagine *Worcestershire* would be deeper.

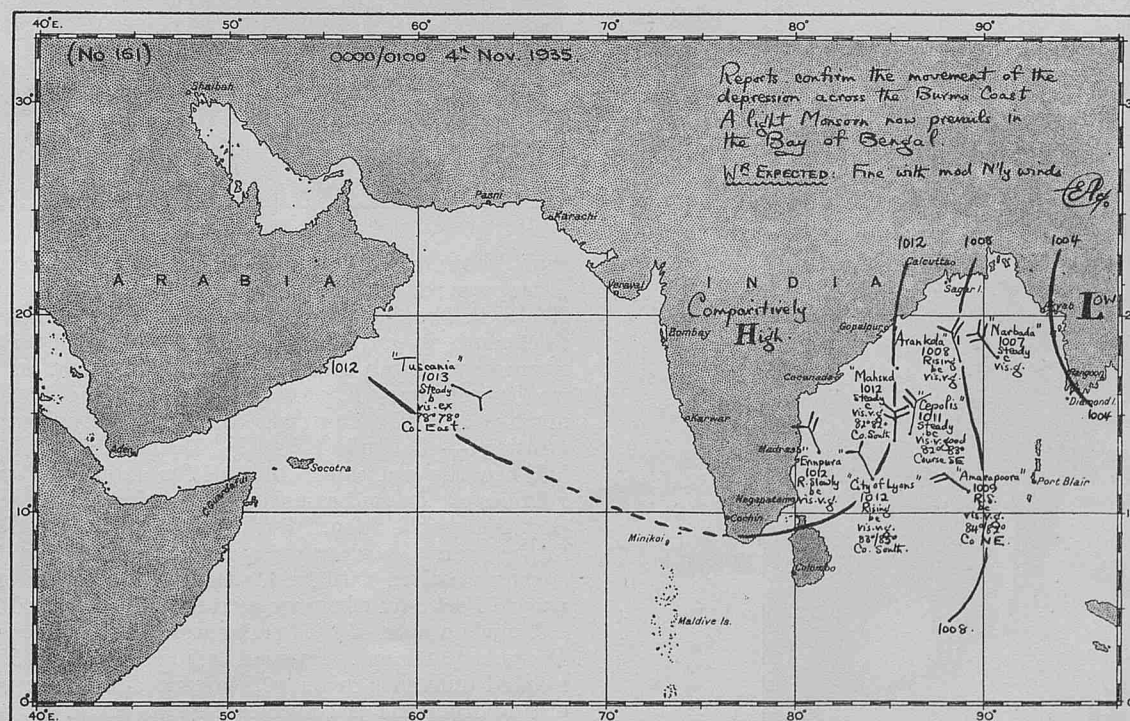
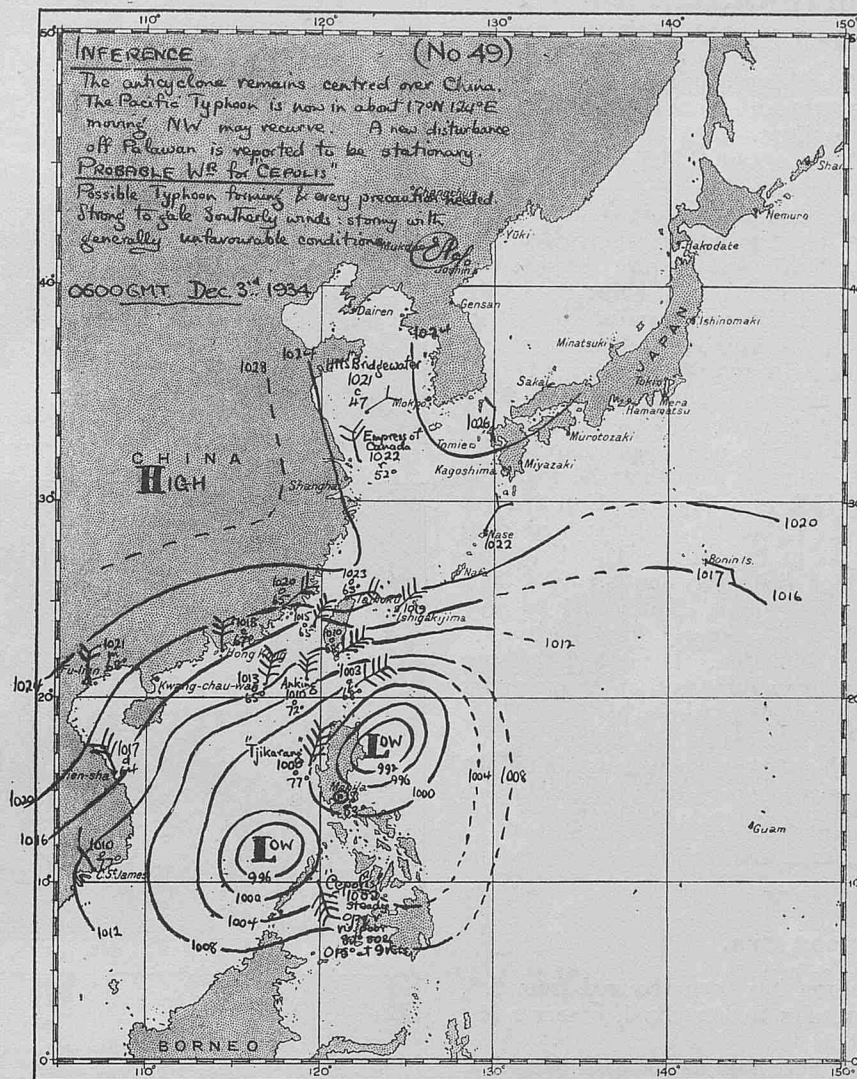
Weather Charts.

Weather Charts Nos. 49 and 161 show you that even outside the Voluntary Observing Fleet, we are making full use of the information which is being so regularly broadcast by the Marine Observers and also relayed by shore Meteorological Services as at Hong Kong.

With reference to 49, this was drawn in the China Sea during a voyage from Miri to Kobe, upon the occasion of our approach to a Pacific Typhoon. A system apparently subsidiary to this typhoon developed off Palawan Island in its S.W. segment. Owing to the very heavy swell set up by the system, which also lay in our path, Captain J. F. ALLAN decided to take the inside route from Borneo to the Luzon Strait, viz. via Balabac Strait, Cuyo West Pass, Mindoro Strait and Apo West Pass, instead of the more direct one through the Palawan Passage. We achieved our object in as far as we were sheltered from the swell, but unfortunately the storm moved eastwards towards us and the centre probably passed very close to us on the evening of the 4th December. I presume that the storm was not a typhoon in the strict sense of the word, since there was very little depression of the barometer; the lowest recorded reading at 20.00 on the 4th was 996.3 mb. (corrected Aneroid), wind E.N.E. 10, with a very nasty sea in spite of the small "fetch." The wind eased at 23.00 and backed N.N.E., blowing half a gale for the remainder of the night 4th-5th December. The barometer rose eight millibars by midnight. My chart for 5th December showed the system moving away eastward, while the typhoon first mentioned moved rapidly N.E. towards Japan, and a strong N.E. monsoon set in over the China Sea.

We found that the very large amount of static made W/T communication almost impossible when we were near this storm.

With reference to Chart 161, this was drawn in the Bay of Bengal and illustrates what can be done when observing ships are well distributed. While we were in port on 31st October a small depression developed near the Andamans and, moving north, it crossed the Burma coast near Gwa on 3rd November. After leaving Cocanada to cross the Bay of Bengal we were naturally interested in this system. The Weather Chart confirmed previous reports and showed that *Cepolis* could expect fine weather with a light monsoon on her passage towards the Malacca Strait, and this we experienced.



THUNDERSTORM. Mediterranean Sea.

THE following is an extract from the Meteorological Record of M.V. *Llangibby Castle*, Captain H. R. NORTHWOOD, Marseilles to Port Said, observer Mr. F. C. F. LONGLAND, 4th officer.

"December 9th, 1935, at 05.55 A.T.S. (0355 G.M.T.), Temperature 58° F., Barometer 1006.8 mb.

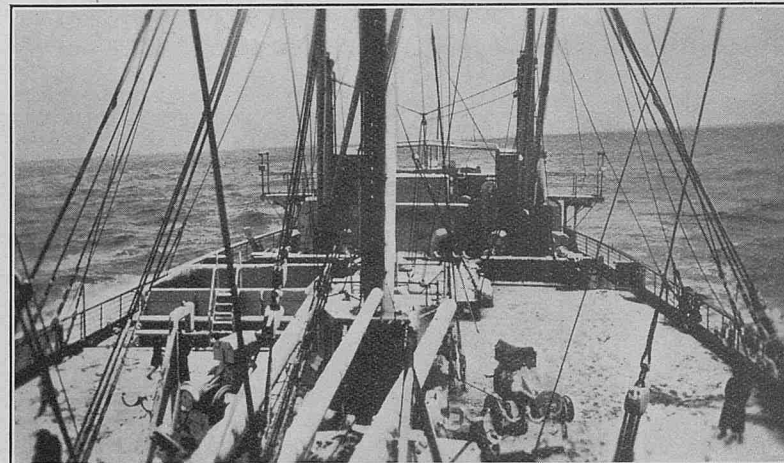
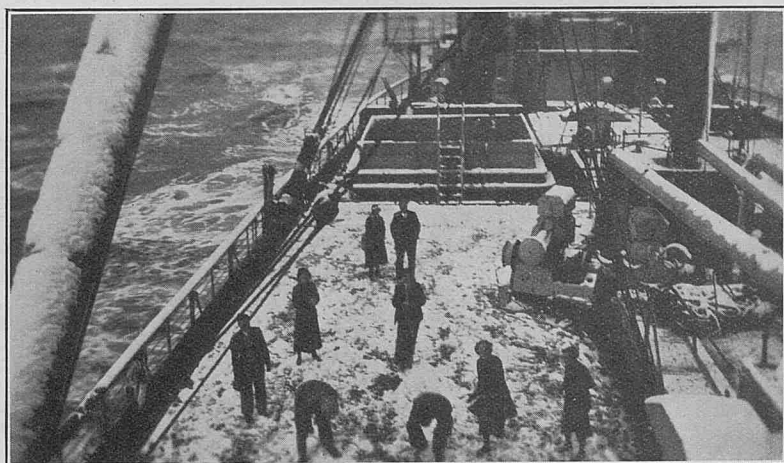
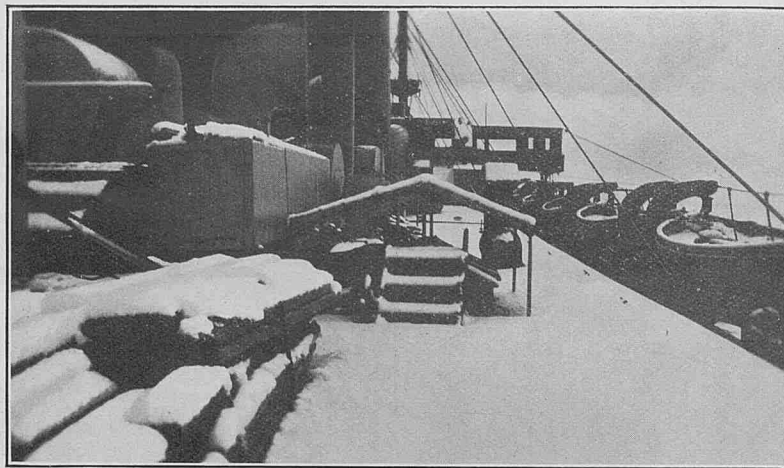
At 05.00 A.T.S. we ran into a dead calm; the previous night had been very sultry and lightning had been playing around a large bank of cumulus cloud to the eastward. At 05.55 a light breeze began to stir and then a blinding flash of lightning burst over the ship; from then until 06.20 it was a deafening cannonade of thunder, and the lightning, which was a light blue, made sight impossible for at least a minute after each flash. The rain was so heavy that visibility narrowed down to 100 yards. At 06.31 there was a sudden lull, but coming up from the eastward was a huge, black nimbus cloud, with lightning at intervals. As the cloud approached, it was accompanied by a dull roar and it was not until it passed over the ship that the roar was found to be caused by hailstones, which were the size of an average egg; some were just rough pieces of ice, but the majority were oval in shape and each had a white spot in its centre. This hailstorm lasted only eight minutes, after which there was another calm; but following up the hailstorm was a wind squall. This could be seen forming an almost straight line of 'white horses' from horizon to horizon in a northerly and southerly direction. It reached the ship at 07.03, and it was like a blast of air from a furnace after the preceding coolness of the hail and rain. The thermometer rose to 65° F. at 07.11, a matter of 7° in eight minutes. All the glass on the bridges became clouded, as if by steam. After this last phenomenon conditions became normal, and the wind commenced to blow from the south-east.

Position of ship, Latitude 35° 30' N., Longitude 21° 45' E."

SNOWSTORM. Mediterranean Sea.

THE following account of a snowstorm has been received from S.S. *Chitral*, Captain H. E. SMITH, Marseilles to Port Said, observer Mr. J. C. LANGTON.

"We left Marseilles for Malta and Port Said at 05.08 on Saturday, December 14th, 1935, the weather being very cold with occasional



snow showers. After rounding Riou Island a course of S. 56° E. (True) was set, speed 16½ knots, to pass 2 miles south-west of Monachi Rocks in the Straits of Bonifacio. At 07.36, as the weather was thickening, speed was reduced, the visibility at the height of the storm being barely 1 cable. At 09.22 the sun broke through and the weather cleared up very quickly, the wind backing suddenly from north-west. The ship was then in the following dead reckoning position:— Latitude 42° 43' N., Longitude 06° 15' E.

When the sun came out, and for about half an hour afterwards, volumes of 'steam' rose from the surface of the sea and it was feared that fog would form. Luckily, however, this did not happen, but further snow showers were experienced during the afternoon, and stormy weather, with fresh westerly winds, remained with us all the way to Port Said where we arrived on December 18th.

I made a note of the temperatures immediately after the storm on December 14th and they read as follows:— Air 33° F., Sea 54° F. This marked difference in temperature no doubt accounts for the 'steam' arising from the sea surface and it would be interesting to know whether this is a record for this part of the world."

ST. ELMO'S FIRE.**South African Waters.**

THE following is an extract from the Meteorological Record of M.V. *Winchester Castle*, Captain J. H. KERBEY, Cape Town to Southampton, observer Mr. R. F. PEMBRY, 3rd officer.

"Friday, 29th November, 1935, at 2130 G.M.T. the truck of the foremast was observed to be glowing and sparking with St. Elmo's fire, the crackling of which could be distinctly heard on the bridge. This lasted until 2150 G.M.T. and then became weaker, finally fading out altogether at 2200 G.M.T.

Weather at the time was overcast, with occasional vivid flashes of sheet lightning to the northward.

Wind north, force 4, Barometer 29.88 in., Air temperature 60° F., Sea 58° F.

Previously, dense fog had been experienced since passing Robben Island 1503 G.M.T. until 1845 G.M.T. when the weather cleared.

Position of ship, Latitude 32° 47' S., Longitude 17° 12' E."

AURORA.**South Indian Ocean.**

THE following is an extract from the Meteorological Log of R.R.S. *Discovery II*, Captain L. C. HILL, O.B.E., Cape Town to Fremantle via Ice Edge, observer Mr. R. WALKER, 1st officer.

"27th November, 1935, 1920 G.M.T. A very clear auroral display was observed in the western sky a few hours after sunset. Commencing with a faint glow bearing 240°, the sky between altitude 15° and 40° became brighter, until the outline of the bright area resembled that of a folded curtain suspended from a point overhead. The lower boundary was clearly defined, and it appeared to remain the same, as the whole curtain of light gradually increased its altitude.

The curtain was made up of closely packed vertical shafts of light and at the sides these vertical shafts moved or folded over with lightning-like rapidity. A few faint vertical shafts of light were seen rising from the horizon immediately beneath the curtain. The main colour is best described as a pale golden straw colour. The display climbed in altitude and the curtain began to fade, the final picture being a number of shafts or streamers of varying length converging to the zenith. Duration of display from 1920 G.M.T. to 1945 G.M.T. Probably a good deal more of this phenomenon would have been visible had the sky to the eastward been clear. Heavy A.-Cu. obscured the sky from south to east.

Position of ship, Latitude 57° 45' S., Longitude 70° 00' E."

"28th November, 1935. At 1705 G.M.T. a faint shaft of light was observed in a cloudless sky bearing east (true), rising to an altitude of 50°. An arc gradually developed and came down to the horizon again, bearing 250° (true). A second arc with its maximum altitude 63½° and mid point bearing 200° was next observed. The lower arc at 23½° maximum altitude, passed across Crux. The arcs waxed and waned in intensity whilst the curtain outline began to develop at the eastern limit of arcs. This curtain appeared to encroach westward whilst the upper arc increased in altitude.

The display continued with varying intensity until 1900 G.M.T. and the upper arc had passed through the zenith and faded. The lower arc with the curtain formation at its western extremity appeared to be more circular than the upper elliptical arc, as though the extremities were closing, whilst the mid part of the arc mounted in altitude. At 1930 G.M.T. the whole phenomenon occurred again and reached its maximum brilliancy for this occasion. Appearing in the same direction as a lofty vertical curtain at an altitude of 70°, the upper part of the arc drew away forming a second line of curtain, whilst from it again numerous broad V-shaped shafts of light converged to the zenith.

At 1945 G.M.T., all that was visible was a faint glow as morning twilight advanced.

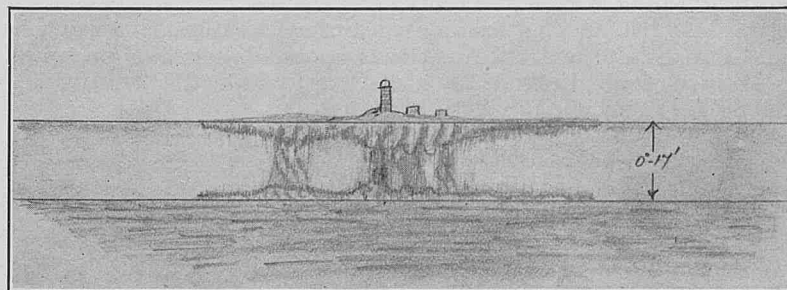
The conditions were exceptionally good—a completely cloudless sky, stars at maximum brilliancy.

No marked effect was noticed on the magnetic compass.

Position of ship, Latitude 57° 04' S., Longitude 75° 50' E."

MIRAGE.**South African Waters.**

THE following is an extract from the Meteorological Record of M.V. *Karamea*, Captain C. M. ANDREWS, Cape Town to United Kingdom, observer Mr. L. B. MILLER, 3rd officer.



"25th December, 1935, at 0900 G.M.T., Dassen Island Lighthouse, 348°, distance 11 miles. Owing to excessive refraction the lighthouse and island presented an interesting spectacle. Two distinct horizons were observed, the refracted horizon being at an angular height of 17' (approx. 330 ft.) above the actual.

Three images were apparent: the actual, the refracted and an inverted image.

The actual and inverted images appeared joined, as in the sketch, but at times they separated and a distinct space was observed between them.

The refracted lighthouse constantly varied in height, at times being long and thin and often short and squat.

Weather at time of observation:—Wind S.W. 2, Barometer 1012 mb., slight sea and swell, Cirrus cloud 1/10, Air temperature 61° F., Sea 56° F."

LUNAR RAINBOW.**South Atlantic Ocean.**

THE following is an extract from the Meteorological Record of M.V. *Durham*, Captain H. L. UPTON, D.S.C., R.D., R.N.R., Fremantle to Dunkirk, observer Mr. W. J. V. BRANCH, 3rd officer.

"January 4th, 1935, at 22.30 A.T.S., observed double lunar rainbow.

This phenomenon was rendered interesting by virtue of the fact that in the whole southern sky, the moon bearing approximately N.N.E., there was no trace of any rain, mist or cloud. It was a brilliantly clear night.

Both arcs were easily distinguishable and appeared to be a shiny bluish-white. They were separated by about 8° of altitude, the upper one being 28°.

Stars were plainly visible on either side of the arcs but not through them. Relative humidity, 84%.

Position of ship, Latitude 18° 00' S., Longitude 4° 30' W."

WATERSPOUTS.**Red Sea.**

THE following is an extract from the Meteorological Record of S.S. *Makalla*, Captain J. GREENALL, Suez to Calcutta, observer Mr. G. E. THOMAS.

"December 17th, 1935. From 10.00 A.T.S. onwards a succession of waterspouts was passed, all to the eastward of the vessel. Cloud was heavy Cu.-Nb. and stretched from about four points on the starboard quarter to almost ahead of the ship. The waterspouts formed continuously and the largest number seen in close proximity was five. Many of them were incomplete and dispersed shortly after their birth. The motion of the air was observed to be clockwise and the whole system appeared to travel with, and at the same speed as, the vessel. No apparent deviation of normal pressure was observed, which remained steady at 29.84 in. The distance was approximately 5 miles and the observed angle 2°, and the estimated height of the waterspouts was about 1,200 ft. A great amount of disturbed water

was visible at the base of each to about two-thirds of the total height and all the complete waterspouts, which lasted about five minutes each, broke at half their height to disperse and re-form a few minutes later. They were all too far distant for any minute observations to be taken. Heavy rain seemed to envelop the whole system, which eventually terminated at 12.30 A.T.S. In all, close upon thirty waterspouts were observed, of which only five were complete columns of water and descended at an angle of about 10° from the base of the cloud. At 13.00 A.T.S. the sky cleared completely for about one hour and then St.-Cu. and Cu.-Nb. clouds appeared from the westward.

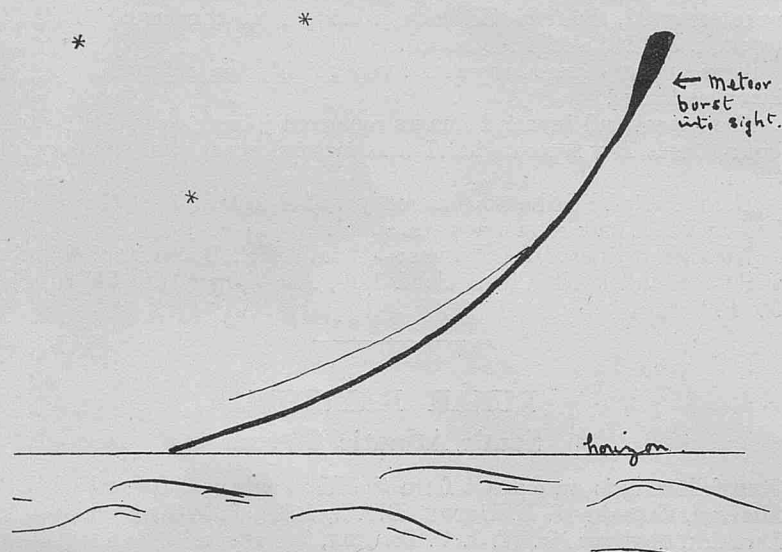
Position of ship, Latitude $23^\circ 30' N.$, Longitude $37^\circ 07' E.$ to Latitude $22^\circ 55' N.$, Longitude $37^\circ 17' E.$ "

METEORS.

North Atlantic Ocean.

THE following is an extract from the Meteorological Record of M.V. *Durham*, Captain H. L. UPTON, D.S.C., R.D., R.N.R., Liverpool to Fremantle, observer Mr. W. J. V. BRANCH, 3rd officer.

*



"October 3rd, 1935, at 21.00 A.T.S., a large and brilliant meteor was observed to the south-west. It was first seen at an altitude of 22° - 23° and was plainly visible until it disappeared beneath the horizon. There was no diminution in intensity as it approached the horizon; indeed, if anything, there was an increase in brilliancy, which was at least twice that of Vega.

No alteration in colour was noticeable, a very definite purplish-blue being predominant throughout the observation.

The meteor travelled in a distinct curve and not in a straight line. The path it had followed lasted for several minutes, but, seen through a powerful telescope, presented neither abnormalities nor points of interest. Halfway along, and above the track, however, was a smaller and less well-defined second track. This disappeared within a minute of the fall of the meteor. It is suggested that the meteor burst during its fall.

