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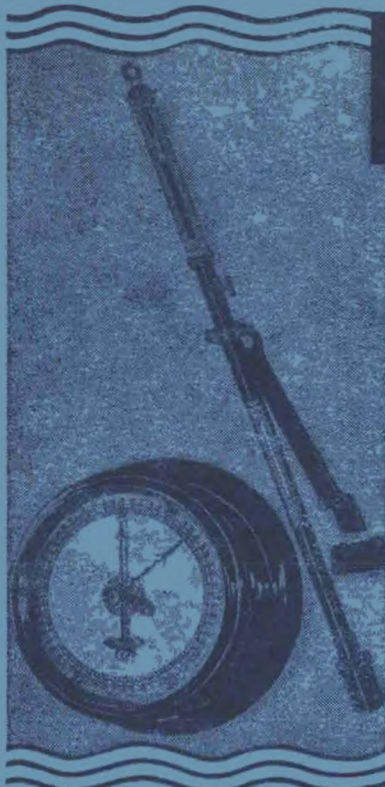
The Marine Observer



Volume XIX No. 146

OCTOBER, 1949

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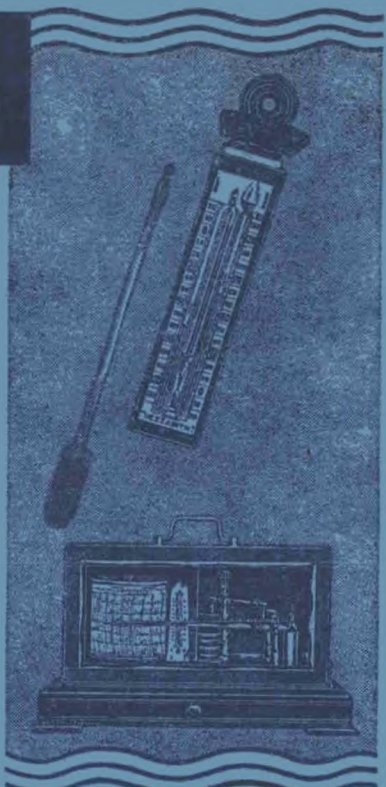
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A Quarterly Journal of Maritime Meteorology
prepared by the Marine Branch of the
Meteorological Office

Vol. XIX

1949

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EDITORIAL

There is little doubt that one invention did more than any other to win the war for the Allies, and that invention was radar. All readers of this magazine will be familiar in a broad sense with the functions of radar and its basic principles, and will be aware of the fact that this farseeing eye was very largely the means of bringing about the defeat of the enemy air forces. "It is an ill wind that blows nobody good", and it is a strange fact that despite all the unpleasantness and horror of war, mankind seems invariably to benefit from a spate of inventions during war-time which eventually react to his advantage for peace-time use. Medical services in particular seem to benefit in this way, and the more destructive and violent the weapons of war become the harder medical science strives to patch up the victims, and it is thus that we have such almost unbelievable work done in the way of plastic surgery, artificial limbs, work for the blind, etc. Warfare also teaches us to combat disease, and we saw how little the troops in the recent war suffered from malaria, dysentery and other scourges which used to wipe out armies in bygone days.

The immense strides which aviation has made since its inception are, it seems, largely due to the fact that two wars have occurred. This is a strange admission, but it is undoubtedly true; let us hope that we have now reached a stage where advances of this nature will merely be for the benefit of mankind and not need to be stimulated by some other conflict. The internal combustion engine generally has, as a result of the last war, made immense strides, and we are reminded of two more spectacular instances of its application in the shape of the jeep and the bulldozer, without the use of which, one rather wonders how the armies in the Italian campaign, for example, could have fought at all. Would we, like Hannibal, have used elephants or—as had to be done in some cases in the Italian campaign where the terrain was too difficult even for jeeps—resort to the valiant and ubiquitous mule?

Notable advances were made as far as shipping is concerned, as, for example, in the revolutionary types of landing craft which were developed. On the humanitarian side of shipping one notes the great improvements that have been made since the beginning of the last war in the way of life-saving appliances generally and radio aids to navigation.

To return to radar and other electronic aids to navigation which have come out of the war, there has been quite a lot of propaganda about the peace-time use of these aids. There is no doubt whatever, for example, that a ship which is fitted with radar is in a much more favourable position from the view of safety, not only of herself but of other ships, provided the apparatus is used with intelligence and discretion. As has been stressed by the Director of Navigation of the Admiralty and by various spokesmen of the Ministry of Transport, radar is, like any other electrical apparatus, merely an *aid* to navigation, and cannot in any circumstances be considered a substitute for visual means or absolve the ship-master or his officers from the necessity of taking the precautions required by the ordinary practice of seamen. It is always possible that any electrical or mechanical aid will fail, and if it does fail it is possible that it will do so at an inopportune moment. If an officer comes to rely too implicitly upon such an aid and allows himself to become rusty and unobservant as far as the older and more direct aids are concerned, he may find himself in very serious trouble. These remarks

are not intended to be in any way derogatory to radar or any other aid to navigation, or to the inventors or manufacturers thereof. It is merely a fact which has to be faced, and emphasises the necessity of those who go down to the sea in ships being sailormen and becoming wise in their craft.

In addition to the possibilities of mechanical breakdown of a radar set, one should always bear in mind the fact that just as mist or fog may block out the visible horizon to a human observer, so may some meteorological phenomenon blur the radar picture. Alternatively, just as the mirage manifests exceptional visibility to the human eye, so can super-refractive conditions in the atmosphere give abnormally large distances to the radar. A reduction in radar efficiency may be a great embarrassment, particularly in the case of a fast ship whose master might, if his radar were operationally efficient, under normal conditions proceed in thick weather at a faster speed than if he had not been so fitted. On the other hand, an abnormal distance on the radar screen would obviously be of value to the ship-master, particularly if he were looking for a landfall. One can't give exact guidance as to when to expect freak meteorological conditions which are liable to affect one's radar range, but one can consider a few general rules. For example, in anticyclonic and relatively calm conditions, particularly if there is not much convection taking place, it is more reasonable to suppose super-refraction would take place. In cyclonic conditions or when there is vigorous convection, there is more likelihood of sub-refraction to be experienced.