Position of ship, Latitude $25^\circ 08' N.$, Longitude $16^\circ 31' W.$ "

Note.— Meteors frequently break up at some part of their flight, but it is rather rare for the separate path followed by a broken fragment to remain visible for a minute after the main meteor has disappeared.

North Pacific Ocean.

THE following is an extract from the Meteorological Record of S.S. *Comeric*, Captain W. BROOME, Miiki to Ocean Island, observer Mr. J. W. ROBINSON.

"A number of meteors and fireballs of the Orionid shower were observed during this voyage and also for a few days afterwards, outstanding examples of which are as follows:—

20th October, 1935. At 22.26 ship's time (12 hrs. 57 mins. 09 secs. G.M.T.) in Latitude $24^\circ 00' N.$, Longitude $140^\circ 00' E.$, observed a small meteor of 2nd magnitude come into view near α Ceti, bearing 20° true, altitude 15° , and travelling due S.S.E. It maintained the same altitude and finally disappeared near ξ Piscis, bearing 160° true. It left a trail of same magnitude which disappeared at once. Duration of flight barely 1 second, sky cloudless. Also, 50 minutes later, another meteor, similar in all respects save for the trail which was shorter, at the same altitude. Both trails appeared to be composed of minute units.

28th October, 1935. A large blue-white meteor was observed, at 0900 G.M.T., in Latitude $4^\circ 45\frac{1}{2}' N.$, Longitude $161^\circ 16' E.$, to appear near λ Scorpii and travel towards θ Scorpii, where it disappeared, leaving a trail which remained visible for 1 second.

In the majority of cases, the paths of the meteors, when traced back as a great circle over the sky, appeared to radiate from the centre of the constellation of Orion."

West African Waters.

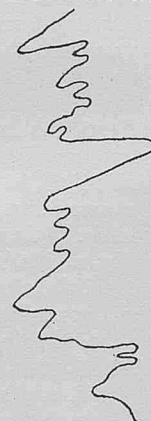
THE following is an extract from the Meteorological Record of S.S. *Llanstephan Castle*, Captain B. RAY, London to Cape Town, observer Mr. D. W. SOWDEN.

Meteor Trail.

1st 5 Minutes

10 Minutes

20 Minutes



"November 14th, 1935, at 5.05 ship's time, 0435 G.M.T., a meteor was observed on the port bow bearing S.S.E. true. It left a trail which subtended an angle of 10° and remained visible for 21 minutes. The colour of the trail was yellow at the extremities but silvery in the middle. During the first five minutes it retained a straight line, but afterwards became distorted, and at 5.26 (ship's time) it disappeared. The phenomenon occurred about 20 minutes before sunrise, sky clear.

Position of ship, Latitude $9^\circ 36' S.$, Longitude $12^\circ 12' E.$ "

THE DENNY-BROWN SHIP STABILIZER.

Fitted to the Southern Railway Co.'s S.S. "ISLE OF SARK," 2,211 tons. Engaged on the Cross Channel Service from Southampton.

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

THIS is a development of an idea first experimented with by the Japanese some 12 years ago in their own vessels to damp the rolling at sea.

The rights have been acquired by Messrs. Denny Bros. of Dumbarton, who, in collaboration with Messrs. Brown Bros. of Edinburgh, of telemotor steering control fame, have developed the idea to its present stage.

Briefly it consists of two horizontal fins or balanced rudders projecting on shafts one from each bilge, much like the hydroplane fins of a submarine. These fins can be canted or inclined through 25° on their shafts by oil rams either automatically by gyro control, or by a hand lever on the bridge.

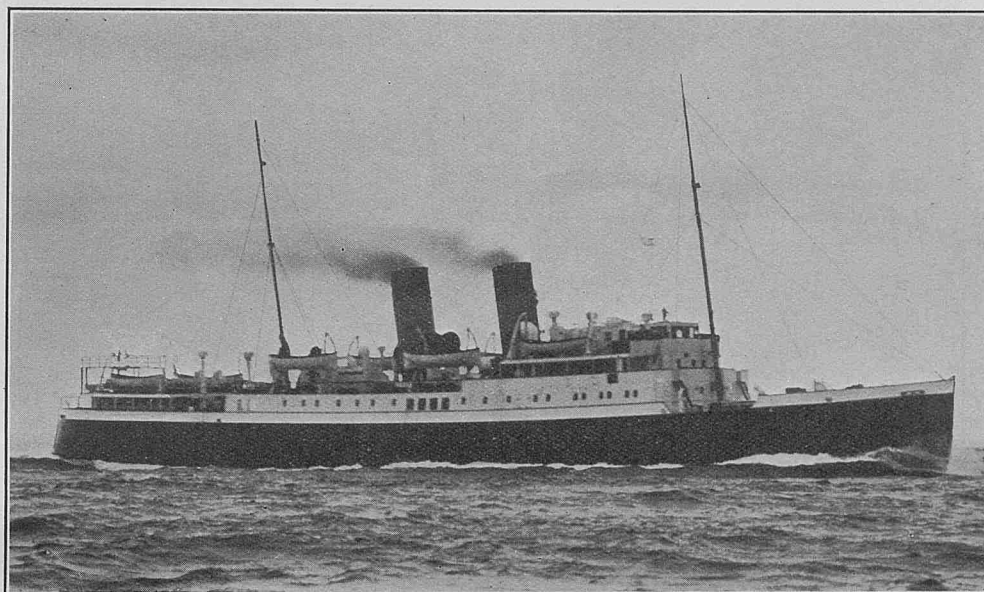
When under way, as the vessel rolls to starboard the starboard fin is inclined upwards and the port fin downwards, so that the forward

movement of the ship creates a pressure on the fins which resists the roll of the ship. As she rolls to port the inclination of the fins is reversed. When not in use the fins are drawn into a recess in a tank so that nothing obtrudes from the run of the bilge.

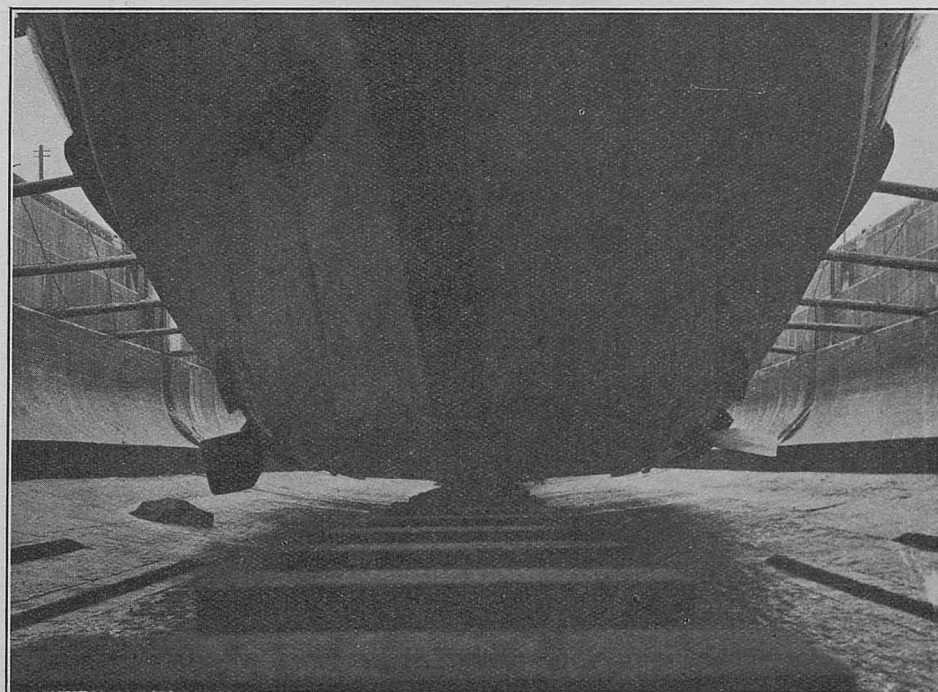
The idea when tried out in Japan depended for its fin angling on a steam engine which proved too slow to anticipate the rolling of the ship. The present manufacturers have evolved an electrically driven oil pump of 30 h.p., controlled electrically by a small gyro in the chartroom, which, as the vessel rolls, automatically by a make and break action sets the pump in motion, which actuates the oil rams inclining the planes in opposite directions.

The gyro may be cut out and the impulse conveyed by a hand lever on the bridge.

The planes or fins fitted on the *Isle of Sark* each weigh 25 cwt. and



Southern Railway Co. Cross Channel Steamer "Isle of Sark."



are about half the area of the ship's rudder. The complete installation weighs about 30 tons, and costs from £7,000 to £9,000, in this case. Cost would be much less if fitted when ship is building, and a more suitable position could be designed both for the fins and the machinery.

Twelve years ago a Japanese mine layer was fitted with four sets of fins on each bilge and they had a very marked effect in damping the rolling. Commercial ships were also fitted with excellent results.

It remains for experiments to determine in how large a vessel the rolling may be controlled by one set of fins.

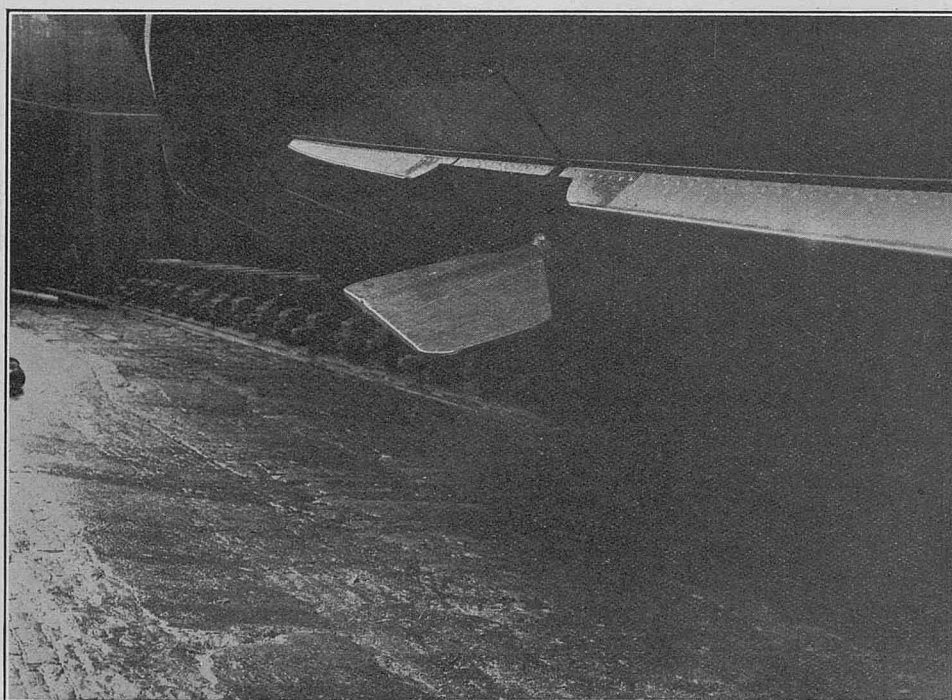
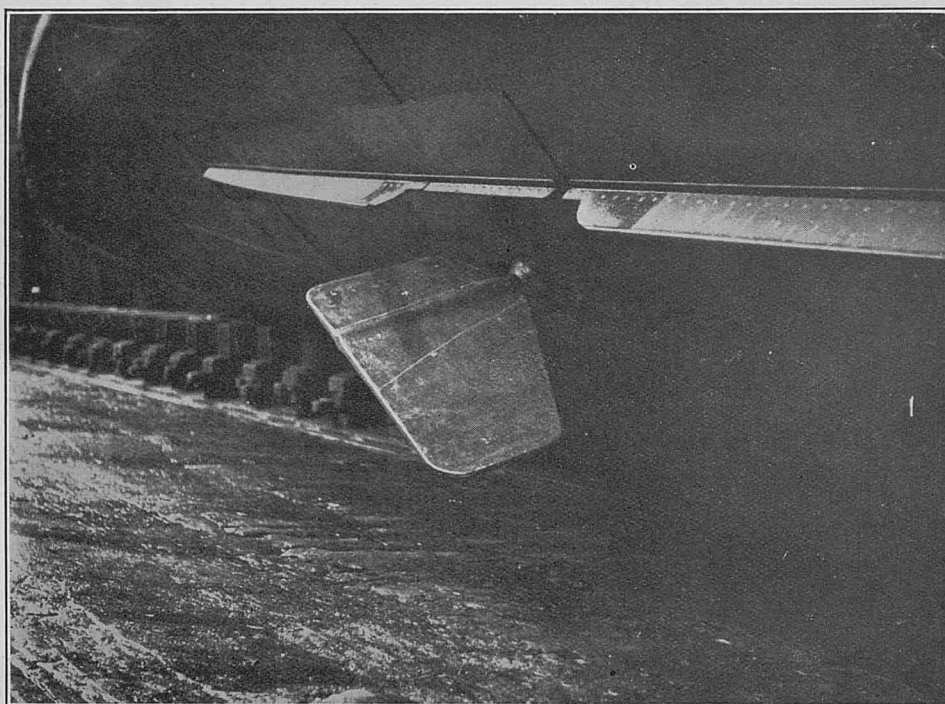
It is expected that the ordinary bilge keels as now fitted may be entirely dispensed with where these automatic inclining planes are fitted.

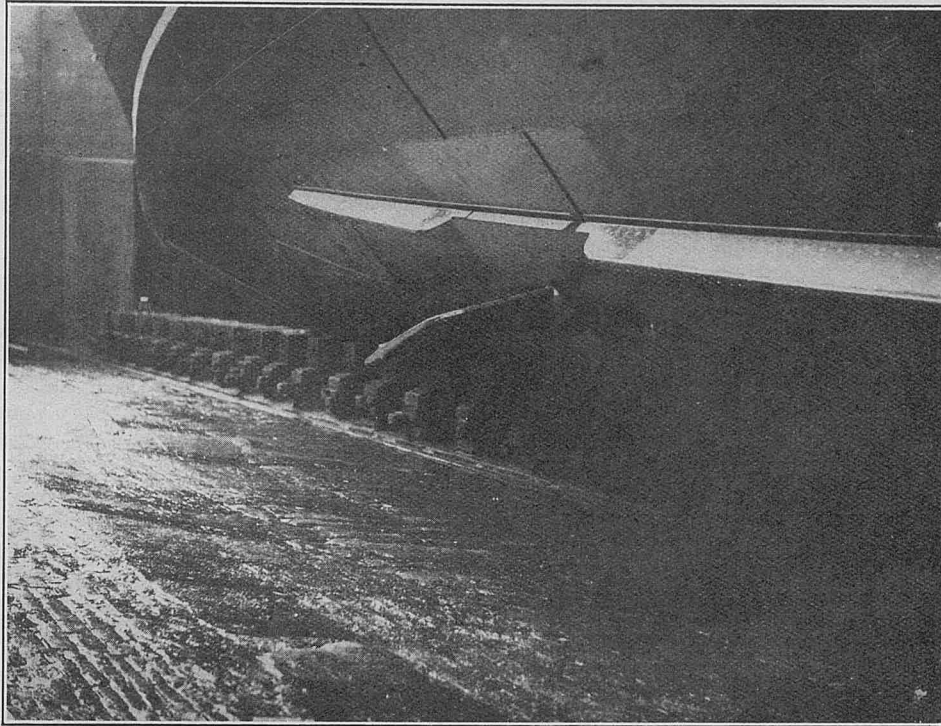
If the experiment now being conducted in the *Isle of Sark* by the enterprise of the Directors of the Southern Railway should prove

successful, we may envisage a valuable addition to the comfort of sea passengers, and perhaps an assistance to the gunnery of fighting ships and the steadiness of aircraft carriers and mine layers.

On March 31st, the *Isle of Sark* went to sea for a test, but the weather was fine and there was no sea or swell to roll the ship. However, the ship was made to roll while running full speed by inclining the fins by the hand control on the bridge and, when rolling had been set up, the automatic gyro control was switched on and then the fins stopped the roll.

Tests were also made at full speed, 19 knots, in Sandown Bay to determine what loss of speed was caused by the fins in their horizontal position without inclination. It was found to be 0.7 of a knot. The machinery worked satisfactorily throughout, and it was found the full range of 25° inclination of the fins was not required.





WEATHER IN THE NORTH ATLANTIC, DECEMBER 11th to 14th, 1934.

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

ON December 2nd, 1934, the S.S. *Usworth*, of 3,535 tons gross left, Montreal for Queenstown fully laden with a cargo of wheat. On December 6th she called at Sydney, Nova Scotia, for bunkers and on proceeding ran into heavy weather which became more boisterous as the days passed. Between the 11th and 14th the ship sustained such heavy damage as to be in a sinking condition and, on the latter date, when in approximately Latitude $48^{\circ} 01' N.$, Longitude $31^{\circ} 49' W.$, she was abandoned, during the process of which 15 members of the crew of 26 lost their lives.

The following weather charts for Noon G.M.T. on December 11th, 12th, 13th and 14th are made from observations taken by ships of the Voluntary Observing Fleet and show the general weather conditions prevailing prior to and at the time of *Usworth's* loss. On each chart the position in which *Usworth* was abandoned is marked with a +.

CHART 1.—On December 11th, at 1200 G.M.T., a depression was centred south of Sable Island. *Alaunia*, in Latitude $45^{\circ} 25' N.$, Longitude $50^{\circ} 15' W.$, noted that this depression was quickly overtaking the ship from S.W. and deepening.

At this time there was also a deep depression in mid-Atlantic, centred N.E. of Latitude $52^{\circ} N.$, Longitude $32^{\circ} W.$ *Berengaria*, in Latitude $46^{\circ} 45' N.$, Longitude $35^{\circ} 45' W.$, reported a strong westerly gale with high sea and long heavy swell.

At 3 a.m. on this day *Usworth*, steering eastward, shipped a sea

which stove in the Port saloon door in the bridge deck house. Vessel was hove to for the repair of the damage. At 4.30 a.m. her steering gear became disabled owing to heavy damage to deck fittings. Auxiliary steering gear proved non-effective and vessel lay helpless in the trough of the sea which was becoming higher with increasing wind force. Wireless messages calling for assistance were sent out and responded to by the Belgian S.S. *Jean Jadot* and later by the Cunarder *Ascania*.

At daybreak on December 12th, the wind and sea having somewhat abated, the *Jean Jadot* successfully passed a towing hawser to *Usworth* who then proceeded under her own steam, steered by *Jean Jadot* in tow astern.

CHART 2.—December 12th, 1200 G.M.T. The depression, which was centred south of Sable Island at noon on the previous day, has now travelled N.E. and is centred to the north and west of *Alaunia's* position in Latitude $47^{\circ} 24' N.$, Longitude $42^{\circ} 21' W.$ *Alaunia* reports a strong W.S.W. breeze with high confused sea and swell.

The depression which caused the heavy weather experienced by *Berengaria* and *Usworth* on the 11th has moved east and a wedge of high pressure occupies the area between the two depressions. *Georgic*, in Latitude $48^{\circ} N.$, Longitude $36^{\circ} W.$, reports a moderate S.W. breeze with rain, rough sea and heavy swell from W.S.W. That evening over this region there was a moderate gale from W. to W.S.W.

The tow rope which *Jean Jadot* had succeeded in passing to *Usworth* on this morning, parted at 4.30 p.m., but *Usworth* was able to proceed slowly with the use of jury steering gear.

CHART 3.—December 13th, 1934, at 1200 G.M.T. The depression which on yesterday's chart was shown centred to the west of the 40th meridian has moved east and deepened considerably. *Georgic* in Latitude $45^{\circ} 30' N.$, Longitude $43^{\circ} 30' W.$ reports the wind at storm force from W.S.W. with very high S.W. sea and a heavy W.S.W. swell. *Alaunia* in Latitude $49^{\circ} 00' N.$, Longitude $33^{\circ} 55' W.$ reported a strong breeze from E.S.E. with rough S.E. sea and confused short heavy swell. Six hours later she was experiencing a strong gale from W.S.W. increasing in strength, with a very high westerly sea and heavy long S.W. swell.

Usworth, using jury steering gear, had in company with the *Jean Jadot* proceeded slowly eastward since the previous evening but, during the afternoon of the 13th, fell into the trough of the sea and was hove to with helm lashed to starboard. She was repeatedly swept by seas and at 10 p.m. on this night a succession of waves engulfed her. The cargo shifted, giving her a list of about 25° to port. Heavy structural damage was sustained fore and aft, boats and derricks were washed away, No. 2 hatch coamings buckled and hatches stove in, water entering the hold. During the night the *Jean Jadot* was blown away from the *Usworth* but returned during the middle watch, and at 7 a.m. *Ascania* arrived.

CHART 4.—14th December, 1934, at 1200 G.M.T. The deep depression moving rapidly east is now centred to the N.E. of Latitude $50^{\circ} N.$, Longitude $20^{\circ} W.$ The winds in its rear were reported by a number of ships to have reached a whole gale during the past 24 hours. *Alaunia* records "Deep depression 950 mb. in $51^{\circ} N.$, $32^{\circ} W.$, moving east." The centre passed close to *Usworth* in distress. Precipitous seas caused by strong veering winds and low barometer.

Throughout the early hours and morning of this day the plight of

Usworth steadily became worse. In spite of the crew's efforts, the list increased to such an extent that the vessel appeared likely to capsize and at about 5 a.m. water in the lower part of the ship reached the furnaces, stopping the pumps.

The *Jean Jadot* and *Ascania* made unsuccessful attempts to pass lines to *Usworth* by means of rockets. After pumping oil on the sea the *Jean Jadot* manned a boat and took off fourteen of the crew, but after pulling clear of the wreck the boat, while attempting to lie to a sea anchor, got into the trough of the sea and capsized. Twelve of the crew of the *Usworth* and two of *Jean Jadot's* crew were drowned. During the afternoon the *Ascania* manned a boat and successfully saved the remainder of *Usworth's* crew with the exception of three who, in jumping too hastily for the boat, were drowned.

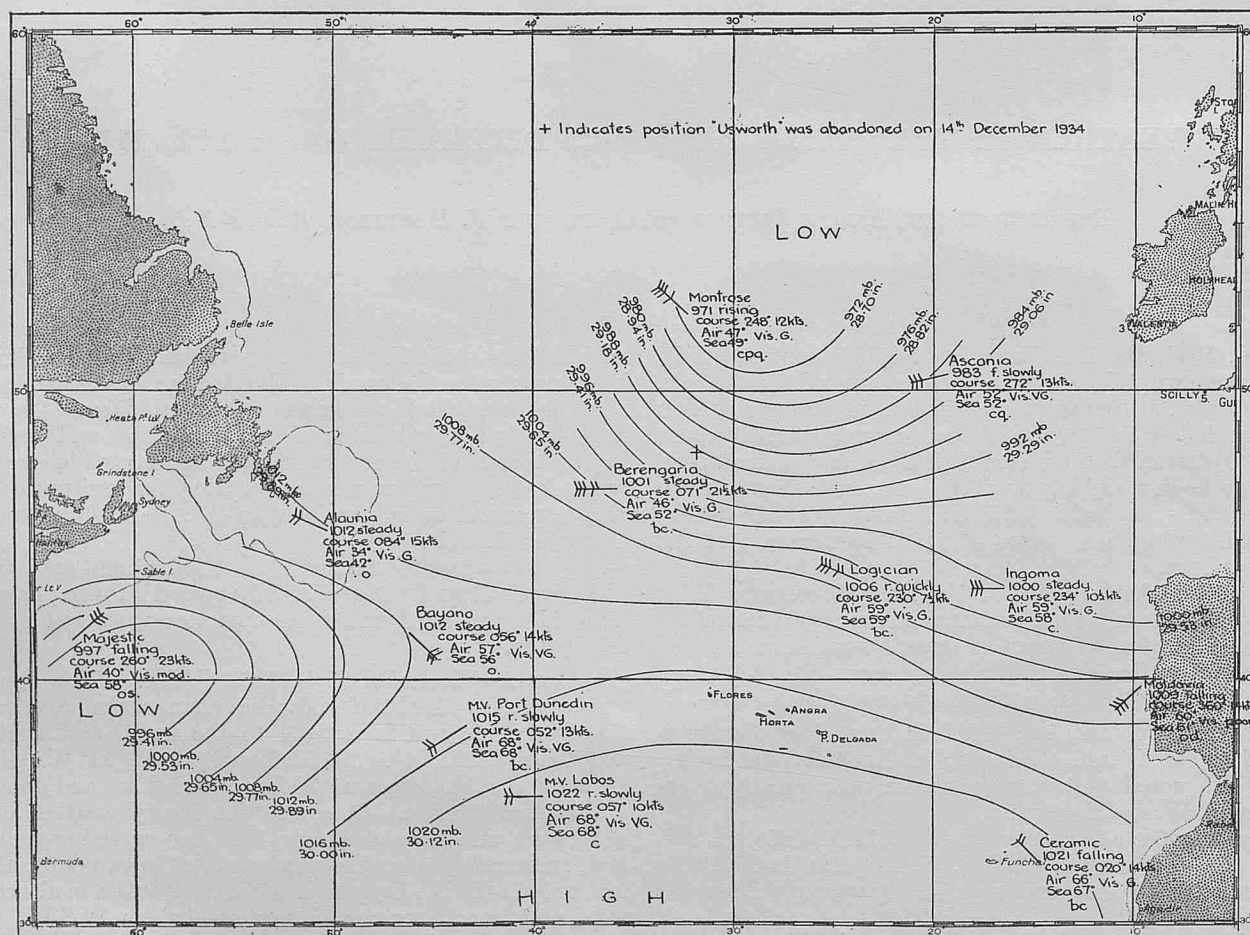
In the finding of the Court who investigated the disaster the *Usworth* was found to have been overwhelmed by the sea and foundered in a hurricane.

Lord Merrivale, the president of the Court, paid a high tribute to the *Usworth's* crew and to the crews of the rescuing ships *Jean Jadot* and *Ascania*. He said:

"The behaviour of the ship's company, officers and seamen, for a long time under circumstances of deadly peril was in the highest degree praiseworthy. When the survivors were rescued, long continued labour without food and without sleep had brought most of them to a state of exhaustion. They did all that was possible to the end.

"One could not but be impressed by a sense of the degree to which the fellowship of the sea kept the masters and crews of those two vessels" (i.e. the *Jean Jadot* and *Ascania*) "as near as might be at hand to render assistance to the *Usworth* which was manifestly in a very dangerous position. They were not able to stand by because of the weather but they both came back and they both rendered assistance. It would not be proper not to take a note of it in an enquiry of this kind."

Chart 1.—Weather Chart, Noon G.M.T., 11th December, 1934.



± Indicates position 'Usworth' was abandoned on 14th December 1934

LOW

HIGH

Ships and their data:

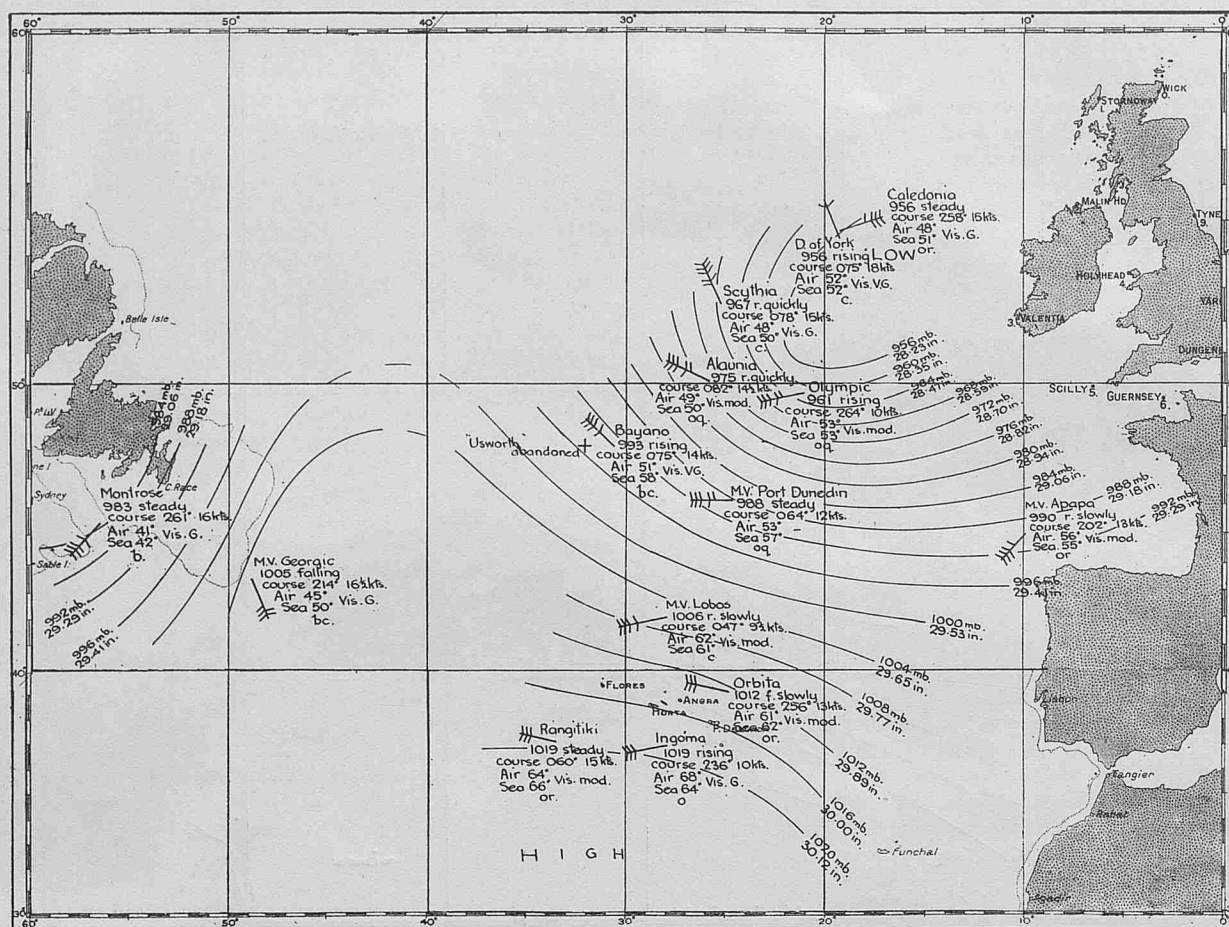
- Montrose**
991 falling
course 244° 16kts.
Air 40° Vis. mod.
Sea 49° or
- Alaunia**
991 steady
course 270° 15kts.
Air 50° Vis. poor
Sea 48° om
- Bayano**
998 falling
course 060° 14kts.
Air 65° Vis. poor.
Sea 63° od.
- MV. Port Dundrin**
1009 f. slowly
course 056° 13kts.
Air 65° -
Sea 65° -
oe.
- MV. Lobos**
1021 steady
course 058° 9kts.
Air 69°
Sea 67° Vis. Very poor.
cd
- MV. Rangitiki**
1025 steady
course 060° 15kts.
Air 70°
Sea 73° Vis. VG.
- Ascania**
991 rising
course 265° 6kts.
Air 51°
Sea 55° Vis. V.S.
bcq.
- Berengaria**
999 steady
course 077° 2½kts.
Air 54° Vis. G.
Sea 56° bc.
- Logician**
1016 rising
course 254° 6kts.
Air 60° Vis. G.
Sea 62° bcq.
- Ingoma**
1018 rising
course 235° 7kts.
Air 58° Vis. G.
Sea 58° bcq.
- Moldavia**
994 steady
course 027° 14½kts.
Air 55° Vis. VG.
bc.
- Orbita**
999 steady
course 283° 13kts.
Air 56° Vis. G.
Sea 59° oa.
- Ceramic**
1010 steady
course 019° 14kts.
Air 61° Vis. G.
Sea 62° o.

Other locations and features:

- British Isles: Wick, Malinbeg, Holmhead, Dunbar, Guernsey, Sillies.
- Iceland: Sydney, C. Race, Sable I.
- Azores: Flores, Angra, Ponta, Delgada.
- Caribbean: Funchal, Rabat, Tangier, Agadir.

[illegible]

Chart 4.—Weather Chart, Noon G.M.T., 14th December, 1934.



CURRENTS IN THE SOUTH PACIFIC OCEAN, SOUTH OF LATITUDE 34° S., DURING THE SOUTHERN WINTER AND GENERAL SUMMARY.

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

DURING the southern winter (May to October) the flow of current south of Latitude 34° S., where it can be distinguished, is similar to that of the summer (November to April). In parts of the Southern Ocean Drift the mean drifts are somewhat stronger than those of the summer. Elsewhere they are generally weaker.

Seasonal Variations of Current.—The mean set and drift of current for each quarter of the year have been computed for a number of areas and are given in the accompanying table. By this means the seasonal variation of set and drift within each of these areas is shown.

The grouping of currents for areas considerably larger than those for which the mean arrows are shown on the charts also serves another purpose. In extended regions where no well-defined currents are shown, such as we are now dealing with, indications of resultant flow may be derived from larger areas which cannot be obtained from smaller ones.

General Current Circulation of the South Pacific Ocean.—The general flow of current for the region south of Latitude 34° S., derived from the present year's work, is inserted in FIGURES 1 and 2. These charts will be added to in subsequent years, as the investigation proceeds.

The Southern Ocean Drift.—The Southern Ocean Drift in the region under discussion is weak throughout the year. In the Table, lines 10 to 15, the seasonal variations have been computed for the ocean between the south island of New Zealand and the coast of South America (Longitudes 168° E. to 70° W.). West of Longitude 168° E. there are practically no observations.

Between Longitudes 168° E. and 172° W. the mean set of current in all quarters is between S. and S.E. Between Longitudes 172° W. and 70° W. the mean set is mainly between N. and E. in all quarters,

but it is more northerly than easterly during the summer, as shown in FIGURE 1. In the winter the easterly component predominates, except between Longitudes 112° W. and 92° W., where the mean set is nearly due north. The mean drifts are weak, mainly 2 or 3 miles per day. Towards Cape Horn, between Longitudes 112° W. and 70° W., the Southern Ocean Drift is somewhat stronger in the winter, the mean drifts being from 3 to 5.5 miles per day. The drifts observed seldom exceed one knot anywhere in the Southern Ocean Drift, the greatest during the period 1910-1935 being 1½ knots.

The areas taken for the Southern Ocean Drift are not fully covered by the current observations, which can only be obtained from the steamship tracks. A glance at the charts of mean arrows will show that the width of this belt of observation never exceeds 8° and is only 4° in its most southerly part, westward of Cape Horn. There are nevertheless sufficient observations to enable reliance to be placed on the mean set and drift of current within this comparatively narrow belt. There can be no doubt that the flow of water in this part of the Southern Ocean is much more northerly than in the case of the South Indian Ocean. This applies particularly to the summer but also, in lesser degree, to the winter. A full explanation of this fact cannot be given at this stage of the investigation of the currents of the South Pacific Ocean, but it may be due to the existence of two areas of high pressure, as against only one in the South Indian Ocean. It may be that the northerly and north-westerly flows between Longitudes 140° W. and 180° W., shown as far north as Latitude 34° S. in FIGURE 1, pass in lower latitudes into the westerly current which flows to the Australian Coast and then turn southward down that coast as the East Australian Coast Current, thus giving a circulation round the high-pressure area which lies off the coast of New South Wales.

Figure 1.
Currents in the South Pacific Ocean.
Summer. November to April.

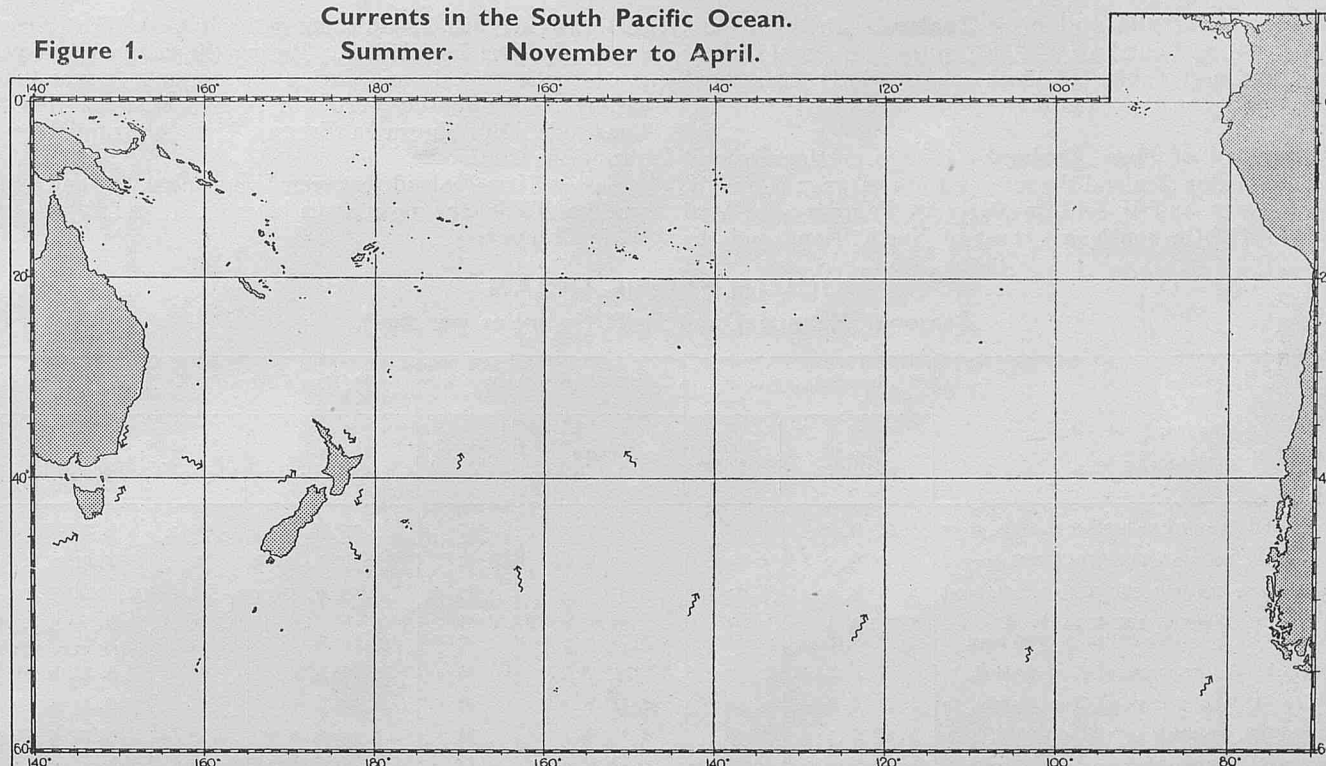
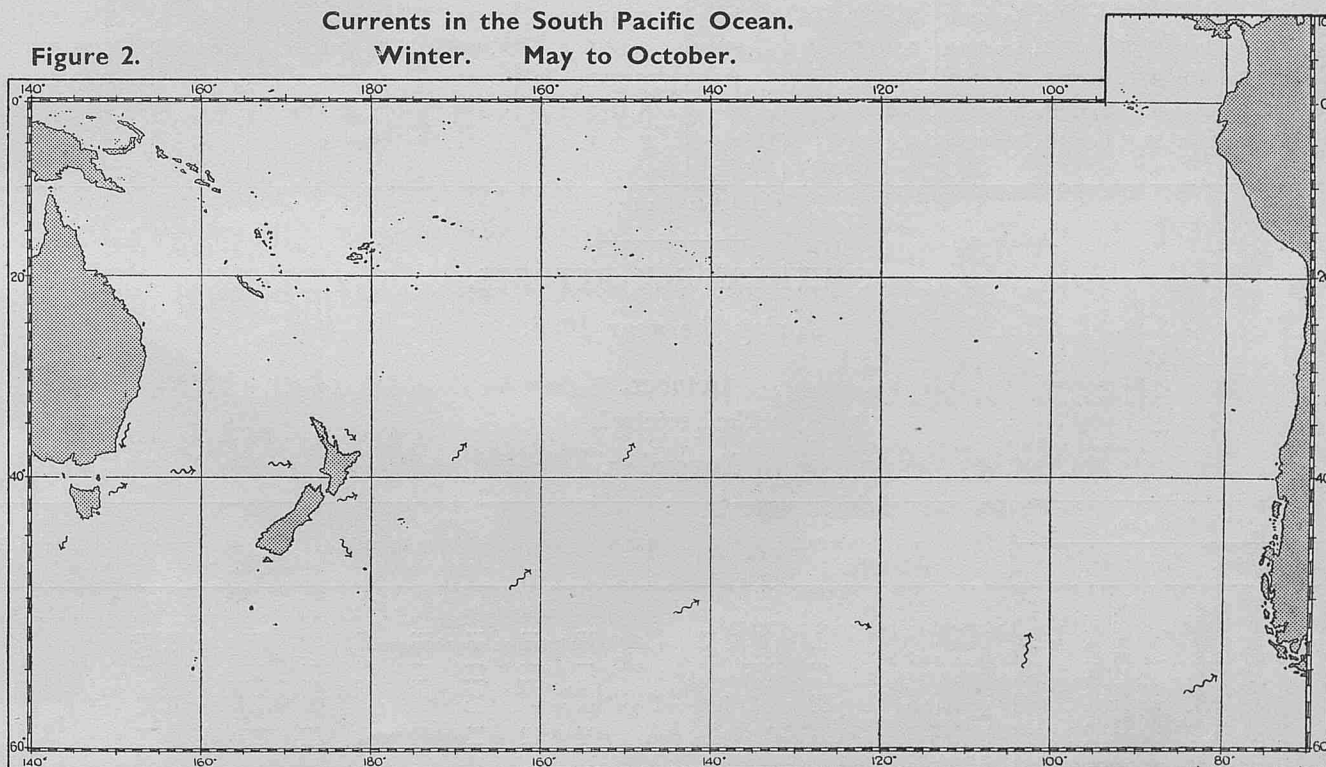


Figure 2.
Currents in the South Pacific Ocean.
Winter. May to October.



The strength of the Southern Ocean Drift in the South Pacific Ocean is about the same as that of the eastern half of the South Indian Ocean (Longitudes 80° E. to 140° E.) It is much weaker than that of the western half of the South Indian Ocean (Longitudes 20° E. to 80° E.). It is possible that the Southern Ocean Drift of the South Pacific flows with greater strength south of the region from which current observations have been obtained; it is known that the average paths of depressions in the South Pacific are from 3° to 7° more southerly, according to season, than those of the South Indian Ocean, so that westerly winds extend farther south in the Pacific Ocean. Observations made on the *Discovery* expeditions show that south of 66° S. there is still a surface current towards the east in the neighbourhood of Graham Land. This current is turned towards the north by the west coast of Graham Land and then flows in a north-easterly direction through the Drake Passage, between Graham Land and Cape Horn.

East Australian Coast Current.—The mean set of this current from Latitude 33° S. to Cape Howe is nearly constant throughout the year, south-south-westerly. Its mean drift is greatest in the summer and is strongest in November to January, 8.5 miles per day. During the winter it averages 4 miles per day. The drifts observed during the period 1910–1935 do not reach two knots, save in the case of one or two short-period observations, the greatest being at the rate of about three knots, as given in the previous article.

Currents near Tasmania.—Eastwards of the Bass Strait and Tasmania (line 2 of Table), the mean set is north-westerly in November to January, but is north-easterly or east-north-easterly during the rest of the year. To the west and south of Tasmania (line 3 of Table) the mean sets differ during each quarter. The mean set for the summer half-year is N. 71° E., while that for the winter is S. 26° W., so that the current here, though weak, is reversed half-yearly.

Region between Australia and New Zealand.—In this region, Latitude 34° S. to 44° S., Longitude 152° E., to the west coast of New Zealand (lines 4 and 5 of Table) the mean set is easterly throughout the year. It is nearly due east from May to October.

Currents eastward of New Zealand.—Off the north-east coast of the north island of New Zealand the mean set lies between S. and E. from May to January and is south-westerly in February to April (line 6 of Table). Off the south-east coast of North Island and the

east coast of South Island as far as Latitude 44° S., the current changes seasonally (line 7 of Table). During the summer half-year the set is south-south-westerly and during the winter half-year it is east-north-easterly. The southerly flow of current between New Zealand and Longitude 180°, shown in FIGURE 1, is interrupted by this change during the winter.

East of New Zealand, between Longitudes 180° and 140° W. (lines 8 and 9 of Table) the mean set is between N. and E. or between N. and W. in all quarters.

SOUTH PACIFIC OCEAN

Seasonal Mean Set and Drift (in miles per day).

Regions.	November to January.		February to April.		May to July.		August to October.	
	Mean Set and Drift.	No. of Observations.	Mean Set and Drift.	No. of Observations.	Mean Set and Drift.	No. of Observations.	Mean Set and Drift.	No. of Observations.
1. East Australian Coast Current, Latitude 33° S. to 38° S., coast to Longitude 152° E.	S. 26° W. 8.5	37	S. 14° W. 6	77	S. 10° W. 4	30	S. 27° W. 4	25
2. Latitude 38° S. to 44° S., Longitude 148° E. to 152° E. (east of Tasmania).	N. 40° W. 2	35	N. 60° E. 3.5	37	N. 49° E. 2	21	N. 61° E. 2.5	31
3. Latitude 42° S. to 48° S., Longitude 140° E. to 148° E. (west and south of Tasmania).	S. 61° E. 2	11	N. 61° E. 4	12	S. 83° W. 0*	8	S. 12° W. 1	7
4. Latitude 34° S. to 44° S., Longitude 152° E. to 164° E.	S. 72° E. 4	214	S. 32° E. 1	230	E. 2	180	N. 83° E. 3	161
5. Latitude 34° S. to 44° S., Longitude 164° E. to west coast of New Zealand.	N. 63° E. 2	166	N. 58° E. 2	173	S. 85° E. 2	170	N. 84° E. 2	136
6. Latitude 34° S. to 38° S., east coast of New Zealand, to Longitude 180°.	S. 77° E. 3	52	S. 54° W. 1.5	64	S. 38° E. 1	38	S. 82° E. 0*	47
7. Latitude 38° S. to 44° S., east coast of New Zealand, to Longitude 180°.	S. 17° W. 2.5	59	S. 16° W. 0.5	99	N. 69° E. 2	64	N. 72° E. 1	52
8. Latitude 34° S. to 44° S., Longitude 180° W. to 160° W.	N. 62° E. 1	589	N. 17° W. 1	742	N. 48° E. 1	519	N. 16° E. 1	497
9. Latitude 34° S. to 44° S., Longitude 160° W. to 140° W.	N. 49° W. 1	284	N. 27° W. 1	376	N. 25° E. 2	236	N. 29° E. 1	202
10. Southern Ocean Drift, Latitude 44° S. to 60° S., Longitude 168° E. to 172° W.	S. 12° E. 1	65	S. 44° E. 1.5	84	S. 32° E. 1.5	89	S. 37° E. 1	34
11. Southern Ocean Drift, Latitude 44° S. to 60° S., Longitude 172° W. to 152° W.	N. 36° W. 2	96	N. 4° E. 3	129	N. 32° E. 3	151	N. 89° E. 2	102
12. Southern Ocean Drift, Latitude 44° S. to 60° S., Longitude 152° W. to 132° W.	N. 34° E. 2	65	N. 19° E. 2	124	N. 69° E. 2	100	N. 56° E. 3	77
13. Southern Ocean Drift, Latitude 46° S. to 60° S., Longitude 132° W. to 112° W.	N. 3° E. 2	49	N. 51° E. 1	112	S. 36° E. 1	91	N. 47° E. 1	57
14. Southern Ocean Drift, Latitude 46° S. to 60° S., Longitude 112° W. to 92° W.	N. 22° E. 2	42	N. 15° E. 2	106	N. 22° E. 3	92	N. 5° E. 5.5	49
15. Southern Ocean Drift, Latitude 46° S. to 60° S., Longitude 92° W. to 70° W.	N. 46° E. 2	49	N. 30° E. 2.5	111	N. 65° E. 4	87	N. 54° E. 3	57

* Less than 0.5 mile per day.

SOUTHERN ICE REPORTS.

During the year 1935.

October.

None received.

November.