Apart from sub-refraction there are other meteorological factors which can have a directly adverse effect upon radar ranges, and these chiefly take the shape of water particles in the atmosphere in various forms. Thunderstorms, thunder-clouds, "fronts" and widespread rain, hail or snow are all susceptible to giving an echo to radar (dust-storms and sand-storms might have the same effect) and they may therefore mask some danger from those aboard the ship, or materially reduce the range. Finally there is the well-known effect of sea clutter, which is only indirectly meteorological but which does affect conditions at close range. This last effect is, to some considerable extent, overcome by mechanical means in the set itself, in the case of the 3 cm. sets approved by the Ministry of Transport for navigational purposes.

In addition to its value for coastal navigation and as a warning to approaching ships, radar can also be of great assistance in the detection of ice—a great boon to those engaged, for example, upon the St. Lawrence trade. It seems, however, that quite apart from small growlers, whose presence may not be detected due to sea clutter or because of their small volume above water, there are large bergs from which little or no response is received. The reason for this last-named phenomenon is not fully understood at present but is being investigated.

Despite the above-mentioned complications, and the fact that careful attention to maintenance routine is essential, there is no doubt that radar is a very great boon to the navigator, not only at sea, but also in the air. Much detailed investigation has to be made and many statistics compiled before we can understand many of the problems concerning the behaviour of radar, and it is certain that the meteorologist and the mariner will be able to do much to assist in providing information to assist the investigators. The masters and officers of all ships fitted with radar can help quite a lot in solving some of these problems by taking a live and intelligent interest in

the behaviour of their instruments under varying conditions and keeping a record thereof. It is important that meteorological conditions should be noted in as much detail as possible whenever freak conditions are experienced.

From the air-navigator's viewpoint the application of radar covers three main items—the radio altimeter, detection of thunder-clouds and, probably what is the most important, the use of G.C.A., or ground control approach, whereby the pilot can be brought safely to “touch down” on the tarmac in nil visibility, the pilot being entirely guided by radar control from the ground.

The meteorological value of radar lies primarily in its use for upper wind finding, but it can also be of valuable assistance in the detection of fronts, rain belts and thunder areas. In this connection mention should be made of the value of radar in determining the centre and danger areas of tropical storms and tracking their movement.

At sea one should remember that in addition to its purely navigational value it can be of enormous help from a rescue viewpoint. If, for any reason, D/F bearings are impracticable and the distressed vessel is uncertain of her position, the rescuing vessel, if fitted with radar, has a much better chance of locating the casualty—particularly if visibility happens to be a bit low.

The science of navigation has certainly gone a long way since Columbus set sail across the Western Ocean, and the modern navigator, with his large ship and all the electronic and other aids at his disposal, may well admire the courage and ingenuity of these early navigators. But today's mariner must still be as alert and seamanlike and he must be much more knowledgeable than his illustrious and adventurous forbears. Rocks are no less hard than in the Middle Ages, the wind and sea are no more gentle, nor are the currents less uncertain in their behaviour . . . and ships cost more than ever before.

MARINE SUPERINTENDENT.



OCTOBER, NOVEMBER AND DECEMBER

The Marine Observer's Log is a quarterly record of the most unusual and significant observations made by mariners.

The observations are derived from the logbooks of marine observers and from individual manuscripts. Photographs or sketches are particularly desirable.

Responsibility for each observation rest with the contributor.

SUBMARINE EARTHQUAKE

North Atlantic Ocean

S.S. *Coulgorm*. Captain G. Robison. Dakar to Hull. Observer, Mr. T. F. Tuomey, 2nd Officer.

5th November, 1948, 1322 G.M.T. A severe tremor was felt on board, several minor tremors followed shortly afterwards. The ship shook and vibrated as though several depth charges were exploded in the vicinity, although no explosion was heard. The barograph was undisturbed.

Position of Ship : Latitude $36^{\circ} 43' \text{N.}$, Longitude $12^{\circ} 17' \text{W.}$

CURRENTS

Off Minikoi Island

M.V. *Clan Maclaren*. Captain E. H. O. Stone. Aden to Colombo. Observer, Mr. J. A. Baxter, 2nd Officer.

17th December, 1948. Approaching Minikoi Island from the west, a position was obtained by simultaneous altitudes of Venus and the sun ; Venus was on the meridian. At 0504 G.M.T. (1001 A.T.S.) the position was lat. $8^{\circ} 20' \text{N.}$, long. $72^{\circ} 33' \text{E.}$, course by gyro 103° , speed $15\frac{1}{4}$ knots. After sighting Minikoi Lighthouse it was noticed that the ship was being set rapidly to the north and at 1146 A.T.S. the course was altered to 110° . At 1704 G.M.T. (1201 A.T.S.), the position was fixed by bearings of the lighthouse and Rangandi Beacon, lat. $8^{\circ} 16' \text{N.}$, long. $72^{\circ} 59' \text{E.}$ The mean set and drift of the current over the two hours was 308° , 5.4 miles. Wind NNE 3, sea slight.

S.S. *Mahout*. Captain H. F. Scoins. Aden to Colombo. Observer, Mr. D. L. Campbell, Chief Officer.

19th December, 1948. After passing Minikoi Island vessel experienced strong N'ly set amounting to 4 miles in $\frac{3}{4}$ hour, at end of which period the light dipped and no further observations were obtained. The island was

ranged by radar and target only picked up at 14 miles, and even then giving weak echo. This has been noticed previously ; also the whirlpool effect of current round the land—apparently clockwise in SW monsoon and anti-clockwise in NE monsoon.

Note. These observations of current are very interesting. Apart from any local effect of current circulation round the island, the currents in the open ocean in this region, between longs. 68°W. and 76°W., in November to January, have a predominating northerly tendency. The bulk of these currents set in directions from W to E through N, and therefore currents with northerly components are common, while those with southerly components are relatively infrequent.

CURRENT RIP

Australian Waters

M.V. *Derryclare*. Captain G. S. Smith. Sydney to Colombo. Observer, Mr. E. T. Paddon, 2nd Officer.

31st October, 1948, 0730 G.M.T. A well-defined current rip was observed with line of demarkation between smooth and broken water running almost due E and W as far as could be seen. The wavelets of broken water were breaking against the wind and sea. Weather conditions : barometer 1022.5 mb. falling (1.3 mb. since 0600), dry bulb 61°F., wet bulb 57.5°, sea 66°, wind SSE, 3, steady, swell SW, 5, sea S, 3, sky 10/10 covered with Cb. decreasing, visibility 9. Course 314°. Speed 9.5 knots.