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1935	24	57° 30' S.	58° 00' E.	1 berg ...	Medium irregular ...	R.R.S. <i>Discovery II.</i>
		58° 00' S.	58° 00' E.	1 growler, much brash in vicinity ...	... ..
		58° 20' S.	58° 20' E.	2 bergs ...	One irregular, one pinnacle ...	
	25	58° 43' S.	58° 25' E.	Loose pack ice ...	... ..
		58° 50' S.	59° 11' E.	Heavy pack ice ...	... ..
	26	58° 27' S.	60° 33' E.	2 small bergs ...	Irregular ...	
		57° 56' S.	63° 24' E.	1 small berg ...	Irregular ...	
	28	57° 50' S.	64° 34' E.	Streams of heavy drift ice ...	... ..
		57° 30' S.	72° 40' E.	1 growler, 1 small berg and occasional drift ice.	... ..
	29	56° 47' S.	76° 48' E.	Loose pack ...	... ..
		56° 29' S.	79° 17' E.	Loose pack ...	... ..
		56° 38' S.	80° 20' E.	5 bergs ...	Medium tabular ...	
	30	From 56° 49' S.	80° 35' E.	22 bergs irregular ...	... ..
		To 57° 31' S.	81° 41' E.	7 tabular small ...	... ..
		From 57° 28' S.	82° 40' E.	15 bergs ...	Small irregular... ..	
		To 57° 39' S.	83° 07' E.	... ..	... ..
		57° 45' S.	83° 53' E.	15 bergs ...	Medium tabular and irregular ...	
		57° 50' S.	84° 26' E.	5 bergs ...	Small irregular... ..	

December.

1	58° 00' S.	85° 42' E.	14 irregular bergs, small ...	... ..	...
2	58° 20' S.	89° 40' E.	14 bergs ...	10 irregular and medium size, 4 tabular medium size ...	...
	58° 20' S.	91° 04' E.	20 bergs and many growlers ...	All medium sized and irregular ...	...
	58° 30' S.	91° 26' E.	4 bergs and small growlers ...	1 large tabular berg—many caves—well worn, 3 medium irregular.	...

SOUTHERN ICE REPORTS (*continued*).

Year	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1935	2	59° 30' E.	93° 24' E.	3 bergs	Medium sized tabular	R.R.S. <i>Discovery II</i> .
	3	From 59° 49' S. 93° 24' E. To 59° 47' S. 94° 05' E.		... ..	Skirting edge of heavy pack ice. 100 bergs of various shapes. Most of them fast in the pack ice.	"
		From 59° 47' S. 94° 05' E. To 59° 06' S. 94° 23' E.		20 bergs	Vessel skirting pack ice edge. None very large and 2 only tabular, the majority of pinnacle shape.	"
		From 59° 06' S. 94° 23' E. To 59° 00' S. 96° 33' E.		93 bergs 3 bergs 8 bergs	Medium sized irregular Tabular and large. Irregular and small.	" " "
	4	59° 30' S. 97° 45' E.		1 large tabular berg 5 small irregular bergs. 3 large irregular bergs.	Also streams of brash on edge of pack	"
		59° 30' S. 98° 20' E.		20 medium tabular bergs 17 medium irregular bergs. ... ..	... ..	"
		59° 08' S. 99° 38' E.		5 medium sized irregular bergs 1 large tabular berg—3 miles long 1 medium tabular berg ... ..	... ..	"
	5	57° 55' S. 102° 35' E.		7 medium irregular bergs 3 medium tabular bergs 4 small tabular bergs ... ..	... ..	"
		57° 31' S. 103° 34' E. 57° 07' S. 104° 36' E.		6 medium sized tabular bergs 3 irregular bergs and many growlers ... ..	... ..	" "
	6	55° 34' S. 108° 30' E.		1 berg	Large irregular	"
		55° 20' S. 109° 15' E.		1 berg	Small and irregular	"
		54° 55' S. 110° 00' E.		1 berg	Small and irregular	"
		54° 31' S. 110° 57' E.		1 berg	Large and irregular	"
	10	52° 34' S. 19° 02' E.		Berg	Old broken down tabular, 850 feet long by 160 feet high (by sextant angles). (The first berg sighted on passage south from the Cape.)	R.R.S. <i>William Scoresby</i> .
		52° 39' S. 19° 02' E.		Berg	Small and irregular	"
		52° 45' S. 19° 00' E.		Bergy bit	Very small	"
	11	54° 58' S. 19° 00' E.		Berg	Old worn tabular, 600 feet long by 250 feet high. Much broken down.	"
		55° 35' S. 19° 20' E.		Berg	Small and irregular	"
		56° 48' S. 19° 26' E.		1 berg, 4 bergy bits	Tabular berg, estimated to be 900 feet long by 130 feet high	"
	12	From 57° 09' S. 19° 30' E. To 57° 43' S. 19° 34' E.		5 bergs, several bergy bits, growlers and brash.	1 tabular berg, estimated to be 600 feet long. Others small and irregular, the largest being 250 feet long by 150 feet high (sextant angles).	"
		From 57° 43' S. 19° 34' E. To 58° 20' S. 19° 40' E.		15 bergs, several bergy bits, numerous growlers, and scattered drift with streams of brash and loose pack ice.	1 long tabular, estimated to be 3,000 feet long by 70 feet high, 6 small tabulars (one 850 feet long by 70 feet high). Remainder small and irregular. Numerous growlers and scattered drift comprising mainly small pieces of rotten ice, with thin streams of brash. In latter position encountered spit of very loose light pack ice, extending to north. Altered course to S.E. and proceeded along edge of areas of loose open light pack. All bergs within 6 miles of track.	"
		From 58° 20' S. 19° 40' E. To 58° 20' S. 20° 18' E.		25-30 bergs. Bergy bits, growlers, pack ice and drift.	6 small tabulars, from 500 feet to 900 feet long and about 100 feet high. Other bergs small and irregular. Numerous bergy bits. Skirting northern edge of loose pack ice with spits extending northwards. Areas of scattered drift also extending to northward.	"
		From 58° 20' S. 20° 18' E. To 57° 58' S. 20° 51' E.		9 bergs. Bergy bits, growlers and drift ice	2 tabular bergs, approximately 2,000 feet long by 70 feet high, remainder small and irregular. Numerous bergy bits and growlers and large areas of scattered drift ice with streams of loose light pack. Drift ice all very rotten and honeycombed.	"
		From 57° 58' S. 20° 51' E. To 57° 56' S. 20° 57' E.		Numerous growlers, and scattered pieces of drift.	Drift ice all very rotten. Small areas of brash. Visibility poor.	"
		From 57° 56' S. 20° 57' E. To 58° 06' S. 21° 08' E.		Scattered pieces of drift	Open water with a few small scattered pieces of drift ...	"
	13	From 58° 06' S. 21° 08' E. To 58° 03' S. 21° 25' E.		4 bergs. Bergy bits and growlers ...	1 tabular berg, estimated to be ½ mile long and 80 feet high. 3 small bergs. Numerous bergy bits, growlers and small pieces of rotten ice.	"
		From 58° 03' S. 21° 25' E. To 58° 06' S. 22° 00' E.		8 bergs, several bergy bits, numerous growlers and scattered pieces of drift.	5 of these bergs were tabulars. 1 estimated to be ½ mile long and 80 feet high, 3 between 800 feet and 1,000 feet long and 1 very small. Other 3 bergs small old and sea worn. All drift ice very rotten and widely scattered.	"
		From 58° 06' S. 22° 00' E. To 57° 49' S. 22° 34' E.		10 bergs, bergy bits and growlers ...	3 small tabular bergs, remainder small irregular and worn. Numerous bergy bits and growlers.	"
		From 57° 49' S. 22° 34' E. To 57° 35' S. 23° 04' E.		4 bergs, 9 bergy bits, 2 growlers ...	All small irregular bergs	"
		57° 34' S. 22° 56' E.		Berg	Small irregular. Estimated 400 feet long by 70 feet high	"
		57° 19' S. 23° 15' E.		Berg, growlers	Berg very small and pinnacled. A few growlers. No other ice. Visibility very good.	"
	14	57° 23' S. 23° 32' E.		1 berg, 1 bergy bit, several growlers ...	Berg small and pinnacled, within radius 2 miles... ..	"
		From 57° 22' S. 24° 13' E. To 57° 19' S. 24° 41' E.		4 bergs, 2 bergy bits, growlers ...	Bergs all small and pinnacled, within 10 miles of track ...	"
	15	57° 19' S. 24° 41' E.		Berg	Small old tabular	"
		56° 50' S. 25° 00' E.		Bergy bit ... ..	... ..	"

SOUTHERN ICE REPORTS (*continued*).

Year.	Day.	Position of Ice.		Description.	Remarks.	Name of Ship reporting.
		Latitude.	Longitude.			
1935	16	56° 36' S.	25° 02' E.	Berg	Small and irregular	R.R.S. <i>William Scoresby</i> .
	17	56° 08' S.	25° 02' E.	Berg	Large tabular, with small portion joined to one end by underwater shelf. Length of main tabular portion, 6,600 feet. Overall length, 7,200 feet. Height for greater part of length about 200 feet, rising at one end to 300 feet. This end facing detached portion. Length and greatest height measured by sextant angles and rangefinder. Usual growlers and brash in vicinity.	"
		56° 06' S.	25° 37' E.	2 bergs, growlers	1 small worn berg 6 miles to S.W., 1 small irregular berg distant to northward, a few scattered growlers.	"
	18	56° 15' S.	26° 07' E.	Berg	Small tabular, 10 miles to N.E.	"
		56° 30' S.	26° 06' E.	Bergy bit ... ..	... ..	"
	19	From 57° 06' S.	27° 30' E.	2 bergy bits ... ..	... ..	"
		To 57° 25' S.	28° 20' E.	No ice ... ..	... ..	"
		To 57° 35' S.	28° 52' E.	2 bergs, several bergy bits	1 tabular berg, 2,660 feet long by 1,360 feet broad. Mean height 200 feet, rising at one end to 300 feet. (NOTE.— This berg was similar in height and general appearance to berg sighted on the 17th December in 56° 08' S., 25° 02' E., but of less than half the length.) Other berg small and irregular. (Measurements by sextant angles.)	"
		To 58° 06' S.	29° 43' E.			
	20	From 58° 06' S.	29° 43' E.	6 bergs, 3 bergy bits... ..	4 of these were tabulars, all small, 1 being 700 feet long by 50 feet mean height, with pinnacle 80 feet high (sextant angles). Other 2 bergs small and irregular. 7 tabular bergs, 2 small and 5 of medium size. 2 small irregular bergs and 1 pinnacle berg. Visibility excellent all day and bergs visible 12 to 15 miles.	"
		To 58° 36' S.	30° 52' E.	10 bergs.		
		To 59° 01' S.	31° 32' E.			
	21	From 59° 01' S.	31° 32' E.	12 bergs, bergy bits and growlers	1 medium sized tabular berg, 2 old listed tabulars, medium size. Remaining bergs small and irregular. Several bergy bits and growlers. Visibility excellent throughout.	"
		To 59° 10' S.	32° 37' E.			
		From 59° 10' S.	32° 37' E.	7 bergs	2 small tabulars. Others small and irregular. Visibility good.	"
		To 59° 31' S.	33° 35' E.			
	22	From 59° 31' S.	33° 35' E.	3 bergs, 1 bergy bit and growler	Bergs all small and irregular. Visibility mainly poor ...	"
		To 60° 07' S.	34° 14' E.			
		From 60° 07' S.	34° 14' E.	2 bergs, 3 bergy bits and growlers	Bergs small and irregular. A few growlers. Visibility mainly poor.	"
		To 60° 12' S.	32° 30' E.			
	23	From 60° 12' S.	32° 30' E.	3 bergs, growlers and brash... ..	1 small old worn tabular berg and 2 very small irregular bergs. A few growlers and one small area of brash. All within 2 or 3 miles of track. Visibility mainly poor.	"
		To 61° 19' S.	35° 03' E.			
		From 61° 19' S.	35° 03' E.	5 bergs, 5 bergy bits	2 small old tabulars, 1 small irregular and 2 very small low sea worn bergs. Within 5 miles track.	"
		To 62° 00' S.	36° 40' E.			
	24	From 62° 00' S.	36° 40' E.	5 bergs, 1 growler	2 small old worn tabulars, 1 listed. Other 3 bergs small and irregular. All within 3 miles of track. Visibility poor to moderate.	"
		To 63° 02' S.	39° 03' E.			
		From 63° 02' S.	39° 03' E.	4 bergs, 2 bergy bits and growlers	1 small tabular and 3 small irregular bergs, 5 growlers. All within 3 miles of track. Visibility poor to moderate.	"
		To 64° 03' S.	41° 18' E.			
	25	From 64° 03' S.	41° 18' E.	6 bergs, 6 bergy bits... ..	Bergs all small and irregular. Visibility very good throughout.	"
		To 64° 03' S.	41° 02' E.			
	26	From 64° 00' S.	41° 02' E.	Drift ice	Encountered scattered drift in latter position, with loose open pack to southward.	"
		To 64° 09' S.	41° 46' E.	Pack ice and drift, 2 bergs, 1 bergy bit and growlers.	In this position passed through stream loose drift and brash. All open water to eastward, with edge of loose open pack trending to S.E. Bergs small and irregular.	"
		To 63° 53' S.	42° 30' E.		No further ice, except a few widely scattered growlers. Visibility excellent.	"
		To 64° 01' S.	43° 17' E.	Growlers		"
		From 64° 01' S.	43° 17' E.	3 bergs, 2 bergy bits, growlers	Bergs all small, 2 irregular and 1 old tabular. A few scattered growlers. Visibility excellent.	"
		To 64° 17' S.	44° 21' E.			
	27	From 64° 17' S.	44° 21' E.	2 bergs, drift ice	Small old tabular bergs. In latter position encountered loose drift ice and streams of brash.	"
		To 64° 20' S.	44° 32' E.	Drift ice, 2 bergs	Small irregular bergs. Scattered drift comprising narrow streams of very light loose pack and small scattered pieces drift with northern limit near latter position.	"
		To 64° 11' S.	45° 14' E.			
		From 64° 11' S.	45° 14' E.	3 bergs, 2 bergy bits... ..	Bergs very small and irregular. Cleared area of loose drift near former position. Drift ice and streams loose pack visible to southward from latter position.	"
		To 63° 54' S.	46° 30' E.	Drift ice.		"
	28	From 63° 54' S.	46° 30' E.	7 bergs	All small bergs. 1 tall broken down old tabular, 1 pinnacle berg. Others small irregular and sea worn. Visibility very good.	"
		To 63° 13' S.	46° 56' E.			
		From 63° 13' S.	46° 56' E.	2 bergs	Very small and irregular. Within 3 miles of track. Visibility moderate.	"
		To 62° 21' S.	47° 26' E.			
	29	From 62° 21' S.	47° 26' E.	2 bergs	Small and irregular	"
		To 62° 27' S.	47° 26' E.	No ice		
		To 62° 21' S.	46° 36' E.			
	30	From 62° 21' S.	46° 36' E.	1 berg, 1 growler	Very small irregular berg. Visibility moderate to good ...	"
		To 62° 02' S.	45° 59' E.	1 bergy bit		
		To 61° 51' S.	45° 14' E.			
	31	From 61° 51' S.	45° 14' E.	No ice		"
		To 61° 40' S.	44° 24' E.	1 berg, 1 bergy bit	Very small, low, irregular berg. Visibility good	"
		To 61° 29' S.	43° 31' E.			

Reports of ice previous to October, November and December, 1935, will be found in the "Marine Observer," Vol. XII, No. 120, p. 163.

I.—SHIPS' WIRELESS WEATHER SIGNALS.

The list which follows contains the latest information of stations to which "A Selected Ships" should report in accordance with those instructions, and stations detailed to intercept or receive

To decode these reports, and for information of the system of communication of "Selected Ships," all concerned are referred to the PAMPHLET, M.O. 329, concerning which special notice to the masters of British ships will be found on p. 31, paragraphs (27) and (34) of the January 1936 number of THE MARINE OBSERVER.

Request for Information.

[illegible]

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' 40" S. Long. 30° 58' 50" 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	143 kc/s. (2100 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.	Weather.	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' 49" 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. 90° 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. 30, of the January 1936 number.
North Pacific and China Sea.	Cape d'Aguilar, Hong Kong.	Lat. 22° 12' 39" N. Long. 114° 15' 11" E.	VPS	8330kc/s. (36 metres) or 500 kc/s. (600 metres).	143kc/s.* (2100 metres).	China Sea and North Pacific to about 1,500 miles from station.	Royal Observatory	Weather only preferably No. 6 Supplementary Groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule. *Alternatively see particulars on p. 146 and use wave length and times for "B Selected Ships."
South Pacific.	Sydney.	Lat. 33° 46' 00" S. Long. 151° 03' 09" E.	VIS	125 kc/s. (2400 metres).	143 kc/s. (2100 metres).	S. Pacific Coral and Tasman Seas and Southern Ocean between Long. 135° and 160° E.; but not within 100 miles of the coast.	Weather.	Weather only. No. 6 Supplementary groups.	No control—all British "A Selected Ships" within area should report in accordance with Schedule. Reports not required for observation times not starred on Chart, p. 30, of the January 1936 number.
	New Zealand.	—	—	—	—	—	Weather Wellington.	Weather only, four universal groups.	The Meteorological Office, Wellington, will be glad to receive routine reports from British Selected Ships within range of New Zealand W/T Stations through the normal commercial channels.

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

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

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
North Atlantic.	Malin Head.	Lat. 55° 21' 45" N. Long. 7° 20' 30" W.	GMH	Weather London.	Weather in four universal groups only.	Station will indicate at 0805 G.M.T. with ordinary traffic calls, the names of British "B" Selected Ships and other British ships within range and North of Lat. 54° N., and West of Long. 7° W. who are desired to report weather at routine times. Thus:--Call signs of ships to report weather through GMH.
	Valentia.	Lat. 51° 55' 48" N. Long. 10° 20' 54" W.	GCK	Weather London.	Weather in four universal groups only.	Station will indicate at 0825 G.M.T. with ordinary traffic calls, the names of British "B" Selected Ships and other British ships within range, South of Lat. 54° N., and to southward of Ireland West of Long. 7° W., who are desired to report weather at routine times. Thus:--Call signs of ships to report weather through GCK.
South Atlantic.	Salinas.	Lat. 0° 37' 00" S. Long. 47° 23' 00" W.	PPL	Meteoro Rio.	Weather only, including supplementary groups.	
	S. Luiz.	Lat. 2° 31' 28" S. Long. 44° 16' 30" W.	PXM			
	Fortaleza.	Lat. 3° 42' 49" S. Long. 38° 30' 56" W.	PPC			
	Natal.	Lat. 5° 46' 30" S. Long. 35° 16' 20" W.	PXN			
	Olinda.	Lat. 8° 00' 55" S. Long. 34° 50' 40" W.	PPO			
	Amaralina.	Lat. 13° 00' 50" S. Long. 38° 28' 27" W.	PPA			
	Abrolhos.	Lat. 17° 57' 35" S. Long. 38° 42' 00" W.	PXH			
	Victoria.	Lat. 20° 18' 52" S. Long. 40° 19' 06" W.	PPT			
	Rio.	Lat. 22° 59' 19" S. Long. 43° 11' 26" W.	PPR			
	Santos.	Lat. 23° 59' 22" S. Long. 46° 18' 18" W.	PPS			
	Florianopolis.	Lat. 27° 35' 22" S. Long. 48° 34' 17" W.	PPF			
	Juncção.	Lat. 32° 03' 22" S. Long. 52° 08' 13" W.	PPJ			
Mediterranean.						
Red Sea and Indian Ocean.						
Indian Ocean.	Jacobs (Durban).	Lat. 29° 55' 40" S. Long. 30° 58' 50" 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.	

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

(Continued.)

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

Ocean.	Station.	Position.	Call Sign.	Telegraphic address of Meteorological Centre desiring information.	Information desired.	Notes.
Indian Ocean (continued).	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' 49" E.	VPQ	Weather Nairobi.		
	Dar-es-Salaam.	Lat. 6° 50' 38" S. Long. 39° 17' 24" E.	ZBZ	Weather Nairobi.		
	Mauritius.	Lat. 20° 23' 41" S. Long. 57° 35' 25" 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. 33° 52' 40" S. Long. 121° 53' 34" E.	VIE				
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' 37" 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' 47" S. Long. 168° 22' 24" E.	ZLB			
	Chatham Island.	Lat. 43° 57' 28" S. Long. 176° 34' 25" W.	ZLC			
	Rarotonga.	Lat. 21° 11' 52" S. Long. 159° 48' 52" W.	ZKR			
	Apia.	Lat. 13° 50' 17" S. Long. 171° 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			

CHILE.**II.—WEATHER SHIPPING BULLETINS.**

Santiago Central W/T Station, approximate position Latitude $33^{\circ} 27' S.$, Longitude $70^{\circ} 42' W.$

Call sign **C C S.**

Wavelengths 3,000 metres and 25 metres C.W.

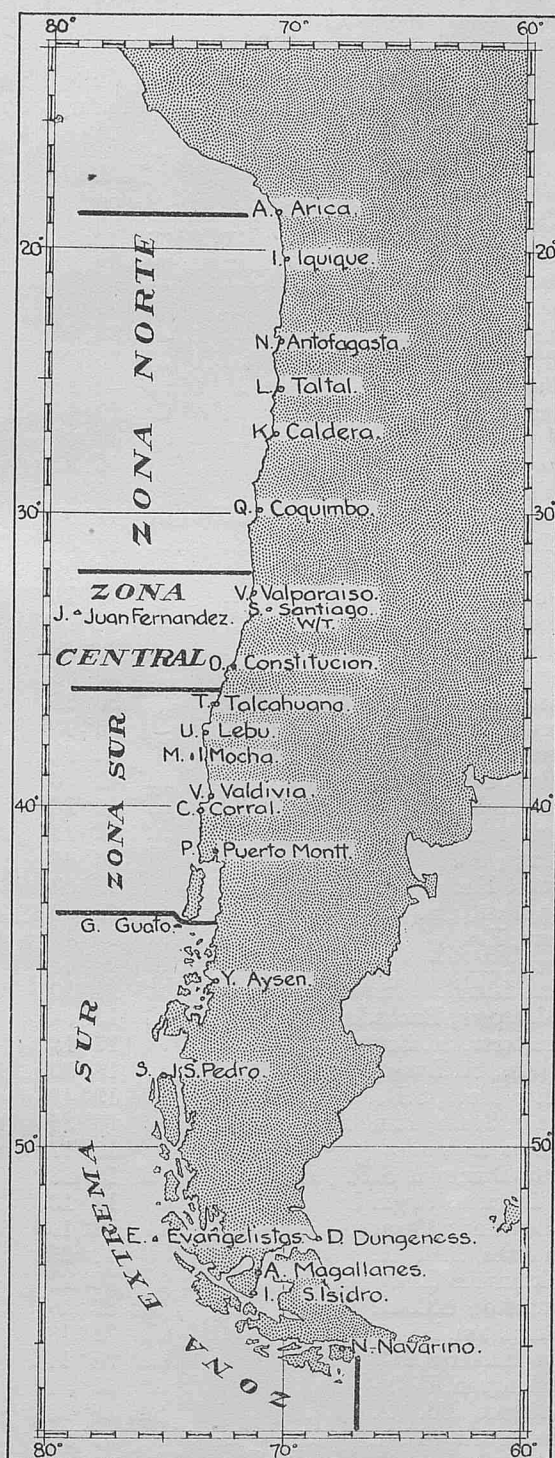
Times of transmission 0130, 1430 and 2030 G.M.T.

The messages are based upon observations taken at 2300, 1200 and 1800 G.M.T. respectively.

They consist of three parts :—

Part I.—General statement of weather conditions *en clair* (Spanish).

Chart showing Stations for Weather Shipping Bulletin for coast of Chile.



The sea areas for forecasts are indicated on the chart from information supplied by a British Selected Ship.

Part II.—Weather Report in code giving actual observations at stations shown on the chart on this page.

Part III.—Forecast of weather in plain language.

The stations are sent in groups of five, the distinguishing letters of the stations, which are shown alongside each station, on the chart, forming the initial group of each eleven groups. The stations are transmitted in the order from North to South.

The station reports are made in the International Ships Wireless Weather Telegraphy Code.

To decode these reports the tables given in the Decode M.O. 329 are required. The Key letters are fully described on p. 36 of the January, 1936, number and in M.O. 329.

Key letters used for station reports—DDFww BBVTT.

WIRELESS STORM WARNINGS.

Valparaiso W/T Station, approximate position Latitude $33^{\circ} 01' S.$ Longitude $71^{\circ} 39' W.$, call sign **CCE**, broadcasts storm warnings when necessary, on a wavelength of 600 metres (I.C.W.).

III.—WIRELESS TIME SIGNALS.

W/T Station.	Call Sign.	Wavelength (Metres).	G.M.T. of Time Signal.
Valparaiso Lat. $32^{\circ} 59' 50'' S.$ Long. $71^{\circ} 33' 40'' W.$	CCL	2,150 (C.W.)	^h ^m ^s ^h ^m ^s 00 55 00—01 00 00

SYSTEM.—The Time Signal commences at 00h. 55m. 00s. G.M.T. and continues for 5 mins., and consists of a series of dots which represent each second, except that the dots at the 29th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th and 59th seconds of each of the five minutes are omitted. The dot at the 60th second of each minute is the time signal.

NOTES.—

Time Signal controlled by the Hydrographic Office.

In the event of failure or irregularities in the Time Signal the word “Señal nula” (Signal annulled) will be made three times in succession, one minute after 0100 G.M.T.

ARGENTINA.**II.—WIRELESS WEATHER BULLETINS.**

The following W/T Stations broadcast a weather forecast, for 24 hours, for the coast of Argentina *en clair* in Spanish.

W/T Station.	Position.		Call Sign.	Time of transmission.	Wavelength.
	Latitude.	Longitude.			
Comodoro Rivadavia.	$45^{\circ} 52' S.$	$67^{\circ} 28' W.$	LOX	G.M.T. 2000	600 metres C.W.
Buenos Aires —Darsena Norte.	$34^{\circ} 36' S.$	$58^{\circ} 22' W.$	LOL	0203	1053 „ „
Buenos Aires —General Pacheco.	$34^{\circ} 28' S.$	$58^{\circ} 38' W.$	LPD	1700	600 „ I.C.W.
Parana ...	$31^{\circ} 44' S.$	$60^{\circ} 27' W.$	LPE	1830	600 „ C.W.
Formosa ...	$26^{\circ} 14' S.$	$58^{\circ} 07' W.$	LOC	1530	600 „ I.C.W.

BRAZIL.

II.—WIRELESS WEATHER BULLETINS.

The Brazilian W/T coast stations given in the list below transmit, **every four hours**, the state of weather and sea, and force and direction of the wind. The observations are made at the W/T Stations. They are sent in Portuguese *en clair*, on a wavelength of 600 metres.

W/T Station.	Position (approx.).		Call Sign.	Times of Sending. G.M.T.
	Latitude.	Longitude.		
Salinas	0° 37' S.	47° 23' W.	PPL	0245, 0645, etc., etc.
S. Luiz do Maranhão	2° 31' S.	44° 17' W.	PXM	0300, 0700, etc., etc.
Natal Norte...	5° 47' S.	35° 16' W.	PXN	0330, 0730, etc., etc.
Olinda (Pernambuco)	8° 01' S.	34° 51' W.	PPO	0000, 0400, etc., etc.
Amaralina (Bahia) ...	13° 01' S.	38° 28' W.	PPA	0315, 0715, etc., etc.
Santos	23° 59' S.	46° 18' W.	PPS	0245, 0645, etc., etc.
Florianopolis	27° 35' S.	48° 34' W.	PPF	0315, 0715, etc., etc.
Juazeiro (Rio Grande do Sul)	32° 03' S.	52° 08' W.	PPJ	0345, 0745, etc., etc.

III.—WIRELESS TIME SIGNALS.

W/T Station.	Call Sign.	Wavelength (Metres).	G.M.T. of Time Signal.
Rio de Janeiro— Lat. 22° 59' 19" S. Long. 43° 11' 26" W.	PPR	1,000 (I.C.W.)	h m s 14 00 00 and 24 00 00

The Time Signals are relayed from Rio de Janeiro Observatory in accordance with the New International system of W/T Time Signals.

The procedure is as follows :—

G.M.T.						Signal.	Meaning.
h	m	s	h	m	s		
13	56	05	to	13	56	50	Time Signal.
23	56	05	to	23	56	50	
	57	00	„	57	49	— — — — — every alternate 5 seconds.	
	57	55	„	58	00	— etc.	
	58	08	„	58	10	55 56 57 58 59 60	
	58	18	„	58	20	— .	Time Signal.
	58	28	„	58	30	— .	
	58	38	„	58	40	— .	
	58	48	„	58	50	55 56 57 58 59 60	
	58	55	„	59	00	— .	
	59	06	„	59	10	—	Time Signal.
	59	16	„	59	20	—	
	59	26	„	59	30	—	
	59	36	„	59	40	—	
	59	46	„	59	50	55 56 57 58 59 60	
13	59	55	„	14	00	00	Time Signal.
23	59	55	„	24	00	00	Time Signal.

The duration of the dash is one second, and that of the dot 0.2 of a second. The final dot, therefore, terminates at

14h } 00m 00.2s, G.M.T.
24h }

In the event of failure, the time signals are transmitted thirty minutes later.

NOTE.—Sent daily except Sundays and public holidays.

UNITED STATES OF AMERICA, WEST INDIAN ISLANDS, AND BERMUDA.

Atlantic Coast.

II.—WIRELESS WEATHER BULLETINS.

Washington—Arlington W/T Station, approximate position Latitude 38° 52' N., Longitude 77° 05' W.

Call sign **NAA**.

Times of Transmission—0300 and 1500 G.M.T.

Wavelengths—2653 m. and 4690† metres C.W. simultaneously.

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

Part I is a summary in plain language of the general pressure distribution, including the location of high and low areas, and the barometric readings at their centres; wind and weather forecasts for the areas shown on the chart, p. 149.

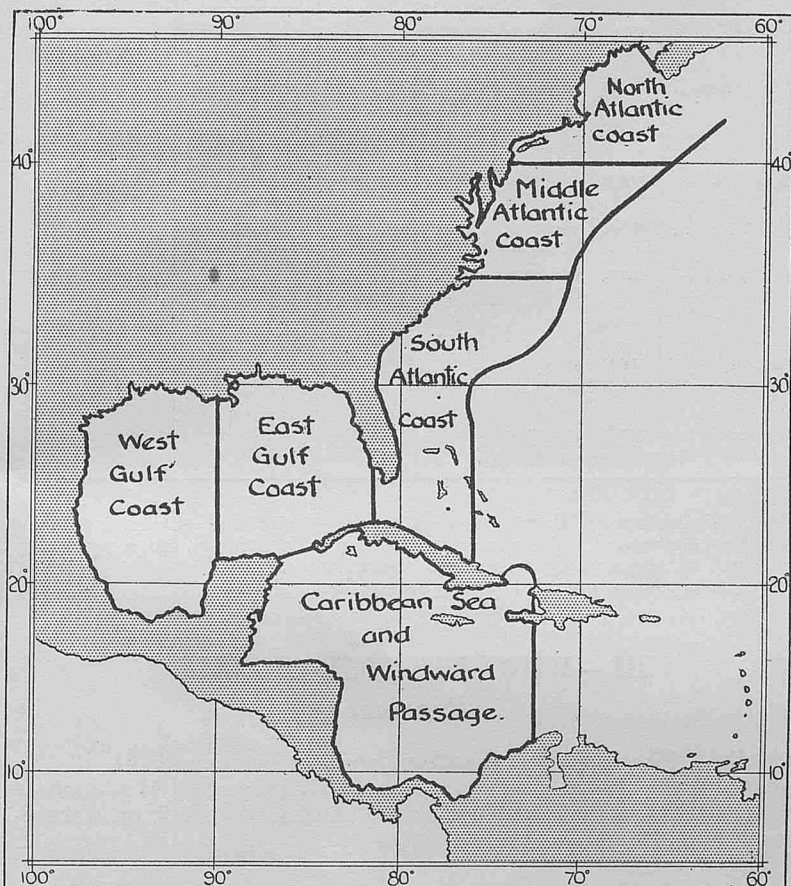
Part II—Actual weather observations in the United States code taken at 0100 and 1300 G.M.T. respectively from a number of stations in the list below.

Indicator letters	Name of station	Latitude north	Longitude west
TP	The Pas. Man.	53° 35'	101° 12'
WG	Winnipeg, Man.	49° 55'	97° 10'
BK	Bismarck, N. Dak.	46° 49'	100° 49'
O	Omaha, Nebr.	41° 16'	95° 58'
KC	Kansas City, Mo.	39° 05'	94° 35'
OK	Oklahoma City, Okla.	35° 29'	97° 31'
DA	Dallas, Tex.	32° 45'	96° 48'
GV	Galveston, Tex.	29° 19'	94° 50'
DU	Duluth, Minn.	46° 49'	92° 09'
M	Marquette, Mich....	46° 33'	87° 26'
LC	La Crosse, Wis.	43° 50'	91° 12'
CH	Chicago, Ill.	41° 50'	87° 40'
SL	St. Louis, Mo.	38° 39'	90° 13'
CN	Cincinnati, Ohio	39° 07'	84° 30'
NV	Nashville, Tenn.	36° 11'	86° 50'
LR	Little Rock, Ark.	34° 41'	92° 15'
VK	Vicksburg, Miss.	32° 17'	90° 50'
NO	New Orleans, La.	30° 00'	90° 05'
P	Pensacola, Fla.	30° 25'	87° 12'
L	Alpena, Mich.	45° 05'	83° 25'
D	Detroit, Mich.	42° 21'	83° 03'
F	Buffalo, N.Y.	42° 53'	78° 50'
PB	Pittsburgh, Pa.	40° 26'	79° 57'
CT	Charlotte, N.C.	35° 13'	80° 51'
AT	Atlanta, Ga.	33° 45'	84° 21'
TA	Tampa, Fla.	27° 59'	82° 29'
K	Key West, Fla.	24° 40'	81° 48'
MI	Miami, Fla.	25° 46'	80° 12'
NU	Nassau, Bahamas	25° 05'	77° 23'
TI	Turks Island, Bahamas	21° 20'	71° 10'
BB	Bridgetown, Barbados	13° 04'	59° 37'
BT	Basseterre, St. Kitts	17° 18'	62° 43'
LV	Castries, St. Lucia	13° 50'	60° 55'
PL	Puerto Plata, S.D.	19° 49'	70° 43'
PS	Port of Spain, Trinidad	10° 35'	61° 30'
RS	Roseau, Dominica	15° 17'	61° 23'
SD	Santo Domingo, S.D.	18° 28'	69° 53'
ST	St. Thomas, Virgin Is.	18° 13'	64° 29'
W	Willemstadt, Curacao	12° 10'	69° 00'
SJ	San Juan, P.R.	18° 29'	66° 06'
JA	Jacksonville, Fla.	30° 21'	81° 40'
C	Charleston, S.C.	32° 50'	79° 58'
WL	Wilmington, N.C.	34° 18'	77° 59'
H	Cape Hatteras, N.C.	35° 14'	75° 32'
WA	Washington, D.C.	38° 54'	77° 03'
BAL	Baltimore, Md.	39° 18'	76° 38'
AC	Atlantic City, N.J.	39° 22'	74° 27'
NY	New York, N.Y.	40° 43'	74° 01'
T	Nantucket, Mass.	41° 15'	70° 00'

Transmission on 4690m. ceases at 0400 G.M.T. for 0300 G.M.T. bulletin.

Indicator letters	Name of station	Latitude north	Longitude west
BN	Boston, Mass.	42° 22'	71° 02'
N	Northfield, Vt.	44° 08'	72° 40'
E	Eastport, Me.	44° 54'	67° 00'
CK	Cochrane, Ont.	49° 04'	80° 58'
DC	Doucet, Que.	48° 17'	76° 40'
PN	Parry Sound, Ont.	45° 20'	80° 01'
ML	Montreal, Que.	45° 31'	73° 34'
FP	Father Point, Que.	48° 30'	68° 30'
BC	Port Aux Basques, N.F.	47° 33'	59° 10'
CR	Cape Race, N.F.	46° 40'	53° 04'
SAB	Sable Island, N.S.	43° 56'	60° 00'
HX	Halifax, N.S.	44° 38'	63° 35'
B	Bermuda (St. George's)	32° 18'	64° 42'
HT	Horta, Azores	38° 32'	28° 29'

Chart showing Forecast and Storm Warning Areas for Atlantic and Gulf Coasts of United States.



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

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

W/T Station.	Call Sign.	Position (approx.).		Time. G.M.T.	Wave length. Metres.
		Latitude.	Longitude.		
Tuckerton, N.J.	WSC	39° 33' N.	74° 23' W.	1400, 2200	650 } (I.C.W. and C.W.) 2256
Chatham, Mass.	WCC	41° 43' N.	70° 46' W.	1400, 2200	2326 (C.W.)
Thomaston, Me.	WAG	44° 09' N.	69° 13' W.	1400, 2200	720 } (I.C.W. and C.W.) 2420
Sayville	WSL	40° 45' N.	73° 06' W.	1400, 2200	765 } (I.C.W. and C.W.) 2500

WIRELESS STORM WARNINGS.

Storm warnings are broadcast when necessary by the following stations, at the times and for the areas stated below:—

W/T Station.	Call Sign.	Position (Approx.) Latitude, Longitude.	Time. G.M.T.	Wave-length. (Metres).	Area (see Chart).
†Jupiter, Fla.	NAQ	26° 57' N. 80° 05' W.	0000, 1630	1,621 (I.C.W.).	Middle and South Atlantic and E. Gulf coasts.
Savannah, Ga.	WSV	32° 05' N. 81° 06' W.	1600, 2330	735 (C.W.).	Do.
†Charleston, S.C.	NAO	32° 52' N. 79° 58' W.	1530, 2300	2,458 (C.W. and I.C.W.).	Do.
Baltimore	WMH	39° 17' N. 76° 36' W.	1530	720 (C.W. and I.C.W.).	Do.
†Washington (Arlington)	NAA	38° 52' N. 77° 05' W.	0300* 1500*	2,653, 4,690 C.W. simultaneously.	N. Atlantic and Gulf coasts.
†New York	NAH	40° 28' N. 74° 00' W.	1530, 2130	2,941 (C.W.).	N. middle and S. Atlantic coasts, Gulf and Caribbean Sea.
†Boston, Mass.	NAD	42° 21' N. 70° 57' W.	0518, 1630	2,941 (C.W.).	N. Atlantic Coast.

* In Part II of the Weather Bulletin.

† Transmit Urgent Hurricane warnings on receipt and at the first silent period on 600 m. These are repeated hourly for 12 hours, unless previously cancelled, the wavelength being indicated in commencement of signal.

The messages are preceded by the Safety Signal TTT.

III.—WIRELESS TIME SIGNALS.

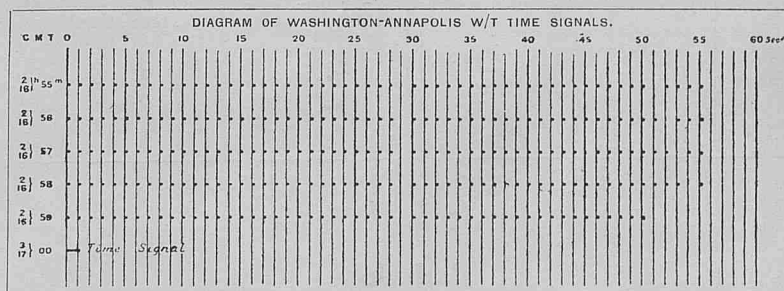
Time Signals are broadcast according to the United States System (See Diagram).

Washington—Arlington, Latitude 38° 52' 05" N., Longitude 77° 04' 47" W., call sign **NAA** on a wavelength* of 2,653 metres (I.C.W.) on high power, at 00h. 00m. 00s., G.M.T., and each subsequent hour except 0200, 0400, 1400 and 1600 G.M.T.

The time signals are broadcast daily and are controlled by the Naval Observatory, Washington.

The transmission of each time signal will be followed by the letters **VA**. In case of error or failure another time signal will be sent one hour later.

The error of the time signal is generally less than 0.02 second.



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

IV.—WIRELESS ICE WARNINGS.

North Atlantic International Ice Patrol.

The North Atlantic International Ice Patrol commences in March, continuing during April, May and June and longer if necessary. The Patrol vessels, call sign **NIDK**, transmit wireless warnings

giving the limits and position of the ice in the neighbourhood of the regular Transatlantic Lane Routes.

The warnings are broadcast daily at 0100 and 1300 G.M.T. on a wavelength of 1713m. C.W. and at 1000 and 2200 G.M.T. on a wavelength of 706m. I.C.W.

Ice information will also be sent on request at all times to any ship with which the Patrol Vessel can communicate, without charge.

The following W/T Stations broadcast messages received from the Patrol Vessel :—

W/T Station.	Call Sign.	Times of Transmission. G.M.T.	Wavelength. Metres.
Washington ...	NAA	0500, 1700	2653 C.W.
Boston ...	NAD	0518, 1630, 2200	2939 C.W.
New York ...	NAH	1530, 2130	2939 C.W.
Norfolk ...	NAM	0900, 1600, 2100	2458 C.W.

CARIBBEAN SEA, GULF COAST AND WEST INDIAN ISLANDS.

II.—WIRELESS WEATHER BULLETINS.

Weather forecasts are issued from the following stations at the times and for the areas given :—

W/T Station.	Position.		Call Sign.	Times of Transmission. G.M.T.	Wavelength.	Area affected (see chart, p. 149).
	Latitude.	Longitude.				
Limon	10° 00' N.	83° 03' W.	TIM	1630	750 m.	E. Gulf, W. Gulf, Caribbean Sea, Windward passage.
Galveston	29° 20' N.	94° 45' W.	NKB	0500	833 m.	S. Atlantic, E. Gulf, W. Gulf, Caribbean Sea and Windward passage.
New Orleans	30° 00' N.	90° 06' W.	WFB	0430, 1630	3331 m. C.W.	E. Gulf, W. Gulf, Caribbean Sea, Windward passage.
Key West	24° 33' N.	81° 48' W.	NAR	0400 } 1600 }	2828 m. C.W.	S. Atlantic, E. Gulf, W. Gulf, Caribbean Sea, Windward passage.
				1800	2828 m. C.W.	S. Atlantic coast and E. Gulf coast.

Barbados.

Bridgetown W/T Station, approximate position latitude 13° 06' N., longitude 59° 37' W., call sign **VPO**, wavelength 600m. I.C.W., broadcasts the following weather information, received from the Meteorological Station, Codrington (latitude 13° 07½' N., longitude 59° 36' W.), when unsettled weather conditions prevail or indications of stormy weather are observed :—

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

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

WIRELESS STORM AND HURRICANE WARNINGS.

Storm Warnings are broadcast by the following W/T Stations for the areas shown on the Chart, p. 149.

When a storm exists that is likely to affect the area, the location and expected direction of movement of the storm centre will be given.

Hurricane Warnings are broadcast when necessary and repeated at the intervals as stated in the last column below.

W/T Station.	Call Sign.	Position (approx.) Latitude. Longitude.	Wavelength. Metres.	Time (G.M.T.) of Storm Warnings.	Area (see Chart, p. 149).	Intervals at which hurricane warnings are repeated.
Galveston, Tex.	WGCV	29° 18' N. 94° 48' W.	720 (C.W.)	1400 and when issued.	West Gulf Coast	—
* " "	NKB	29° 20' N. 94° 45' W.	833 (I.C.W.)	0000, 1700	E. and W. Gulf and Caribbean Sea.	—
Port Arthur ...	WPA	29° 52' N. 93° 56' W.	600 and 720 (C.W.)	When issued.	E. and W. Gulf Coasts, Caribbean Sea, S. Atlantic Coast of U.S.A.	—
New Orleans...	WFB	30° 00' N. 90° 06' W.	3331 (C.W.)	0000, 1330	E. and W. Gulf Coasts, Caribbean Sea and S. Atlantic coast.	—
				0430, 1630	E. and W. Gulf coasts and Caribbean Sea.	—
*Pensacola ...	NAS	30° 21' N. 87° 16' W.	2653 (C.W.)	1548	E. and W. Gulf coasts.	—
*Key West ...	NAR	24° 33' N. 81° 48' W.	2828 (C.W.)	0400, 1600 1800	S. Atlantic Coast and E. and W. Gulf Coasts.	—
Guantanamo (Cuba.)	NAW	19° 55' N. 75° 09' W.	600 (I.C.W.)	When issued.	—	About 4 hourly.
San Juan ...	NAU	18° 07' N. 66° 10' W.	600 (C.W.)	Following silent period after receipt.	—	Hourly.
			2653	0200 (1 July to 15 Nov.).	—	4 hourly.
Ensenada (Porto Rico.)	WPR	17° 58' N. 66° 56' W.	600	When issued.	—	4 hourly.

* Transmits urgent Hurricane warnings on receipt and at the first silent period, on 600 metres. These are repeated hourly for 12 hours, unless previously cancelled, on the working wavelength shown above.

The messages are preceded by the Safety Signal TTT.

III.—WIRELESS TIME SIGNALS.

Panama.

Balboa (Darien) W/T Station, position Latitude 9° 07' 12" N., Longitude 79° 45' 24" W. Call sign **NBA** relays the Washington-Arlington time signals sent out at 0300 and 1700 G.M.T. on a wavelength of 6,518 metres C.W.

BERMUDA.

II.—WIRELESS WEATHER BULLETIN.

Bermuda W/T Station, approximate position Latitude 32° 23' N. Longitude 64° 40' W.

Call sign, **VRT**.

Times of Transmission—0100 and 1300 G.M.T. on wavelength of 665m. I.C.W. and 0130 and 1330 G.M.T. on wavelength of 2250m. C.W. giving 0000 and 1200 G.M.T. observations respectively at Bermuda of barometer, barometric tendency, wind direction and force, past weather, and visibility when it reaches 5 or less.

SAMPLE MESSAGE—"Barometer 30.03 falling, wind N.E. 4. Weather cloudy."

A brief weather forecast for the area 30° to 40° N., 60° to 70° W. (20° to 40° N., 60° to 70° W. during August and September), and 30° to 40° N., 50° to 60° W. when conditions are exceptional, is broadcast at 2100 G.M.T. on a wavelength of 665m. I.C.W. repeated at 2118 G.M.T. on 2250m. C.W.

CANADA, NOVA SCOTIA, NEWFOUNDLAND, LABRADOR, ETC.

II.—WIRELESS WEATHER BULLETINS.

THE following stations broadcast weather bulletins, giving forecasts. Where the times of transmission are omitted, forecasts are sent on request. Stations marked with an asterisk (*) are open during the season of navigation only.