Position of Ship : Latitude 34° 20'S., Longitude 114° 12'E.

TIDE RIPS

Red Sea

S.S. *Paparoa*. Captain E. Hopkins. Aden to Suez. Observer, Mr. C. B. Hewett, 3rd Officer.

23rd December, 1948, 0600 G.M.T. Passed through a tide rip that was setting in a W'ly direction. The position of the rip was very easily observed both by the line of broken water and by the distinct difference of colour of the water on either side of it. The current was quite strong, swinging the ship 10° off her course in a matter of seconds. The wind was N×E 4, sea temperature at 0545, 83°F., at 0605, 79°. Two other small tide rips were crossed at 0910 and 1100 and were setting quite strongly in a W'ly direction. Apart from slight broken water and the ship being swung off her course, there were no signs of the rips. Sea temperature remained steady at 79°.

Position of Ship at 0600 : Latitude 21° 21'N., Longitude 38° 05'E.

LINE OF DEMARKATION

Off Coast of Ceylon

M.V. *Nairnbank*. Captain C. S. Holbrook. Madras to Colombo. Observer, Mr. B. Amstad, 2nd Officer.

2nd December, 1948, 0330 G.M.T. A very marked change in the colour of the water was observed, with a clear-cut dividing line running in a N-S

direction from the shore to the horizon. The water to E of the line was a dark blue in colour and to W a light green. The water temperature immediately to the E was 82°F. and to the W 85°. This line appeared to mark the limit of the SW'ly flowing current, as after crossing it no further effect was experienced. Prior to this the current had been setting in a SW'ly direction at an average speed of 3 knots. Course 260°. Speed 11 knots.

Position of Ship : Latitude 5° 56'N., Longitude 81° 07'E.

DISCOLOURED WATER

Caribbean Sea

S.S. *Fordsdale*. Captain T. Oliver. Auckland to Hull, via Panama. Observer, Mr. R. Welch, 2nd Officer.

18th October, 1948, 1835 G.M.T. Observed a line of discoloured water lying ESE-WSW, approximately 2 miles long and 20 ft. wide. A distinct greenish-yellow colouring was clearly visible in contrast to the normal dark blue of the sea; the darkest green was to the north and the lightest yellow to the south. Weather conditions : barometer 1011.2 mb. Wind SE × E 4. Temperatures : air 84°F., wet bulb 79°, sea 83°. Sky 4/10 cloud with Cu. and Ci. Swell ESE, 1, sea SE 4.

Position of Ship : Latitude 13° 11'N., Longitude 67° 49'W.

M.V. *Port Lincoln*. Captain H. H. Smith, O.B.E. Cristobal to Curaçao. Observer, Mr. M. W. Raggett, 4th Officer.

15th December, 1948, 1500 G.M.T. Vessel entered a large area of light-coloured water about 1,000 ft. wide running from horizon to horizon on bearings 110° (T) and 290°. Wind NE × E, 3 to 4, barometer 1014.7 mb., slight sea and part cloudy.

Position of Ship : Latitude 12° 22'N., Longitude 70° 33'W.

PHOSPHORESCENCE

Atlantic Equatorial Waters

S.S. *Explorer*. Captain W. F. O'Neill. Durban to Belfast. Observer, Mr. R. Soar, 3rd Officer.

2nd November, 1948, 2000 G.M.T. The vessel entered moderately phosphorescent waters, which towards 2030 increased in luminosity until abnormal phosphorescent conditions prevailed. Large brilliant segments about 18 in. diameter were seen to gleam and give the impression of passing numerous lighted buoys. At 2040, the time of greatest intensity, the phosphorescence appeared like the twinkling lights of a large city. At 2050 it returned to normal and by 2230 the vessel had passed clear of the luminous area. Weather conditions : wind ESE, 4, veering NNE, 2, at 2230, barometer 30.00 in. rising, air temperature 74°F., wet bulb 70°, sea 76°. Sky overcast with Cb. at about 3,000 ft., sea slight, moderate short S × W swell, visibility good. Course 325°. Speed 11 knots.

Position of Ship : Latitude 3° 11'S., Longitude 6° 35'W.

M.V. Capetown Castle. Captain W. D. Roach. Southampton to Cape Town. Observer, Mr. L. MacEwan, 4th Officer.

12th November, 1948, 0410 G.M.T. Vessel passed through long streaks of phosphorescence which were mainly parallel and ran in a N \times S direction about 200–300 yards apart. These streaks lasted for about 3 miles. The sea was very full of phosphorescence and when the ship passed through these streaks it became quite vivid and the streaks resembled breakers on a flat beach.

Position of Ship : Latitude $1^{\circ} 48'N.$, Longitude $10^{\circ} 00'W.$

Gulf of Guinea

M.V. Port Hobart. Captain T. F. Kippins, O.B.E., D.S.C. Cape Town to Hull. Observer, Mr. A. J. Braund, 2nd Officer.

8th November, 1948, 0500 G.M.T. About an hour before daylight visibility became greatly reduced by rain showers drifting down from ahead, owing to the ship's speed being greater than the wind, SSE, 2, from astern. At about 0500 the shower lifted and revealed a river of phosphorescence about 100 yards wide and stretching from horizon to horizon in an almost perfectly straight line E to W. Prior to this considerable streaks of phosphorescence had been seen, mostly from N to S, but none immediately before this observation. Course 323° (T).

Approximate position of Ship : Latitude $1^{\circ} 25'N.$, Longitude $9^{\circ} 40'W.$

SEA SMOKE

Approaching Newport News, Va.

S.S. Fort Spokane. Captain A. B. Fasting, R.D., R.N.R. New Zealand to London via Panama. Observer, Mr. M. V. Meardon, 2nd Officer.

27th December, 1948, 1510 G.M.T. During the morning watch and early part of the forenoon large clouds of steam were given off by the sea and visibility was somewhat limited near the surface. This was due to the warm Gulf Stream and the cold air temperature, and is known by seamen as a "barber". Farther ahead the sea was of a deeper shade of green and there was no steam. In the warm water area the following observations were made : sea temperature $73^{\circ}F.$, air 44° , depth 55 fathoms. Six minutes later : sea 50° , air 43° , depth 52 fathoms. The current was seen to set in a ENE direction as far as the horizon. Course 356° (T). Speed 10 knots.