Country.	W/T Station.	Call Sign.	Position (approx.).		Time, G.M.T.	Wave-length.
			Lat. N.	Long. W.		
Canada (Nova Scotia).	Lurcher Lt.-Vsl.	VGA	43° 49'	66° 32'	—	600 m.
	Yarmouth ...	VAU	43° 46'	66° 07'	0430, 1630	720 m.
	Camperdown ...	VCS	44° 30'	63° 31'	0440, 1640	750 m.
	Sambro Outer Bank Lt.-V.	VGX	44° 22'	63° 26'	1200, 1730	435 m.
	Canso ...	VVX	45° 19'	60° 58'	—	600 m.
Canada ...	North Sydney ...	VCO	46° 13'	60° 15'	—	600 m.
	Louisburg ...	VAS	46° 09'	59° 57'	—	600 m.
	Grindstone ...	VCN	47° 23'	61° 54'	—	600 m.
	*Fame Point, Que.	VCG	49° 07'	64° 36'	0430, 1630	660 m.
	*Clarke City, Que.	VCK	50° 11'	66° 37'	—	600 m.
Canada (New Brunswick).	*Father Point, Que.	VCF	48° 31'	68° 28'	0420, 1620	600 m.
	*Quebec ...	VCC	46° 48'	71° 12'	0410, 1610	600 m.
	*Montreal ...	VCA	45° 34'	73° 38'	0400, 1600	600 m.
	St. John ...	VAR	45° 14'	66° 03'	0400, 1600	650 m.
	St. John's ...	VON	47° 34'	52° 41'	0400, 1600	600 m.
Newfoundland and Labrador.	Belle Isle ...	VCM	51° 53'	55° 22'	0440, 1640	620 m.
	Cape Race ...	VCE	46° 39'	53° 04'	0420, 1620	660 m.
	Point Amour ...	VCL	51° 27'	56° 50'	—	600 m.
	*Port Churchill	VAP	58° 47'	94° 09'	1500	600 m.
	*Cape Hopes	VAY	61° 05'	69° 33'	—	600 m.
Hudson Bay and Strait.	Advance	VCB	63° 06'	77° 56'	—	600 m.
	*Nottingham Is.	VAW	61° 20'	64° 50'	1620	600 m.
	*Resolution Is.	VBZ	63° 20'	90° 43'	—	600 m.
	*Chesterfield Inlet					

† Forecast and weather conditions for Hudson Bay and Strait and N. Atlantic adjacent thereto.

Wireless Telephony R/T Issues.

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

Country.	Station.	Call Sign.	Position (approx.).		Time, G.M.T.	Wave-length R/T.
			Lat. N.	Long. W.		
Canada (New Brunswick).	St. John ...	CHSJ	45° 14'	66° 03'	1000, 1200	268 m.
Canada (Nova Scotia).	Sambro Outer Bank Lt.-V.	VGX	44° 22'	63° 26'	1200, 1730	435 m.
	Louisburg ...	VAS	46° 09'	59° 57'	0400, 1700	441 m.

WIRELESS STORM WARNINGS.

Storm warnings are broadcast by the following W/T stations on receipt, on 600 metres and repeated in the Weather Bulletins shown above.

Yarmouth VAU.	Camperdown VCS.
Sambro Outer Bank Lt.-V. VGX.	Fame Point VCG.
Louisburg VAS.	Quebec VCC.
Father Point VCF.	St. John VAR.
Montreal VCA.	Cape Race VCE.
Belle Isle VCM.	Resolution I. VAW.
Port Churchill VAP.	

Gulf of St. Lawrence Ice Patrol (repeated in ice report, see below).

III.—WIRELESS TIME SIGNALS.

Camperdown W/T Station, Latitude 44° 31' 13" N., Longitude 63° 32' 30" W., call sign **VCS** broadcasts a time signal daily (Sundays excepted) at 14h. 00m. 00s., G.M.T., on a wavelength of 750 metres (spark).

The procedure is as follows:—

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

For the purpose of these signals the observatory at St. John (New Brunswick) is connected by land telegraph to Camperdown W/T Station.

IV.—WIRELESS ICE WARNINGS.

The following W/T stations broadcast ice warnings:—

W/T Station.	Latitude N. (approximate.)	Longitude W. (approximate.)	Call Sign.	Wavelength (Metres).	G.M.T. of issue.
Lurcher Lt.-V....	43° 49'	66° 32'	VGA	600 (Spk.)	On request.
*Camperdown ...	44° 30'	63° 31'	VCS	750 (I.C.W.)	"
Sable Island ...	43° 56'	60° 02'	VCT	600 (Spk.)	On request.
*North Sydney ...	46° 13'	60° 15'	VCO	600 (Spk.)	"
*Louisburg ...	46° 09'	59° 57'	VAS	2804 (C.W.)	0400, 1600.
*Grindstone Island	47° 24'	61° 51'	VCN	600 (Spk.)	On request.
Fame Point ...	49° 07'	64° 36'	VCG	660 (I.C.W.)	0430, 1630.
Clarke City ...	50° 11'	66° 37'	VCK	600 (Spk.)	On request.
*Cape Race ...	46° 39'	53° 04'	VCE	660 (I.C.W.)	0420, 1620.
St. John's ...	47° 34'	52° 41'	VON	600	0400, 1600.
Pt. Amour ...	51° 27'	56° 52'	VCL	600 (Spk.)	On request.
Belle Island ...	51° 53'	55° 22'	VCM	620 (I.C.W.)	0440, 1640.
Port Churchill...	58° 47'	94° 11'	VAP	600 (I.C.W.)	On request.
Cape Hopes	61° 05'	69° 33'	VAY	600 (I.C.W.)	On request.
Advance					
Nottingham Is. ...	63° 06'	77° 56'	VCB	600 (I.C.W.)	On request.
Resolution ...	61° 19'	64° 53'	VAW	600 (I.C.W.)	On request.
Chesterfield Inlet	63° 20'	90° 43'	VBZ	600	"

* Broadcasts Gulf of St. Lawrence Ice Patrol report as explained below.

THE GULF OF ST. LAWRENCE ICE PATROL.

The Gulf of St. Lawrence Ice Patrol commences from the opening of navigation in the Gulf and continues until the route is clear of ice.

The Patrol Vessel, call sign **VCQP**, transmits wireless warnings of ice conditions from Cape Race to Quebec and recommendations as to route to be followed.

The warnings are broadcast at 0100 and 1300 G.M.T. on a wavelength of 1621 m. (I.C.W.) preceded by the general call CQ on a wavelength of 600 m.

The warnings will also be sent on request to any ship, ships should call **VCQP** on 600 m.

The above warnings are also transmitted by the stations marked* in the list above.

PACIFIC COAST.

II.—WIRELESS WEATHER BULLETIN.

San Francisco, California, W/T station, approximate position Latitude 38° 06' N., Longitude 122° 17' W.

Call sign **NPG**.

Times of Transmission—0330 G.M.T. and 1530 G.M.T.

Wavelengths—7009 and 2778 metres (C.W.) simultaneously.

The bulletins commence with "Weather Bureau Bulletin" and are in two parts.

Part I—In plain language giving summary of general pressure distribution and forecasts of wind and weather for the off-shore areas—N. of Cape Blanco; between Cape Blanco and Point Conception; and S. of Point Conception.

The period covered by the forecasts in the 0330 G.M.T. bulletin is for 24 hours beginning at 0800 G.M.T. and in the 1530 G.M.T. bulletin for 24 hours beginning at 2000 G.M.T.

Part II—Actual weather observations in United States code for stations in the list below, taken at 0100 G.M.T. for the 0330 G.M.T. bulletin and 1300 G.M.T. for the 1530 G.M.T. bulletin, except as follows, where the observations do not synchronise :—

Observations at Alaskan stations are taken at Midnight and Noon G.M.T.

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

Guam, Manila, China and Japan observations taken at 1400 G.M.T.

Observations taken at Midway Island at 0630 G.M.T.

Indicator Letters and Stations.

Indicator Letters.		Station.			Position (approx.).	
					Latitude.	Longitude.
<i>Alaska.</i>						
FA	...	Fairbanks	...	...	64° 52' N.	147° 39' W.
NM	...	Nome	...	...	64° 30' N.	165° 24' W.
SPI	...	St. Paul	...	...	57° 15' N.	170° 10' W.
DH	...	Dutch Harbour	...	...	53° 55' N.	166° 30' W.
TN	...	Tanana	...	...	65° 10' N.	152° 06' W.
EA	...	Eagle	...	...	64° 46' N.	141° 12' W.
KD	...	Kodiak	...	...	57° 47' N.	152° 22' W.
CV	...	Cordova	...	...	60° 32' N.	145° 44' W.
JU	...	Juneau	...	...	58° 18' N.	134° 22' W.
<i>Canada.</i>						
DAW	...	Dawson	...	...	64° 04' N.	139° 29' W.
ED	...	Edmonton, Alberta	...	...	53° 33' N.	113° 30' W.
KA	...	Kamloops, B.C.	...	...	50° 41' N.	120° 29' W.
CY	...	Calgary, Alberta	...	...	51° 02' N.	114° 02' W.
SC	...	Swift Current, Sask.	...	...	50° 19' N.	108° 02' W.
PR	...	Prince Rupert, B.C.	...	...	54° 18' N.	130° 18' W.
<i>United States, etc.</i>						
TAT	...	Tatoosh I, Wash.	...	...	48° 23' N.	124° 44' W.
SE	...	Seattle, Wash.	...	...	47° 38' N.	122° 20' W.
NH	...	North Head, Wash.	...	...	46° 16' N.	124° 04' W.
PD	...	Portland, Oreg.	...	...	45° 32' N.	122° 41' W.
RO	...	Roseburg, Oreg.	...	...	43° 13' N.	123° 20' W.
EUR	...	Eureka, Calif.	...	...	40° 48' N.	124° 11' W.
RD	...	Redding, Calif.	...	...	40° 10' N.	122° 15' W.
SM	...	Sacramento, Calif....	...	...	38° 35' N.	121° 30' W.
SF	...	San Francisco, Calif.	...	...	37° 48' N.	122° 36' W.
FN	...	Fresno, Calif.	...	...	36° 43' N.	119° 49' W.
SPE	...	San Pedro, Calif.	...	...	33° 44' N.	118° 16' W.
PAR	...	Point Arguello, Calif.	...	...	34° 35' N.	120° 39' W.
LA	...	Los Angeles, Calif.	...	...	34° 03' N.	118° 15' W.
DI	...	San Diego, Calif.	...	...	32° 43' N.	117° 10' W.
SPO	...	Spokane, Wash.	...	...	47° 40' N.	117° 25' W.
WW	...	Walla Walla, Wash.	...	...	46° 02' N.	118° 20' W.
BA	...	Baker, Oreg.	...	...	44° 46' N.	117° 50' W.
HL	...	Helena, Mont.	...	...	46° 34' N.	112° 04' W.
BS	...	Boise, Idaho	...	...	43° 37' N.	116° 13' W.
LD	...	Lander, Wyo.	...	...	42° 50' N.	108° 45' W.
WM	...	Winnemucca, Nev.	...	...	40° 58' N.	117° 43' W.
R	...	Reno, Nev....	...	...	39° 32' N.	119° 49' W.
SLC	...	Salt Lake City, Utah	...	...	40° 46' N.	111° 54' W.
MD	...	Modena, Utah	...	...	37° 48' N.	113° 54' W.
DV	...	Denver, Colo.	...	...	39° 45' N.	105° 00' W.
GJ	...	Grand Junction, Colo.	...	...	39° 04' N.	108° 34' W.
SA	...	Santa Fe, N. Mex....	...	...	35° 41' N.	105° 57' W.
PH	...	Phoenix, Ariz.	...	...	33° 28' N.	112° 00' W.
YU	...	Yuma, Ariz.	...	...	32° 45' N.	114° 36' W.
HO	...	Honolulu, Hawaii	...	...	21° 19' N.	157° 52' W.
MDI	...	Midway Island	...	...	28° 12' N.	177° 22' W.

China and Japan, etc.

FMA	Manila P.I.	14° 35' N.	120° 59' E.
FGM	Guam	13° 27' N.	144° 45' E.
FHO	Hong Kong, China	22° 18' N.	114° 10' E.
FSH	Shanghai, China	31° 15' N.	121° 29' E.
FBI	Bonin Island	27° 05' N.	142° 11' E.
FKO	Koshun, Formosa	22° 00' N.	120° 45' E.
FNA	Naha, Japan	26° 13' N.	127° 41' E.
FKA	Kagoshima, Japan	31° 34' N.	130° 33' E.
FTO	Tokio, Japan	35° 41' N.	139° 45' E.
FNE	Nemuro, Japan	43° 20' N.	145° 35' E.

San Francisco W/T Station also transmits a report containing barometric pressure, wind direction and force and state of weather in the Bonita Channel, at 0000, 0430, 0600, 0800, 1200, 1630 and 2000 G.M.T. Wavelength 2,776 metres (C.W.).

WIRELESS STORM WARNINGS.

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

W/T Station and position (approx.).	Call Sign.	Wave-length. Metres.	Broad-casting Time, G.M.T.	Particulars.
†Puget Sound ... Lat. 47° 42' N. Long. 122° 37' W.	NPC	2,941 (C.W.)	0100, 0300 0400, 1300 1700, 2100	Storm Warnings.
†Tatoosh Island ... Lat. 48° 23' N. Long. 124° 44' W.	NPD	800	0100, 0400 1300, 1700 2100	Puget Sound and Strait of Juan de Fuca.
†Astoria ... Lat. 46° 09' N. Long. 123° 50' W.	NPE	2,941 (C.W.)	0130, 1330 1730, 2130	—
†Eureka, Calif. ... Lat. 40° 42' N. Long. 124° 16' W.	NPW	2,776 (C.W.)	0018, 0433 0818, 1218 1633, 2018	Storm Warnings for the N. coast of California, Washington and Oregon coasts.
†San Francisco, Calif. Lat. 38° 06' N. Long. 122° 17' W.	NPG	7009 (C.W.) 2,778 (C.W.) 2,778 (C.W.)	0330, 1530	Storm Warnings. In Part I. of weather bulletin.
„ „ „	„	2,778 (C.W.)	0000, 0430 0600, 1200 1630, 2000	Storm Warnings, for N. California coast.
†San Diego, Calif. Lat. 32° 42' N. Long. 117° 15' W.	NPL	600	When issued and repeated after the first silent period.	—

† Transmit Urgent Hurricane warnings on receipt and at the first silent period on 600 metres. These are repeated hourly for 12 hours, unless previously cancelled on the working wavelength shown above.

III.—WIRELESS TIME SIGNALS.

For method of transmission of the undermentioned Time Signals, see diagram, p. 149.

W/T Station.	Call Sign	Wavelength. Metres.	Time of Signal being made, G.M.T.	
San Francisco, Calif. Lat. 38° 05' 55" N. Long. 122° 16' 37" W.	NPG	2,778 and 7,009 (C.W.)	h. m. s. h. m. s. 2 55 00—3 00 00 7 55 00—8 00 00 16 55 00—17 00 00	Sent daily.

HAWAIIAN ISLANDS.

II.—WIRELESS WEATHER BULLETIN.

Honolulu-Pearl Harbour W/T Station approximate Latitude 21° 12' N., Longitude 157° 58' W., call sign **NPM**, broadcasts weather forecasts daily (except Sundays and holidays), for the Hawaiian Islands and neighbouring ocean areas at 0600 and 1800 G.M.T. The station also broadcasts the barometric reading, wind direction and force and state of weather at Honolulu at 0200 and 2230 G.M.T. Wavelengths 706 and 2,830 metres, C.W.

III.—WIRELESS TIME SIGNALS.

For method of transmission of the undermentioned Time Signals, see diagram, p. 149.

Honolulu-Pearl Hbr. Lat. 21° 20' 45" N. Long. 157° 57' 56" W.	NPM	2,828 (I.C.W.)	h. m. s. h. m. s. 23 55 00-0 00 00	Sent daily.
---	------------	----------------	---------------------------------------	-------------

NOTE.—These time signals are relayed from the standard clock at Pearl Harbour, which is checked periodically by means of the time signal broadcast from San Francisco. They are normally correct to less than 0.5 sec., having a generally constant lag.

PERSONNEL.

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

RETIREMENT.

Captain William Henry Lea retired in May this year from the post of Marine Superintendent of the Commonwealth & Dominion Line (Port Line) in London, an appointment he had held since 1928.

Captain LEA was Master of one of the ships of Messrs. Thomas Royden & Co., when that firm was absorbed in the Commonwealth & Dominion Line in 1911. From then he commanded several of the "Port" ships, and between 1920 and 1927 contributed many excellent Meteorological Logs while in the *Port Sydney* and *Port Dunedin*.

During the war his ship the *Port Adelaide* was torpedoed in 1916, and he spent the remaining two years of the war as a prisoner in Germany.

C. H. W.

OBITUARY.

With deep regret we record the following:—

Captain H. F. David, R.D., R.N.R., formerly of the White Star Line, died at Seaford suddenly on Sunday, 2nd August. Notice of Captain DAVID's retirement from active service afloat was given in the January, 1924, number of THE MARINE OBSERVER. It was, in fact, the first notice regarding personnel published in THE MARINE OBSERVER. He had done many years of valuable work as a member of the voluntary corps of marine observers.

Since his retirement Captain DAVID has done much useful work as a Nautical Assessor and in many other fields of activity in connection with the Merchant Navy. On the *Conway* Committee and the Departmental Committee of the Board of Trade which overhauled the examinations for Masters and Mates, his great knowledge, keenness and interest was of great service to the future of nautical education and training. He was in his 70th year at the time of his death.

L.A.B.S.

Captain J. W. Hartley, Commander of the P. & O. liner *Strathaird*, died recently after a short illness.

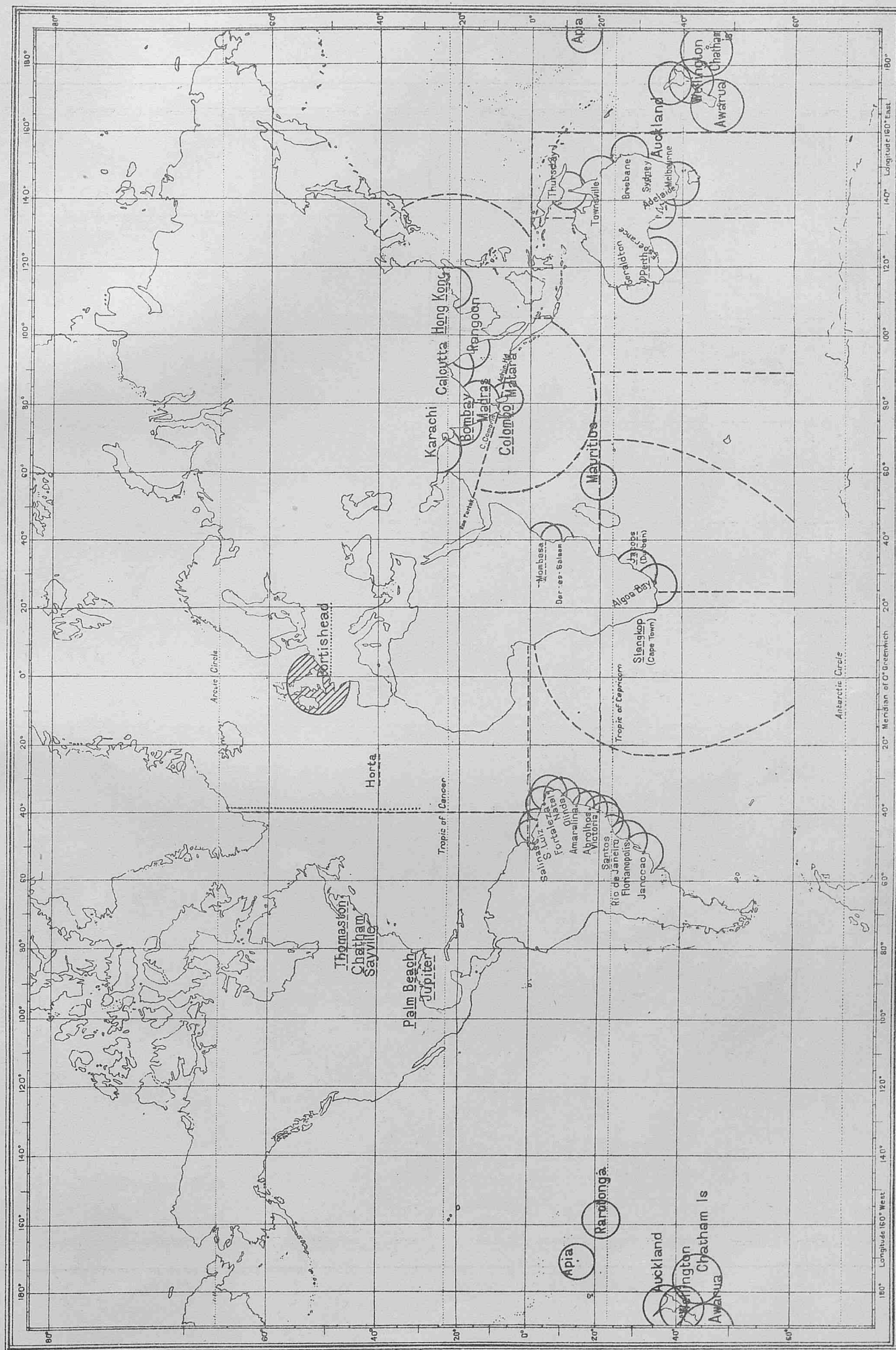
In 1899, after two years in the *Conway*, JOHN WATKIN HARTLEY went to sea in the Clan Line, and in 1904 he joined the P. & O. as 5th officer in their S.S. *Plassy*. He passed through the various ranks and was promoted chief officer in 1918.

While chief officer he held several temporary commands and was promoted staff commander of one of the big ships in 1932.

He was appointed to the command of the *Strathaird* in 1935.

C. H. W.

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



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

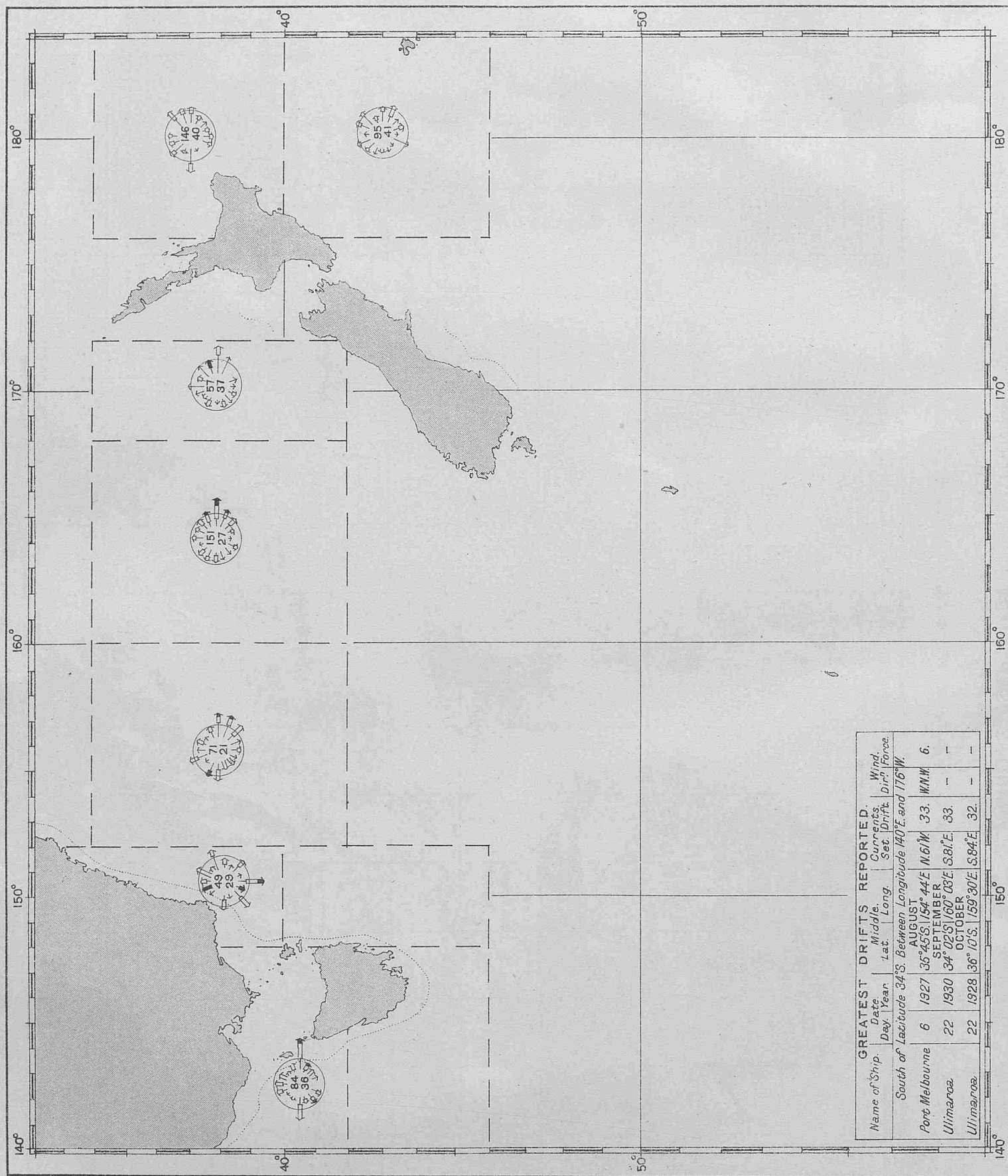
A pecked line indicates the reporting areas round stations in other countries to which British "Selected Ships" should report. The names of such stations being underlined with a pecked line.

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

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

AUGUST SEPTEMBER and OCTOBER.

Observations of ships regularly observing for the British Meteorological Office. 1910-1935.



EXPLANATION OF CURRENT ROSES.

The current roses are drawn from observations within the pecked lines. Arrows point from tail of arrow to circle represents frequency thickness strength,—

→	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 gives total number of observations, the lower figure the percentage frequency of currents less than 6 miles per day.

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

CURRENTS IN THE SOUTHERN PORTION OF THE SOUTH PACIFIC.
(Western)

AUGUST SEPTEMBER and OCTOBER.

Observations of ships regularly observing for the British Meteorological Office, 1910-1935.



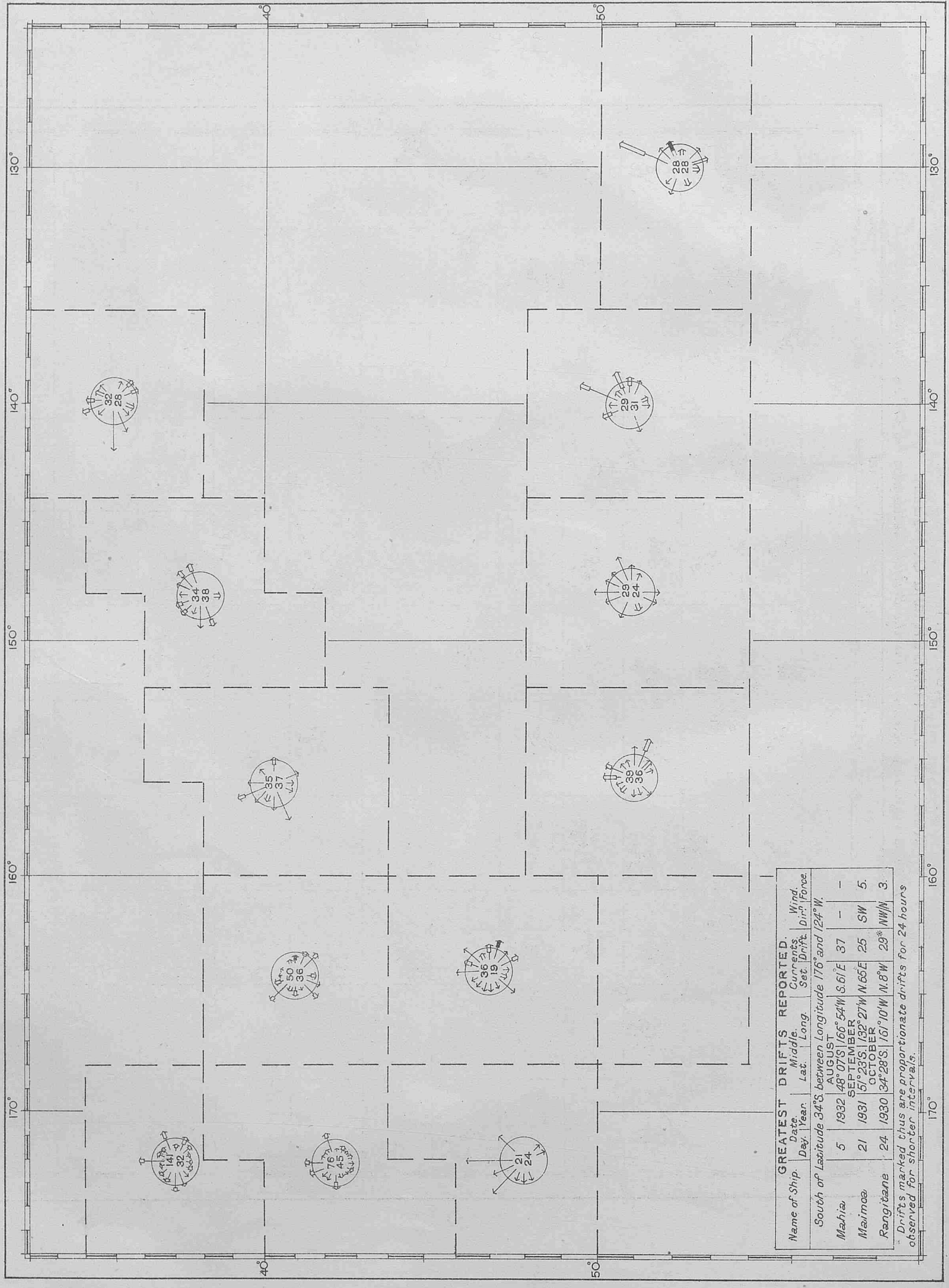
EXPLANATION OF CURRENT ARROWS.
The arrows flow with the current and represent the resultant of currents observed within the pecked lines. The centre of each arrow lies in the mean position of observation.
The figures above the arrows give the velocity of current in miles per day; the figures below the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

CURRENTS IN THE SOUTHERN PORTION OF THE SOUTH PACIFIC.

(Middle)

AUGUST SEPTEMBER and OCTOBER.

Observations of ships regularly observing for the British Meteorological Office, 1910-1935.



GREATEST DRIFTS REPORTED.						
Name of Ship.	Date.	Middle.	Currents.	Wind.		
	Day.	Lat.	Long.	Set. Drift.	Dir. ⁿ Force.	
South of Latitude 34°S between Longitude 176° and 124°W.						
AUGUST						
Mahia	5	1932	48° 07'S 166° 54'W	S. 61° E	37	—
SEPTEMBER						
Maimoa	21	1931	51° 23'S 132° 27'W	N. 65° E	25	SW 5.
OCTOBER						
Rangitane	24	1930	34° 28'S 161° 10'W	N. 8° W	29*	NW/N 3.

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

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

(Middle)

Observations of ships regularly observing for the British Meteorological Office, 1910-1935.

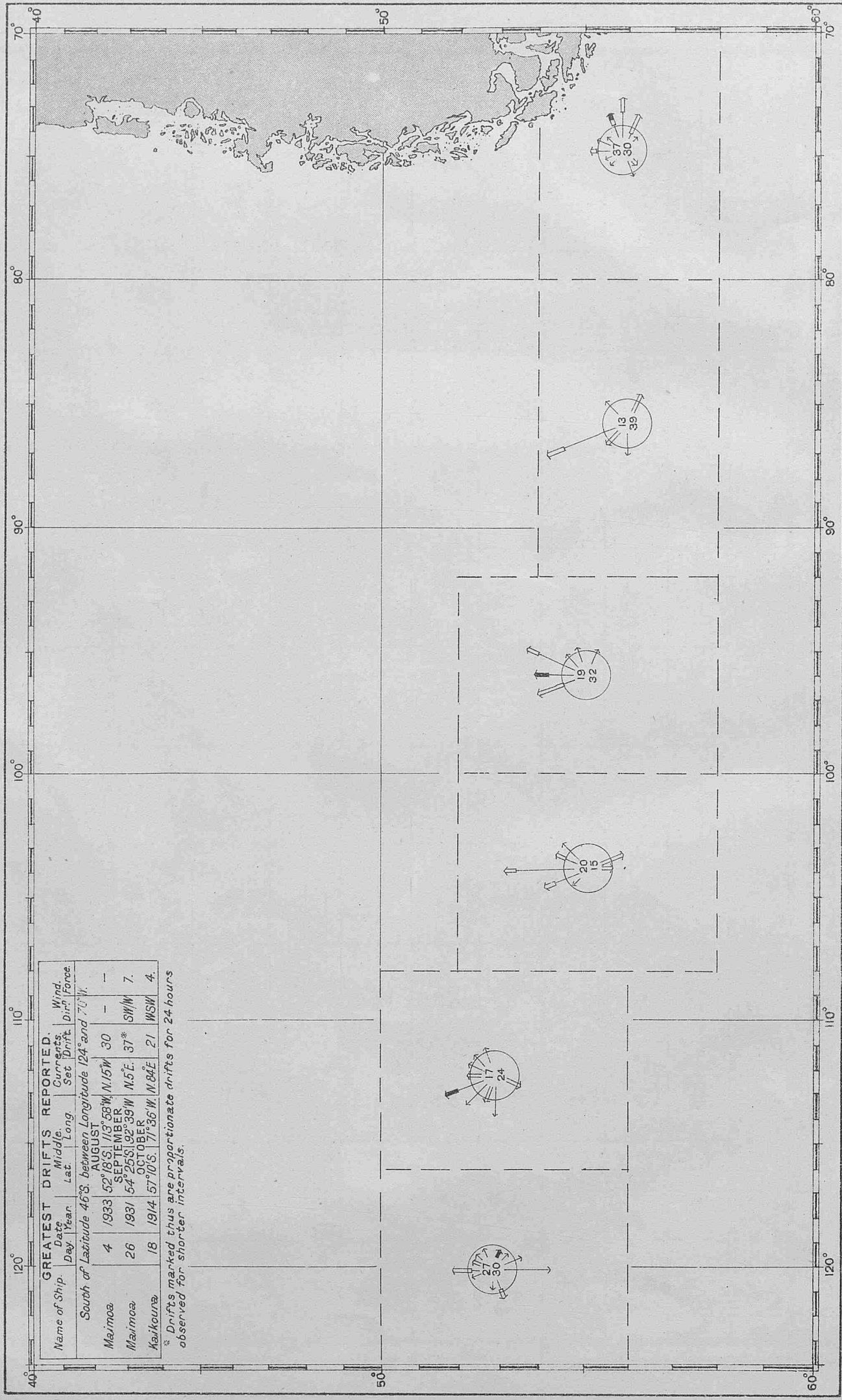


CURRENTS IN THE SOUTHERN PORTION OF THE SOUTH PACIFIC.

(Eastern)

AUGUST SEPTEMBER and OCTOBER

Observations of ships regularly observing for the British Meteorological Office, 1910-1935.

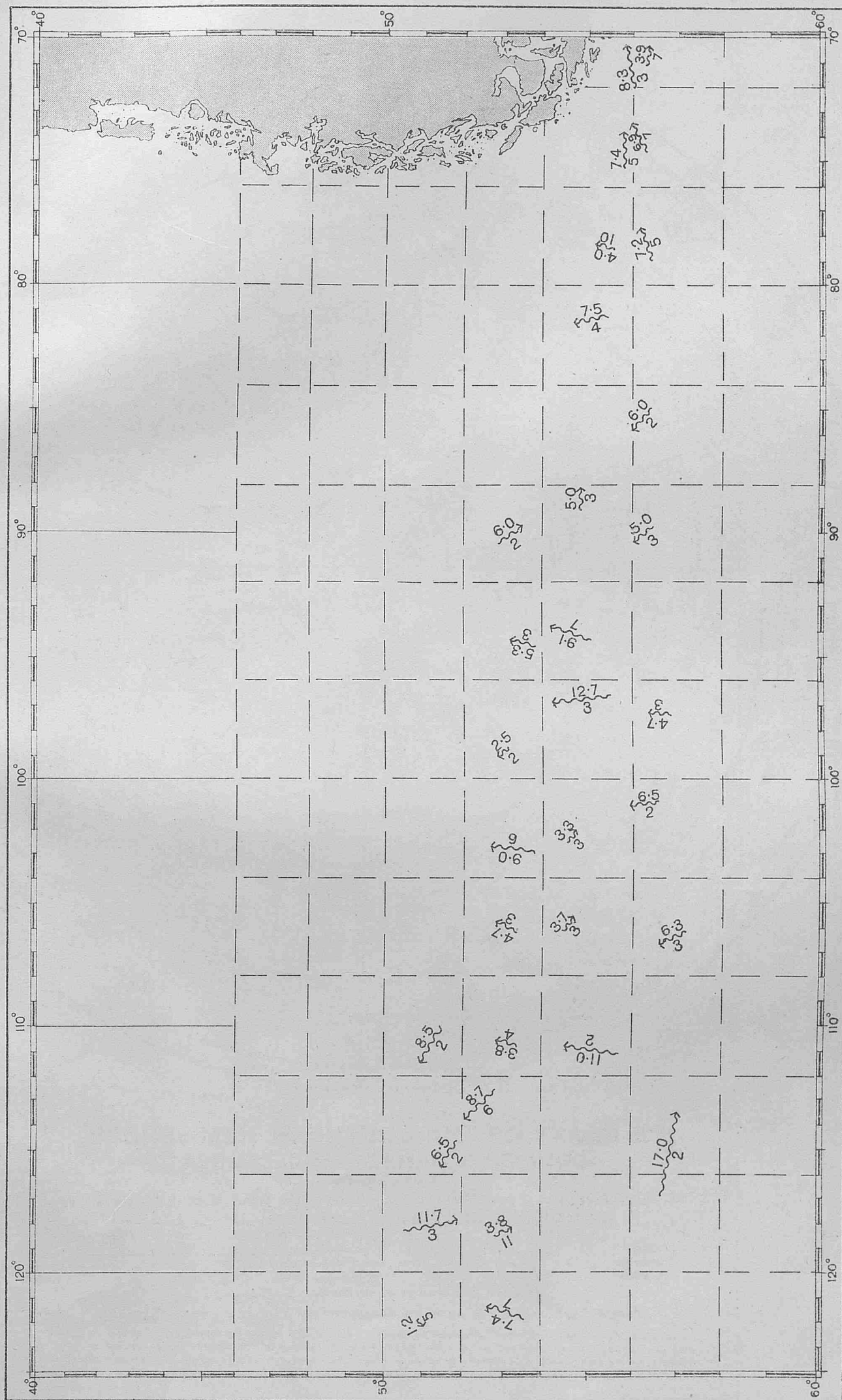


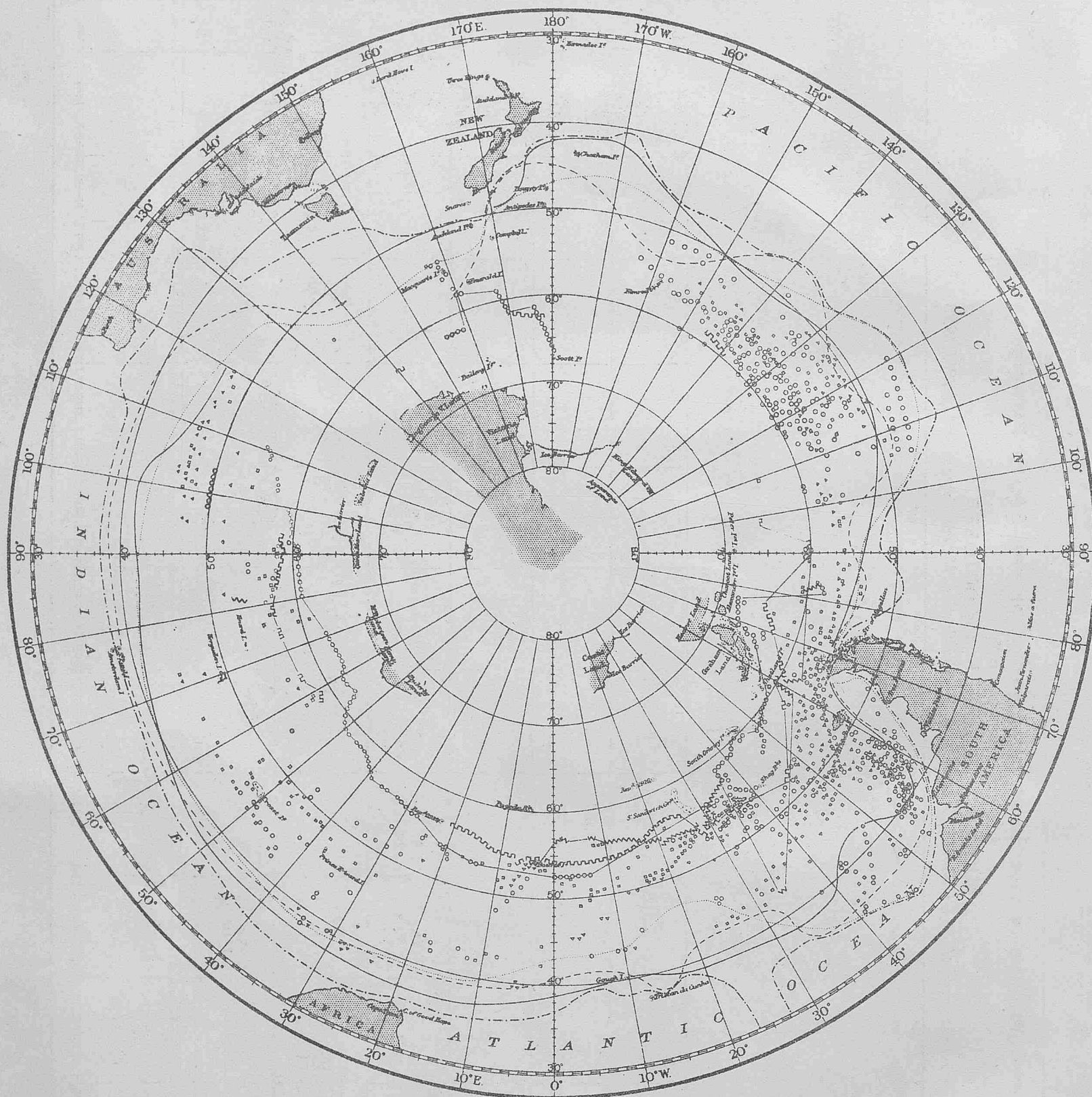
GREATEST DRIFTS REPORTED:					Currents		Wind	
Name of Ship	Date	Year	Middle Lat.	Long.	Set	Drift	Dir.	Force
South of Latitude 46°S, between Longitude 124° and 70°W.								
AUGUST								
Maunoo	4	1933	52°18'S	113°58'W	N15°W	30	—	—
SEPTEMBER								
Maunoo	26	1931	54°25'S	122°39'W	N5°E	37*	SW/W	7.
OCTOBER								
Kaukoura	18	1914	57°10'S	117°36'W	N84°E	21	WSW	4.

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

AUGUST SEPTEMBER and OCTOBER.

Observations of ships regularly observing for the British Meteorological Office, 1910-1935.





ICE CHART OF THE SOUTHERN HEMISPHERE, OCTOBER NOVEMBER and DECEMBER

EXPLANATION.

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

	Bergs; 1902-1935.	Position of northernmost pack ice actually observed 1885-1935.	Extreme limit of all ice, 1772-1935.
October	△	~~~~~	---
November	□	~~~~~	---
December	○	~~~~~	---
		Extreme limit of all ice, all months.	---

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.

A.	PAGE.	F.	PAGE.
Subject.		Subject.	
<i>Accra</i> , M.V.—Unusual Lunar Halo, N. Atlantic	8	Falcons at Sea, N. Pacific, M.V. <i>Tantalus</i>	126
<i>Aeneas</i> , S.S.—		Fog and Squall, China Sea, M.V. <i>Glegarry</i>	48
Mistral, Gulf of Lyons	6	Fog Bows and Rainbows	15
Waterspouts, Tyrrhenian Sea	9		
<i>Aidan</i> , S.S.—Current Rips, N. Atlantic	48	C.	
AIREY, Captain J. J.—Retirement	74	GARBETT, Captain L. G.—Promotion	73
ALLIN, Captain C. H. C.—Obituary	74	GILLIES, Captain JAMES, C.B.E.—Retirement	40
<i>Alipore</i> , S.S.—Green Ray at setting of Venus, N. Indian Ocean	8	<i>Glegarry</i> , M.V.—Fog and Squall	48
<i>Alynbank</i> , M.V.—Earthquake Tremor at Yokohama	47	Green Flash at Sunrise and Sunset, The	55
<i>Amsterdam</i> , S.S.—Wind effect on tidal streams, Harwich—Hook of Holland Route	84	Green Flash at Sunset, S. Pacific, S.S. <i>Mataroa</i>	48
<i>Aorangi</i> , M.V.—		Green Ray at Setting of Venus, N. Indian Ocean, S.S. <i>Alipore</i>	8
Discoloured Water, S. Pacific	4	H.	
Encounter of a shark with a giant squid, N. Pacific	6	Halos :—	
Eruption of Mauna Loa, N. Pacific	123	Lunar, N. Atlantic, S.S. <i>Westmoreland</i>	49
Appointments :—		Lunar, N. Pacific, S.S. <i>Deebank</i>	8
KENNEDY, Captain G. S.	73	Lunar, S. American Waters, M.V. <i>Lassell</i>	92
WILLIAMS, Commander G. D., D.S.O., R.D., R.N.R.	73	Lunar, Unusual, N. Atlantic, M.V. <i>Accra</i>	8
<i>Arandora Star</i> , S.S.—		Solar, N. Indian Ocean, S.S. <i>Harmonides</i>	49
Heavy rain squall, S. Indian Ocean	6	Solar, N. Pacific, M.V. <i>Tantalus</i>	49
Jan Mayen, Spitzbergen cruise and Ice edge	86	<i>Harmonides</i> , S.S.—Solar Halos, N. Indian Ocean	49
Atlantic, North, Comparison of the Severity of the Weather in the, during the last five winters	18	HARTLEY, Captain J. W.—Obituary	153
Atlantic, North, Weather in the, 25th–27th February, 1935 (S.S. <i>Blairgourie</i>)	21	<i>Hertford</i> , S.S.—Abnormal Refraction, N. Atlantic	8
Aurora :—		<i>Hibernia</i> , S.S.—Wind effect on tidal streams, Holyhead—Kingstown Route	85
Australis, Southern Ocean, R.R.S. <i>William Scoresby</i>	8	HILL, Lieutenant LEONARD CHARLES, I.N.R.—Award	73
S. Indian Ocean, R.R.S. <i>Discovery II</i>	131	HOIT, Captain F. W., M.B.E.—Retirement	40
<i>Australia Star</i> , M.V.—Magnetic Disturbance, S. Indian Ocean	123	HUTCHISON, Lieutenant Commander G. S. H.—Obituary	75
Award, Lieut. LEONARD CHARLES HILL, R.N.R.	73	I.	
Awards—List of Captains and Principal Observing Officers to whom the Meteorological Committee have made Excellent	80	Ice Conditions, Western N. Atlantic, 1935, Summary of	58
B.		Ice edge, Spitzbergen Cruise, S.S. <i>Arandora Star</i>	86
BAYNHAM, Captain Sir WALTER DE MOUCHET, K.B.E., R.N.R.—Obituary	74	Ice in the Southern Ocean, Photographs of, R.R.S. <i>William Scoresby</i>	124
BEATTY, Admiral of the Fleet Earl, P.C., G.C.B., O.M., G.C.V.O., D.S.O., D.C.L., LL.D., Obituary	75	Ice Reports, Southern, during 1935 :—	
BECKETT, Captain F. W.—Retirement	74	January, February and March	23
<i>Berwickshire</i> , S.S.—Magnetic Disturbance, S. Indian Ocean	123	April, May and June	61
BETTS, Captain W. MORTON—Retirement	74	July, August and September	104
<i>Blairgourie</i> , S.S.—Weather in the N. Atlantic, 25th–27th February, 1935... ..	21	October, November and December	40
Brighton, S.S.—Wind effect on tidal streams, Newhaven—Dieppe Cross Channel Route... ..	84	Ice sighted exceptionally far south, N. Pacific, M.V. <i>King Neptune</i>	147
BROWN, Captain J. F. SPRING—Retirement	74	<i>Inanda</i> , S.S.—	
BUCK, Commander R. H., R.D., R.N.R.—Obituary	118	Clear Sea, West Indies	5
<i>Buteshire</i> , S.S.—Weather Forecasting at Sea, Weather Charts, Western Australia 29–30.12.35	127	Lunar Rainbow, N. Atlantic	8
C.		<i>Isle of Sark</i> , S.S.—The Denny-Brown Ship Stabilizer fitted to	133
<i>Carthage</i> , S.S.—Thunderstorms and Waterspouts, Mediterranean	93	J.	
<i>Ceramic</i> , S.S.—		Jan Mayen, cruise, S.S. <i>Arandora Star</i>	86
Crepuscular Rays and Rainbow, N. Atlantic	48	JELlicoe, Earl, Admiral of the Fleet, G.C.B., O.M., G.C.V.O., The Passing of a Great Seaman	2
Discoloured Water, S. African Waters	48	JERMYN, Captain WM.—Retirement	118
<i>Cepolis</i> , S.S.—Practical Application of Wireless Weather Telegraphy in Navigation, Weather Charts, China Sea 3.12.34, Bay of Bengal 4.11.35	128	JONES, Commander W. C. H., R.D., R.N.R.—Obituary	75
<i>Chital</i> , S.S.—Snowstorm, Mediterranean	130	K.	
<i>City of Dieppe</i> , S.S.—Squalls, S. African Waters	6	<i>Karamea</i> , M.V.—Mirage, S. African Waters	131
<i>City of Evansville</i> , S.S.—		KENNEDY, Captain G. S.—Appointment	73
Current Rips, N. Indian Ocean	88	KING GEORGE V., The Passing of, on 25th January, 1936	42
Phosphoresence, Bay of Bengal	47, 88	<i>King Neptune</i> , M.V., Ice sighted exceptionally far south, N. Pacific	47
Clear Sea, West Indies, S.S. <i>Inanda</i>	5	<i>Koolinda</i> , S.S.—Willy-Willy, N.W. Australia	6
<i>Comeric</i> , S.S.—		L.	
Magnetic Disturbance, S. Indian Ocean	123	LATTA, Captain ROBERT GILMORE—Retirement	40
Meteor, N. Pacific	132	<i>Lassell</i> , M.V.—Lunar Halo, S. American Waters	92
Meteor, S. Pacific	93	LEA, Captain W. H.—Retirement	153
<i>Contractor</i> , S.S.—Meteor, N. Indian Ocean	9, 50	<i>Llanstephan Castle</i> , M.V.—Thunderstorm, Mediterranean	130
COOK, Captain JAMES, 1728–1779	10, 51	<i>Llanstephan Castle</i> , S.S.—Meteor, W. African Waters	132
<i>Cornwall</i> , S.S.—Current Rip, S. Indian Ocean	5	Locusts and Butterflies, N. Atlantic, M.V. <i>El Argentino</i>	88
Corona, Double Lunar, S. African Waters, M.V. <i>Durham</i>	50	LUENSEE, Capitan SIEGFRIED—Obituary	76
Crepuscular Rays and Rainbow, N. Atlantic, S.S. <i>Ceramic</i>	48	M.	
Current matter of greatest interest, The	44	Magnetic Disturbance, S. Indian Ocean :—	
Current Rip :—		M.V. <i>Australia Star</i>	123
N. Atlantic, S.S. <i>Aidan</i>	48	S.S. <i>Berwickshire</i>	123
N. Indian Ocean, S.S. <i>City of Evansville</i>	88	S.S. <i>Comeric</i>	123
S. Indian Ocean, S.S. <i>Cornwall</i>	5	S.S. <i>Somerset</i>	123
W. Coast of Africa, S.S. <i>Port Auckland</i>	126	<i>Makalla</i> , S.S.—Waterspouts, Red Sea	131
Currents in the S. Pacific, S. of Latitude 31° S., during :—		<i>Malda</i> , S.S.—Meteors, Red Sea	9
Southern Summer	57	MANSELL, Vice-Admiral Sir ROBERT, K.C.V.O., C.B.E. :—	
Southern Winter and General Summary	138	Retirement	40
D.			