Position of Ship : Latitude $35^{\circ} 13'N.$, Longitude $75^{\circ} 02\frac{1}{2}'W.$

WATERSPOUTS

North Atlantic Ocean

M.V. City of Chester. Captain W. A. Rogerson, O.B.E. New York to Cape Town. Observer, Mr. F. M. Faulds.

20th October, 1948, 2040 G.M.T. Five waterspouts were sighted in varying stages of formation. The ship passed within half a mile of one which had just started to form, and although there was no visible junction with the cloud above it, the water was frothing and greatly disturbed. Two of the spouts made visible junction with a very large Cb. cloud, while the other ones varied in their amount of completion. Their movement was

towards ESE, with their tops moving a little ahead of the remainder. At 2108 they commenced to disappear and at 2115 all were out of sight. Weather conditions : barometer 1010.2 mb., air temperature 73°F., wet bulb 68°, sea 76°, wind WNW, 4 to 5, sky 3/10 clouded, visibility very good.

Position of Ship : Latitude 35° 15'N., Longitude 65° 48'W.

Mediterranean Sea

S.S. *Empire Halladale*. Captain E. J. Stormont, M.B.E. Port Said to Liverpool. Observer, Mr. W. Brownlie, 3rd Officer.

1st November, 1948, 1325 G.M.T. A heavy rain squall was observed about 5 miles ahead. At 1330 a waterspout was seen to form from Cb., and at 1335 another one formed one mile farther east than the former. The spouts headed in an ESE direction at about 15 knots. At 1340 the first was seen to break up as it appeared to come in contact with the land in the vicinity of Cape Cascine. At 1345 the second spout was hidden by the land. Weather conditions : barometer 1018 mb., falling slightly, wind W × N, 5, sky partly cloudy. Course 266°. Speed 13 knots.

Position of Ship : Latitude 36° 35'N., Longitude 2° 49'E.

HAILSTORMS

Hove-to off Algoa Bay

S.S. *Scholar*. Captain D. Wolstenholme. Mossel Bay to Algoa Bay. Observer, Mr. D. T. English, 2nd Officer.

11th October, 1948, 1245 G.M.T. During frequent squalls with thunder and lightning, wind E'ly, 7, rough sea and heavy swell, the wind suddenly died away and remained calm for 3 minutes. The wind then increased to WSW, 4, with torrential rain and hail, with an instantaneous rise in barometric pressure of about 7 mb. The temperature only fell 1.5°F. for a short while before rising again to 65°. The hail was very heavy for about 10 minutes, many of the hailstones were as large as tennis balls. Considerable damage was done ashore in Port Elizabeth and surrounding districts.

SANDSTORM

Red Sea

S.S. *Clan Macaulay*. Captain A. G. Starkey. Aden to Suez. Observer, Mr. M. Turner, 3rd Officer.

8th October, 1948, 0500 G.M.T. Shortly after passing Perim Island the sky to the NE was observed to be a brownish hue. By 0515 a definite cloud of fine sand rapidly approached the ship and its limit of approximately 4 miles in breadth was clearly defined. The wind freshened as the storm approached and at 0520 visibility was reduced to a minimum. At 0528 the sky overhead was clearing, although visibility at sea level was very poor, indicating that the storm was probably wedge-shaped. Visibility then increased rapidly, and by 0535 all the sky and horizon from E through N to W was clear. During the storm fine dust or sand had been precipitated on to the ship. Weather conditions : barometer 1006.2 mb., rising, air temperature 88°F., wind E, 3.

Position of Ship : 20 miles NNW of Perim Island.

MIRAGES

Chittagong Anchorage

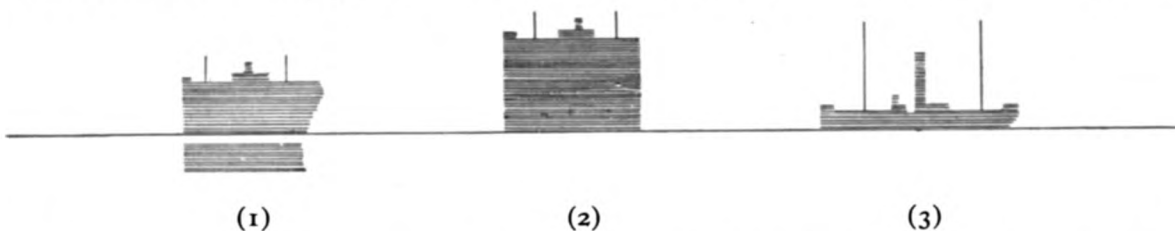
S.S. *Mahanada*. Captain J. W. B. Robertson. Observer, Mr. J. Long, 2nd Officer.

5th October, 1948. Lying to anchor off Karnaphul River bar from sunrise at 0630 A.T.S. and during forenoon until noon, excessive refraction was experienced. Ships and local native craft approaching the anchorage were alternately elevated above the horizon and lost from sight. Weather conditions: winds generally calm and light, offshore airs NNE, sea and swell negligible. At 1000 corrected barometer 29.81 in., air temperature 85°F., wet bulb 80°, sea 82°, trace of Cu. and Ac., visibility good with haze to seaward. During vessel's anchorage it was generally observed that Katuhia Island Light, distant $19\frac{1}{2}$ miles (height of eye 54 ft.), was clearly visible shortly after sunset and shortly before sunrise, but at other times during the night it was not seen.

Mediterranean Sea

S.S. *City of Evansville*. Captain A. N. Fry. Port Said to Gibraltar. Observer, Mr. J. Tattersall, 2nd Officer.

25th October, 1948, 1430 to 1530 G.M.T. Approximately 9 miles NE of Cape Guardia abnormal refraction was observed. Two horizons were seen at various parts along the land, the upper one appearing about $0^{\circ} 3'$ above the lower. A bank of mist appeared to lie around the whole horizon. Temperature: air 79°F., wet bulb 76°, sea 75°. Barometer 1018.3 mb.