O.	Subject.	PAGE.	W.	Subject.	PAGE.
Obituary:—			Waterspouts:—		
ALLIN, Captain C. H. C. ...		74	Mediterranean, S.S. <i>Carthage</i> ...		93
BAYNHAM, Captain Sir WALTER DE MOUCHET, K.B.E., R.N.R. ...		74	Red Sea, S.S. <i>Makalla</i> ...		131
BEATTY, Admiral of the Fleet Earl, P.C., G.C.B., O.M., G.C.V.O., D.S.O., D.C.L., LL.D. ...		75	S. Pacific, M.V. <i>Rangitata</i> ...		50
BUCK, Commander R. H., R.D., R.N.R. ...		118	Tyrrhenian Sea, S.S. <i>Aeneas</i> ...		9
DAVID, Captain H. F., R.D., R.N.R. ...		153	Weather, Comparison of the Severity of the, in the N. Atlantic, during the last five winters ...		18
DULSON, Mr. J. ...		75	Weather Forecasting and Observation and some of their bearings on the Sea Service ...		45
HARTLEY, Captain J. W. ...		153	Weather Forecasting at Sea, Weather Charts:—		
HUTCHISON, Lieutenant Commander G. S. H. ...		75	<i>Buteshire</i> , S.S.—Western Australia 29-30.12.35 ...		127
JONES, Commander W. C. H., R.D., R.N.R. ...		75	<i>Orari</i> , S.S.—Australian Waters 6.7.35, Indian Ocean 15.7.35 ...		89
LUENSEE, Captain SIEGFRIED ...		76	<i>Rangitata</i> , R.M.S.—Western N. Atlantic 25.10.35, S. Pacific 18.11.35 ...		126
MANSELL, Vice-Admiral Sir ROBERT, K.C.V.O., C.B.E. ...		118	Weather in the N. Atlantic:—		
PARKER, Captain WILLIAM HENRY, C.B.E., R.D., R.N.R. ...		40	25th-27th February, 1935 (S.S. <i>Blairgowrie</i>) ...		21
SCUDAMORE, Commander J. H. H., D.S.C., R.D., R.N.R. ...		76	1st-3rd October, 1934 (S.S. <i>Millpool</i>) ...		102
SPENCE, Captain THOMAS ...		40	11th-14th December, 1934 (S.S. <i>Usworth</i>) ...		135
Observation and Weather Forecasting and some of their bearings on the Sea Service ...		45	<i>Westmoreland</i> , S.S.—Lunar Halos, N. Atlantic ...		49
<i>Orari</i> , S.S.—Weather Forecasting at Sea, Weather Charts, Australian Waters 6.7.35 and Indian Ocean 15.7.35 ...		89	Whales, Pair of, struck by ship, Indian Ocean, S.S. <i>Discoverer</i> ...		5
<i>Orduna</i> , S.S.—Sharks, Peruvian Waters ...		47	WILLIAMS, Commander G. D., D.S.O., R.D., R.N.R.—Appointment ...		73
			<i>William Scoresby</i> , R.R.S.:—		
P.			Aurora Australis, Southern Ocean ...		8
<i>Paris</i> , S.S.—Abnormal Refraction, English Channel ...		48	Photograph of Ice in the Southern Ocean ...		124
PARKER, Captain WILLIAM HENRY, C.B.E., R.D., R.N.R.—Obituary ...		40	Willy-Willy, N.W. Australia, S.S. <i>Koolinda</i> ...		6
Phosphorescence:—			<i>Winchester Castle</i> , M.V.—St. Elmo's Fire, S. African Waters ...		131
Bay of Bengal, S.S. <i>City of Evansville</i> ...		47, 88	Wind Effect on Tidal Streams:—		
S. Atlantic, M.V. <i>Durham</i> ...		47	Harwich to Hook of Holland Route, S.S. <i>Amsterdam</i> ...		84
S. Pacific, M.V. <i>Rangitata</i> ...		126	Heysham—Belfast Route, S.S. <i>Duke of Lancaster</i> , S.S. <i>Duke of Argyll</i> ...		85, 86
<i>Port Auckland</i> , S.S.—Current Rips, W. Coast of Africa ...		126	Holyhead—Kingstown Route, S.S. <i>Scotia</i> , S.S. <i>Hibernia</i> ...		85
Promotions—GARBETT, Captain LEONARD GILLILAN ...		73	Newhaven and Dieppe Cross Channel Route, S.S. <i>Brighton</i> , S.S. <i>Worthing</i> ...		84
			Weymouth—Guernsey Route, S.S. <i>St. Helier</i> ...		85
R.			Wind Force, The Observation of, at Sea ...		54
Rainbow:—			Wireless Station detailed to receive Routine Coded Weather Reports from, "A Selected Ships" ...		32, 62, 105, 143
And Crepuscular Rays, N. Atlantic, S.S. <i>Ceramic</i> ...		48	Wireless Stations detailed to intercept Routine Coded Weather Reports from, "B Selected Ships" ...		34, 64, 107, 145
Lunar, N. Atlantic, S.S. <i>Inanda</i> ...		8	Wireless Weather Signals (including I-Ships' W/T Weather Signals, II-W/T Weather Signals, III-W/T Time Signals, IV-W/T Ice Warnings)—		
Lunar, S. Atlantic, M.V. <i>Durham</i> ...		131	Bulletins and Storm Warnings, III-W/T Time Signals, IV-W/T Ice Warnings)—		
Rainbows and Fog Bows ...		15	Africa, S.W. and Union of S. ...		109
<i>Rangitata</i> , M.V.:—			Africa, Portuguese East ...		110
Phosphorescence, S. Pacific ...		126	Argentina ...		147
Waterspouts, S. Pacific ...		50	Australia ...		114
Weather Forecasting at Sea, Weather Charts, Western N. Atlantic 25.10.35 and S. Pacific 18.11.35 ...		126	Azores ...		72
Refraction, Abnormal:—			Barbados ...		150
English Channel, S.S. <i>Paris</i> ...		48	Bermuda ...		150
N. Atlantic, S.S. <i>Deebank</i> ...		92	Brazil ...		148
N. Atlantic, S.S. <i>Hertford</i> ...		8	British Isles:—		
Retirements:—			Development of Weather Bulletins to aid Navigation ...		66
AIRY, Captain J. J. ...		74	Special Service by payment ...		69
BECKETT, Captain F. W. ...		74	Weather Shipping Bulletin ...		66
BETTS, Captain W. MORTON ...		74	Wireless Telegraphy Gale Warnings ...		68
BROWN, Captain J. F. SPRING ...		74	Wireless Telegraphy Time Signals (Rugby) ...		68
GILLIES, Captain JAMES, C.B.E. ...		40	British New Guinea ...		116
HOLT, Captain F. W., M.B.E. ...		40	Burma ...		111
JERMYN, Captain W. M. ...		118	Canada ...		151
LATTA, Captain ROBERT GILMORE ...		40	Caribbean Sea ...		150
LEA, Captain W. H. ...		153	Ceylon ...		111
MANSELL, Vice-Admiral Sir ROBERT, K.C.V.O., C.B.E. ...		40	Chile ...		147
MORRELL, Captain A. R. H. ...		40	China ...		113
THORNTON, Captain E. J., R.D., R.N.R. ...		118	Denmark ...		71
			Estonia ...		71
S.			Fiji Islands ...		117
Safety of Life at Sea ...		44	Finland ...		71
Scintillation ...		101	Formosa ...		112
<i>Scotia</i> , S.S.—Wind effect on tidal streams, Holyhead—Kingston Route ...		85	France ...		71
SCUDAMORE, Commander J. H. H., D.S.C., R.D., R.N.R.:—			French Indo-China ...		112
Obituary ...		76	French Oceania ...		117
By a Brother Officer ...		94	Germany ...		69
Shark, Encounter of a, with a giant squid, N. Pacific, M.V. <i>Aorangi</i> ...		6	Gulf of St. Lawrence Ice Patrol ...		151
Sharks, Peruvian Waters, S.S. <i>Orduna</i> ...		47	Hawaiian Islands ...		153
<i>Silvercypress</i> , M.V.—Experience in Typhoon, Ship passing through centre, N. Pacific ...		90	Holland ...		71
Snowstorm, Mediterranean, S.S. <i>Chitral</i> ...		130	Hong Kong ...		112
<i>Somerset</i> , S.S.—Magnetic Disturbance, S. Indian Ocean ...		123	India ...		111
Southern Ice Reports, 1935:—			International Ships' Wireless Weather, Telegraphy Code ...		36
January, February and March ...		23	International Ships' Wireless Telegraphy Code, Tables ...		37
April, May and June ...		61	Japan ...		114
July, August and September ...		104	Labrador ...		151
October, November and December ...		140	Latvia ...		71
SPENCE, Captain THOMAS—Obituary ...		40	Madagascar ...		110
Spitzbergen cruise, S.S. <i>Arandora Star</i> ...		86	Mauritius ...		111
Squall:—			Morocco ...		72
And Fog, M.V. <i>Glengarry</i> ...		48	New Britain ...		116
Heavy rain, S. Indian Ocean, S.S. <i>Arandora Star</i> ...		6	New Zealand ...		151
Squalls, S. African Waters, S.S. <i>City of Dieppe</i> ...		6	Newfoundland ...		149
Stabilizer, The Denny-Brown Ship, fitted to S.S. <i>Isle of Sark</i> ...		133	North Atlantic International Ice Patrol ...		70
St. Elmo's Fire, S. African Waters, M.V. <i>Winchester Castle</i> ...		131	Norway ...		151
<i>St. Helier</i> , S.S.—Wind effect on tidal streams, Weymouth—Guernsey Route ...		85	Nova Scotia ...		150
			Panama ...		72
T.			Portugal ...		28
<i>Tairoa</i> , S.S.—Mirage, Portuguese Waters ...		92	Request to Weather Service of All Maritime Countries ...		117
<i>Tantalus</i> , M.V.:—			Ships' W/T Weather Signals:—		
Falcons at Sea, N. Pacific ...		126	World Wide System of Voluntary Selected Ships' Routine Wireless Weather Reports ...		28
Solar Halo, N. Pacific ...		49	Chart—International Observation Times for Weather Telegraphy at Sea ...		30
THORNTON, Captain E. J., R.D., R.N.R.—Retirement ...		118	Schedule of times of observation and reporting ...		30
Thunderstorm, Mediterranean, M.V. <i>Llangibby Castle</i> ...		130	South Pacific Ocean Islands ...		117
Thunderstorms and Waterspouts, Mediterranean, S.S. <i>Carthage</i> ...		93	Sweden ...		70
Tidal Streams, Wind Effect on:—			United States of America:—		
Harwich—Hook of Holland Route, S.S. <i>Amsterdam</i> ...		84	Atlantic Coast ...		148
Heysham—Belfast Route, S.S. <i>Duke of Lancaster</i> , S.S. <i>Duke of Argyll</i> ...		85, 86	Gulf Coast ...		150
Holyhead—Kingstown Route, S.S. <i>Scotia</i> , S.S. <i>Hibernia</i> ...		85	Pacific Coast ...		151
Newhaven and Dieppe Cross Channel Route, S.S. <i>Brighton</i> , S.S. <i>Worthing</i> ...		84	West Indian Islands ...		150
Weymouth—Guernsey Route, S.S. <i>St. Helier</i> ...		85	Wireless Weather Signals ...		28
Tonnage ...		121	Wireless Weather Telegraphy in Navigation, Practical Application of—China Sea and Bay of Bengal—S.S. <i>Cepolis</i> and S.S. <i>Worcestershire</i> ...		128
Tonnage, Total Merchant, approximate (Steam and Motor), of the World ...		29	<i>Worcestershire</i> , S.S., Practical Application of Wireless Weather Telegraphy in Navigation, China Sea and Bay of Bengal ...		128
Typhoon, Experience in, Ship passing through centre, N. Pacific, M.V. <i>Silvercypress</i> ...		90	Work of the Year ...		78
			<i>Worthing</i> S.S.—Wind effect on Tidal Streams, Newhaven-Dieppe Cross Channel Route ...		84
U.					
<i>Usworth</i> , S.S.—Weather in the N. Atlantic, 11th-14th December, 1934 ...		135			
V.			Z.		
Volcanic Island, Van Diemen Straits, S.S. <i>Empress of Japan</i> ...		5	Zodiacal Light, S. Indian Ocean—S.S. <i>Mongolia</i> ...		49
Volume XIII ...		122			

LIST OF ILLUSTRATIONS APPEARING IN THE TEXT.

	PAGE.		PAGE.
Photograph of Volcanic Island, Van Diemen Straits—S.S. <i>Empress of Japan</i> ...	5	Sketch of Waterspouts, Mediterranean—S.S. <i>Carthage</i> ...	93
Sketch of Aurora Australis, Southern Ocean—R.R.S. <i>William Scoresby</i> ...	8	Photograph of Commander J. H. SCUDAMOORE, D.S.C., R.D., R.N.R. ...	95
Sketches of Waterspouts, Tyrrhenian Sea—S.S. <i>Aeneas</i> ...	9	Figures illustrating Dead Reckoning ...	97-100
H.M.S. <i>Endeavour</i> ...	11	Weather Charts, N. Atlantic, 1st-3rd October, 1934 (S.S. <i>Millpool</i>) ...	102-103
Chart showing the voyages of Captain COOK ...	13	Chart showing Stations and Forecast Areas for Weather Shipping Bulletins, S.W. Africa and Union of S. Africa and Stations for Portuguese East Africa ...	109
Diagrams illustrating Rainbows ...	15-17	Chart showing Stations and Forecast Areas for Weather Bulletins, India and Ceylon ...	111
Graph showing days with Gales in N. Atlantic Winters, 1930-35 ...	19	Chart showing Stations and Regions for Weather Bulletins, South Pacific Islands ...	117
Weather Charts, N. Atlantic, 25th-27th February, 1935 (S.S. <i>Blairgowrie</i>) ...	21, 22	Chart of the World indicating number of British observing ships using the different Trade Routes ...	120
Chart showing International Observation Times for Weather Telegraphy at Sea ...	30	Photograph of Ice, Southern Ocean—R.R.S. <i>William Scoresby</i> ...	124-125
Photograph of King George V ...	43	Weather Charts: Western N. Atlantic 25.10.35, S. Pacific 18.11.35—R.M.S. <i>Rangitata</i> ...	126-127
Sketch of Ice, N. Pacific—M.V. <i>King Neptune</i> ...	47	Do. Western Australia 29 and 30.12.35—S.S. <i>Buteshire</i> ...	127-128
Sketch of Crepuscular Rays and Rainbow, N. Atlantic—S.S. <i>Ceramic</i> ...	48	Do. China Seas 3.12.34, Bay of Bengal 4.11.35—S.S. <i>Cepolis</i> ...	129
Diagram of Solar Halos, N. Indian Ocean—S.S. <i>Harmonides</i> ...	49	Photographs of Snow, Mediterranean—S.S. <i>Chitral</i> ...	130
Diagram of Lunar Halos, N. Atlantic—S.S. <i>Westmoreland</i> ...	49	Sketch of Mirage, S. African Waters—M.V. <i>Karama</i> ...	131
Sketches of Waterspouts, S. Pacific—M.V. <i>Rangitata</i> ...	50	Sketch of Meteor, N. Atlantic—M.V. <i>Durham</i> ...	132
Picture of Captain COOK ...	51	Diagram of Meteor Trail, W. African Waters—S.S. <i>Llanstephan Castle</i> ...	132
Diagrams illustrating Green Flash at Sunrise and Sunset ...	55-56	Photograph of S.S. <i>Isle of Sark</i> ...	133
Chart showing Stations, Forecast Areas and Districts for British Weather Shipping Bulletin ...	67	Photographs of Denny-Brown Ship Stabilizer ...	133, 134
Chart showing Stations and Zones for Azores Weather Bulletin ...	72	Weather Charts, N. Atlantic, 11th-14th December, 1934 (S.S. <i>Usworth</i>) ...	136-138
Photograph of Daily Position Chart, showing estimated positions of "A" Selected Ships on Tuesday, 31st March, 1936 ...	79	Currents in S. Pacific, Summer and Winter ...	139
Photographs of Jan Mayen Island and Ice Edge, Spitzbergen Cruise, S.S. <i>Arandora Star</i> ...	87-88	Chart showing Stations for Weather Shipping Bulletin for coast of Chile ...	147
Weather Charts, Western Australia 6.7.35, Indian Ocean 15.7.35—M.V. <i>Orari</i> ...	89	Chart showing Forecast and Storm Warning Areas for Atlantic and Gulf Coasts of United States ...	149
Sketch of Mirage, Portuguese Waters—S.S. <i>Tairoa</i> ...	92		
Sketch of Lunar Halo, S. American Waters—M.V. <i>Lussell</i> ...	92		

LIST OF PLATES PRODUCED BY LITHOGRAPHIC PROCESS, INCLUDING CHARTS AND OTHER LARGE DIAGRAMS WHICH APPEAR IN EACH NUMBER.

Lithographic illustrations after page 40 in January number:—
 Ships' Wireless Weather Signals, Chart of the World.
 Currents in the South Pacific, November, December and January.
 Ice Chart of the Southern Hemisphere, January, February and March.
 Lithographic illustrations after page 76 in April number:—
 Ships' Wireless Weather Signals, Chart of the World.
 Currents in the South Pacific, February, March and April.
 Chart of Limits of Ice, Western North Atlantic.
 Chart of Phenomenal Positions of Ice.
 Ice Chart of the Southern Hemisphere, April, May and June.
 Lithographic illustrations after page 118 in July number:—
 Ships' Wireless Weather Signals, Chart of the World.

Marsden Charts Nos. I and II, showing number of sets of observations extracted between 1st April, 1920, and 31st March, 1936, and recovery of arrears of extraction of observations from logs received prior to 1920 for North Atlantic and Pacific Oceans.
 Chart III.—Chart of the World, showing positions of British Selected Ships at Sea on 1st June, 1935.
 Currents in the South Pacific, May, June and July.
 Ice Chart of the Southern Hemisphere, July, August and September.

Lithographic illustrations after page 154 in October number:—
 Ships' Wireless Weather Signals, Chart of the World.
 Currents in the South Pacific, August, September and October.
 Ice Chart of the Southern Hemisphere, October, November and December.

INTERNATIONAL SHIPS' WIRELESS WEATHER TELEGRAPHY CODE.

	PAGE.		PAGE.
I.—Day	P.	Day of the week ...	37
II.—Position	Q.	Octant of the Globe ...	37
III.—Compass	DD.	Compass Table for Wind direction to points ...	37
IV.—do.	d and ds.	Compass Table to half cardinal points ...	37
V.—Wind	F.	Wind Force, Beaufort Scale ...	37
VI.—Weather	ww.	Present Weather (Abridged for British Ships) ...	37
VII.—do.	W.	Past Weather ...	38
VIII.—Barometer	BB.	Code Table for corrected Barometer readings in millibars and inches (Adapted for British Ships) ...	38
IX.—do.	A.	Change of Barometer in last 2, 3 or 4 hours (Adapted for British Ships) ...	38
X.—Barograph	a.	Characteristic of changes of the Barometer in the last three hours ...	38
		XI.—Barograph	bb.
		Amount of rise or fall of the Barometer in the last three hours (Adapted for British Ships) ...	38
		XII.—Visibility	V.
		Visibility ...	38
		XIII.—Clouds	Cl.
		Form of Low Cloud ...	39
		XIV.—do.	Cm.
		Form of Middle Cloud ...	39
		XV.—do.	Ca.
		Form of Upper Cloud (Cirrus Cloud) ...	39
		XVI.—do.	C.
		Form of Predominating Cloud ...	39
		XVII.—do.	N. and (N.L.)
		Amount of Cloud ...	39
		XVIII.—Temperature	td.
		Difference between Air and Sea Surface Temperature ...	39
		XIX.—Swell	K.
		Swell ...	39
		XX.—Speed	f.
		Speed of Ship ...	39

THE HISTORY OF THE UNITED STATES

1776	1777	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787	1788	1789	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014	3015	3016	3017	3018	3019	3020	3021	3022	3023	3024	3025	3026	3027	3028	3029	3030	3031	3032	3033	3034	3035	3036	3037	3038	3039	3040	3041	3042	3043	3044	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057	3058	3059	3060	3061	3062	3063	3064	3065	3066	3067	3068	3069	3070	3071	3072	3073	3074	3075	3076	3077	3078	3079	3080	3081	3082	3083	3084	3085	3086	3087	3088	3089	3090	3091	3092	3093	3094	3095	3096	3097	3098	3099	3100	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114	3115	3116	3117	3118	3119	3120	3121	3122	3123	3124	3125	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135	3136	3137	3138	3139	3140	3141	3142	3143	31
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	----