Calm smooth sea. A vessel passing close inshore appeared distorted as shown in sketch (1) and (2). Another vessel passing to the N appeared to have a greatly elongated funnel and masts, sketch (3). The phenomenon lasted until about 1530, when the mist cleared and objects resumed their normal appearance.

Approximate position of Ship: Latitude $37^{\circ} 20' \text{N.}$, Longitude $9^{\circ} 55' \text{E.}$

Off Coast of French Guinea

S.S. *Empire Kinsman*. Captain F. Harris. London to Cape Town. Observer, Mr. H. D. Nock, 2nd Officer.

17th October, 1948, 0330 G.M.T. The vessel was heading SE at 10 knots when land appeared bearing NE, approximately 3 miles distant. At this time the nearest possible land was Byougo Islands, bearing NE at a distance of at least 60 miles. The moon was full, bearing SW, altitude 50° . Air temperature 80°F., wet bulb 77°. The mirage lasted for 20 minutes before it faded to a dark shadow and then disappeared completely.

Position of Ship: Latitude $10^{\circ} 16' \text{N.}$, Longitude $16^{\circ} 48' \text{W.}$

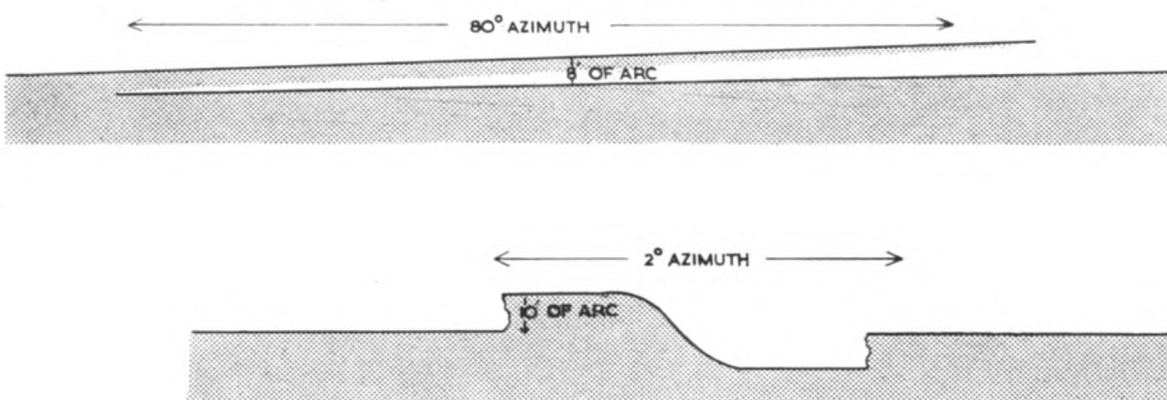
Australian Waters

M.V. *Australind*. Captain J. F. Wood. Abadan to Sydney. Observers, Mr. J. B. McGowan, 2nd Officer, and Mr. R. Mattingley, 3rd Officer.

22nd December, 1948, 2330 G.M.T. A double horizon was observed extending some 100° of azimuth in the NE quadrant.

Position of Ship : Latitude $35^\circ 51'S.$, Longitude $136^\circ 55'E.$

23rd December, 1948, 0030 G.M.T. Two passing vessels, estimated to be 7 and 9 miles distant, were established by radar to be 14 and 17 miles distant. The vessels were undistorted and the horizon was normal in appearance. From 0400 to 0630 varying types and amounts of false horizons were observed ; two varieties are sketched below.



This second phenomena appeared for about 15 minutes. Barometer 1013.3 mb., air temperature $72^\circ F.$, sea 65° .

Position of Ship : Latitude $38^\circ 07'S.$, $138^\circ 23'E.$

Later on the 23rd at 1100 G.M.T., Cape Northumberland Light (flash 5 seconds, 150 ft.), visible 18', dipped at a distance of 38 miles bearing 055° , height of eye 45 ft. Barometer 1013.3 mb., air temperature $65^\circ F.$, wind E'ly, 2.

Red Sea

S.S. *Silvercedar*. Captain J. Thompson. Karachi to Suez. Observer, Mr. G. K. Harrison, Jnr. 2nd Officer.

12th December, 1948, 1415 G.M.T. High land on Sinai Peninsula was visible at 70 to 90 miles, and Shadwan Island at over 60 miles. Ships leaving the Gulf of Suez were observed well above the horizon and all had the appearance of " shimmering ". The mirage around Shadwan was very conspicuous and continued to be so until just before sunset. The sky was 1/10 covered with Cu. of fair weather, air temperature $66^\circ F.$, wet bulb 55° , sea 77° , wind WNW, 3. The mirage and unusual visibility followed a day which had been mainly overcast with moderate rain showers from 0200 to 0430, wind N'ly, 3, throughout.

Position of Ship : Latitude $26^\circ 55'N.$, Longitude $34^\circ 27'E.$

EXCEPTIONAL VISIBILITY

North Sea

S.S. *Baltara*. Captain G. E. Thomas. Kotha, Finland, to London. Observer, Mr. D. B. Davies, 2nd Officer.

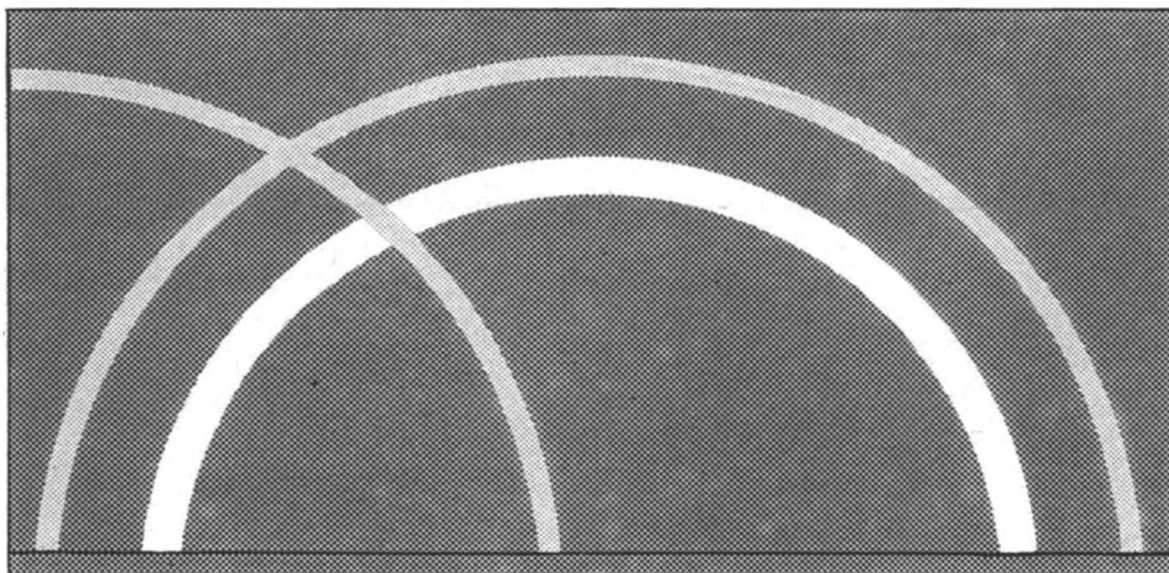
9th November, 1948, 0038 G.M.T. A fix was obtained of Texel light vessel bearing $158\frac{1}{2}^{\circ}$ (T) and Terschelling main light 124° at a distance of 52 miles off Terschelling. This position was checked later when abeam of S.T.2 buoy at 0144 G.M.T. The sky was 4/10 covered with Cb. on the SE horizon.

Position of Ship : Latitude $53^{\circ} 50\frac{1}{2}'$ N., Longitude $4^{\circ} 01\frac{1}{2}'$ E.

LUNAR RAINBOWS

North Atlantic Ocean

S.S. *Corinthic*. Captain G. M. Robertson, D.S.C. Curaçao to London. Observer, Mr. S. H. Wilde, 3rd Officer.



10th November, 1948, 2200 G.M.T. Two complete lunar rainbows were observed and one arc of a third bow. The lower complete bow showed the spectrum colours very distinctly, but the upper bow and remaining arc were white. Bearing NNE, height of centre 28° . Passing rain squalls with Cb. 6/10 and As. 3/10, wind NW, 8. Course 065° . Speed $14\frac{1}{2}$ knots.

Position of Ship : Latitude $39^{\circ} 01'$ N., Longitude $39^{\circ} 06'$ W.

Note. This is a very interesting observation. The secondary lunar rainbow is not very often seen, as it is usually too faint to be visible. The most remarkable part of the observation is the arc of the third bow, which is an example of an abnormal bow. Such bows are very rarely seen and cannot be explained on the basis of the ordinary optical theory of rainbows.

LUNAR CORONAE

Indian Ocean

S.S. *Recorder*. Captain R. F. Longster. Lourenço Marques to Calcutta. Observer, Mr. H. Ll. Jones.

19th October, 1948, 0045 G.M.T. As. clouds increased and a lunar corona was visible. The actual ring was not intense, but from the luminary the distinct bluish-white aureole light and the brownish inner ring were clearly defined. Arc measured by sextant was 6° . At 0100 the corona became more defined and further colours were discernable in the sequence of brown, green, yellow and red. The red outer ring was very thin but discernable. Between this and the brown inner ring the colours were not defined but seemed to diffuse into one another in a yellowish green tint.

Position of Ship : Latitude $14^{\circ} 36'S.$, Longitude $42^{\circ} 48'E.$

22nd October, 1948, 2345 G.M.T. In As. cloud associated with Ac. a lunar corona was again visible, and although of short duration the colours were much clearer than in the previous observations on 19th October. The colours from the brownish ring to the red outer ring were definitely distinguished in the sequence of purplish blue, green, yellow, orange and red. The arc was about 5° to 10° in radius from the luminary.

Position of Ship : Latitude $4^{\circ} 06'S.$, Longitude $51^{\circ} 30'E.$

S.S. *Pakeha*. Captain H. C. Smith. Melbourne to Durban. Observer, Mr. A. Pugh, 3rd Officer.

8th November, 1948, 1400 to 1410 G.M.T. A very clear lunar corona was observed. At 1400 the moon, which was in its first quarter, bore 277° (T), altitude 49° , the diameter of corona was approximately 6° . At 1405 the corona was at its brightest, the aureole was brilliant bluish-white with brownish-red outside. Violet, blue, green, yellow, orange and red were all clearly visible outside the aureole. The corona faded at 1410.

Position of Ship : Latitude $30^{\circ} 54'S.$, Longitude $98^{\circ} 56'E.$

LUNAR HALO

North Atlantic Ocean

M.V. *New Zealand Star*. Captain G. Owen, O.B.E., R.D. Curaçao to London. Observer, Mr. G. Munro, 3rd Officer.

19th November, 1948, 0445 G.M.T. A lunar halo of 22° which had been faintly visible for the previous 6 hours appeared unusually brilliant, showing the colours red, yellow, green, blue and violet. The inner edge (red) remained clearly defined until 0510, leaving the yellow and green predominant until 0525, when the phenomena was obscured by Cu. At time of observation the sky was covered by Cs. 9/10 and Cu. 1/10. Moon bearing 220° , approximate altitude 70° .

Position of Ship : Latitude $42^{\circ} 58'N.$, Longitude $30^{\circ} 33'W.$

Note. It is unusual for the colours of a lunar halo to be so clearly visible.

GREEN FLASH

North Atlantic Ocean

M.V. *Port Wyndham*. Captain H. Steele. Curaçao to London. Observer, Mr. P. R. Lewis, 2nd Officer.

30th October, 1948, 2133 G.M.T. A slight green flash was observed (by binoculars) as the sun set. It was seen above distant Cu. about 3' above the horizon, duration 1 second. The green colour was noticed to creep from the edges to the centre of the upper limb of the sun.

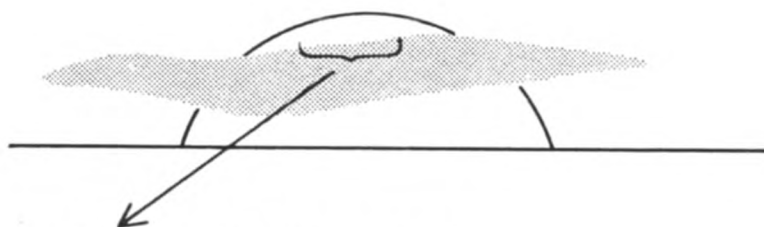
Position of Ship : Latitude $22^{\circ} 05' \text{N.}$, Longitude $59^{\circ} 36' \text{W.}$

Note. The green flash may sometimes be seen, as in the above observation, when the sun passes down behind a cloud edge, provided that this edge is well defined and not far above the horizon. Besides the more brilliant manifestation of the green flash, when the colour is very vivid to naked-eye observation there are many occasions when the colour is less bright and might be seen only in binoculars. When using binoculars near sunset care must be taken not to look at the sun with them until at least three-quarters of the disc has set behind horizon or cloud.

South African Waters

M.V. *Port Wyndham*. Captain H. W. Hazlewood. London to Cape Town. Observer, Mr. P. R. Lewis, 2nd Officer

18th December, 1948, at sunset. The sky was cloudless except for a trace of St. close to the western horizon, altitude about $0^{\circ} 10'$. The green



EXTENT OF GREEN FLASH

flash was seen twice, firstly as the upper limb of the sun disappeared below the top of the cloud and secondly when it went below the horizon. This flash, although mainly faint, at one time momentarily glowed very brightly, almost white (*see* diagram above).

Position of Ship : Latitude $29^{\circ} 58' \text{S.}$, Longitude $14^{\circ} 59' \text{E.}$

On 8th December, 1948, in approximate position lat. $22^{\circ} 51' \text{N.}$, long. $17^{\circ} 10' \text{W.}$, a bright green flash was observed at sunset, duration 2 seconds, final colour violet. On 30th December, 1948, in approximate position lat. $42^{\circ} 07' \text{S.}$, long. $100^{\circ} 48' \text{E.}$, green flash was seen at sunset, duration 2 seconds, colour in three stages : blue-green to apple-green (very bright), then blue-green again.

Note. The observations of December 8th and 30th are particularly interesting. Theoretically, in suitable conditions the green flash may be a blue or violet one, or may end in one of these colours. Actual observations of these colours, especially violet, are rare. An observed change in the green colour, as noted in the observation on 30th December, has not, so far as we know, been recorded before.

SCINTILLATION

Mediterranean Sea

S.S. *British Commodore*. Captain N. Pinkney. Port Said to Genoa and Vado. Observer, Mr. A. Davies, Chief Officer.

22nd October, 1948, 1800 to 1835 G.M.T. The star Capella, altitude 10° , was seen to flicker rapidly, changing colour all the while. At times it attained exceptional brilliance, with magnitude approximately -1 . The period for a complete colour cycle was under 1 second in the order red, yellow, green and occasionally blue, thence directly back to red; the interval occupied by the yellow-green range was three-quarters of the whole cycle. By 1820 the magnitude was reduced to about zero and the colour variations greatly reduced. By 1835 the star had assumed its normal intensity relative to its neighbours, which were unaltered. The atmosphere was clear with all stars visible.

Position of Ship : Latitude $43^{\circ} 25' \text{N.}$, Longitude $09^{\circ} 25' \text{E.}$

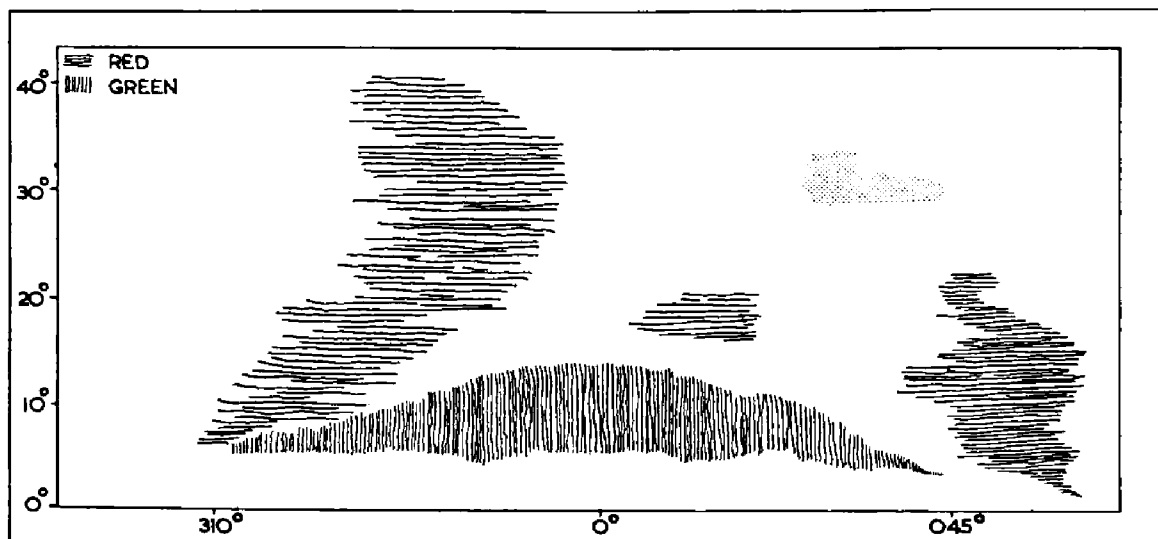
AURORAE

North Atlantic Ocean

M.V. *Telemachus*. Captain G. Brown, M.B.E. New York to Alexandria. Observer, Mr. P. Cruickshank, 3rd Officer.

17th to 18th October, 1948. Brilliant aurora was observed in spite of bright moonlight; its colours were pale green, red to pink.

17th October, 2345 G.M.T. Green glow observed low down, between 045° and 310° .



18th October, 0000 G.M.T. Green glow spreading, becoming brighter, assuming form as shown in sketch.

- | | | |
|------|---|--|
| 0030 | „ | Red colours flickering. |
| 0100 | „ | Aurora steady, as in sketch. |
| 0130 | „ | Green band fading, red fusing into one large glow. |
| 0140 | „ | On a bearing 015° , white rays flickering fanwise to approximately 60° altitude. |
| 0145 | „ | Aurora ceased after gradually fading. |

Throughout the observation the sky was 1/10 covered with Cu., wind SSW, 4, visibility 8.

Position of Ship at midnight : Latitude $37^{\circ} 53' \text{N.}$, Longitude $65^{\circ} 18' \text{W.}$

S.S. *Geologist*. Captain A. E. Jackson. Cardiff to Barbados. Observer, Mr. M. A. Wardle, 2nd Officer.

18th October, 1948, 0045 G.M.T. To NNW a large patch of brilliant pink hue appeared, in shape and contour similar to the clouds, but at a far greater height, and its rate of progress across the sky was slower than that of the clouds. At 0115 the patch began to enlarge in area and decrease in intensity, forming a translucent pink film over that part of the sky. It finally disappeared at 0135.

Position of Ship : Latitude $42^{\circ} 47' \text{N.}$, Longitude $19^{\circ} 05' \text{W.}$

M.V. *Salamanca*. Captain D. W. Hutchison. Cristobal to Liverpool. Observer, Mr. J. N. Owen, 3rd Officer.

18th October, 1948, 0042 G.M.T. Aurora was first observed bearing $000^{\circ} (\text{T})$, and consisted of four vertical bands of pinkish red light 10° in length, their lower edges being about 20° above the horizon. These bands fused together and extended westward as a band 10° wide from 000° to $290^{\circ} (\text{T})$. The lower edge of this band was 20° above the horizon. The light was diffused and did not emanate from any particular source. It was mainly pinkish-red, with patches of brighter and darker red. Sc. clouds which passed across the light appeared green, but stars within the light underwent no apparent change in colour or magnitude. At 0100 G.M.T. the band of light extended eastward and formed an arc which measured 95° along the horizon. The angular height of the summit was 24° , measured from the lower ledge, the sky under the concave border was not dark and stars were visible. At 0110 the arc gradually diminished to a bright patch bearing 310° , altitude 25° , and at 0115 it had disappeared. During the aurora the moon was full and bright, bearing 170° , altitude 55° .

Position of Ship : Latitude $43^{\circ} 34' \text{N.}$, Longitude $22^{\circ} 48' \text{W.}$

Other ships reported aurora on 17th to 19th October, 1948.

S.S. *Manchester Progress* on the 18th, lat. $56^{\circ} 10' \text{N.}$, long. $14^{\circ} 52' \text{W.}$
"Northern Lights at 0000 G.M.T."

S.S. *Empress of Canada* on the 19th, lat. $53^{\circ} 38' \text{N.}$, long. $48^{\circ} 34' \text{W.}$
"Magnificent Aurora Borealis 0400 to 0700 G.M.T."

S.S. *Cairnesk* on the 18th, lat. $58^{\circ} 09' \text{N.}$, long. $26^{\circ} 40' \text{W.}$ "0100 to 0130 G.M.T., diffused auroral light covering about 1/10 of sky, vivid red in colour."

S.S. *Cairnvalona*. Captain G. R. Nowell. Montreal to Newcastle. Observer, Mr. T. D. Ridley, 3rd Officer.

21st October, 1948, 0050 to 0145 G.M.T. A white auroral arc was observed stretching from horizon to horizon, bearing 045° to 270° . It had a flattened appearance, with the lower edge bright and clearly defined, about 15° altitude. The upper edge was not so bright or clear and stars were visible through the arc. The height of the arc slowly increased, but the bearings of the extremities did not change until 0120, when the arc had reached an altitude of 40° with no appreciable change in intensity or colour. At 0123 a second arc, much fainter, appeared bearing 060° to 240° , altitude about 80° . The ends of the two arcs were almost touching in the E but were well apart and more intense in the W. At 0125 the arcs dispersed and curtaining of varying intensity covered the whole of the northern sky. This was more predominant in the NW, where for a short period the lower and upper edges turned from white to brilliant red and green respectively. It was 0145 before the last traces of light disappeared. During the whole of this phenomenon it was bright moonlight and cloudless.

Position of Ship : Latitude $52^{\circ} 30' \text{N.}$, Longitude $53^{\circ} 20' \text{W.}$

METEORS

North Atlantic Ocean

S.S. *Parthia*. Captain R. G. Thelwell, O.B.E., R.D., A.D.C., R.N.R. New York to Liverpool. Observers, the Captain and Mr. J. Killan, Jnr. 1st Officer.

13th November, 1948, 2350 G.M.T. A brilliant electric-blue meteor with a vivid red tail dropped from approximately 25° to 15° altitude, bearing SSE, nearly midway between the moon and Betelgeuse. The weather was fine and cloudy with occasional clear patches; the meteor was observed in one such clear patch.

Position of Ship : Latitude $45^{\circ} 32' \text{N.}$, Longitude $41^{\circ} 30' \text{W.}$

Leaving Gulf of Guinea

S.S. *Coulgorm*. Captain G. Robison. Cape Town to Dakar. Observer, Mr. J. G. Ridley, 3rd Officer.

23rd October, 1948, 2245 G.M.T. A brilliant meteor was observed bearing approximately 270° , altitude 30° , travelling E and leaving a trail. When at about 50° altitude it appeared to stop and burst in a brilliant flash, leaving a shower of what looked like stars radiating in various directions and lasting for about 10 seconds. The whole phenomenon lasted about $1\frac{1}{2}$ minutes. The sky was clear and the moon had not yet risen.

Position of Ship : Latitude $3^{\circ} 30' \text{N.}$, Longitude $12^{\circ} 50' \text{W.}$

South Atlantic Ocean

S.S. *Edinburgh Castle*. Captain T. W. McAllan. Southampton to Cape Town. Observer, Mr. R. J. Taylor, 3rd Officer.

20th December, 1948, 1954 G.M.T. A very brilliant bluish-white meteor was observed in a cloudless sky bearing 140° (T), altitude 35° . It increased rapidly in brilliance to magnitude -4 at bearing 180° , then decreased slowly to magnitude -1.5 , ending in two separate heads of equal size, bearing 210° , altitude approximately 18° . It left a glowing trail of red sparks 50° long. Duration of flight 7 seconds. Magnitude comparisons were α Canis Majoris and Venus.

Position of Ship : Latitude $21^{\circ} 43'S$, Longitude $6^{\circ} 56'E$.

South African Waters

S.S. *Coulgorm*. Captain G. Robison. Fremantle to Durban. Observer, Mr. T. F. Tuomey, 2nd Officer.

3rd October, 1948, 0000 G.M.T. A bright meteor was observed bearing 350° , altitude 25° , travelling SE. It appeared in a brilliant flash, faded to red and disappeared 3 seconds later in another flash which illuminated the ship and surrounding area. No trail was visible although the sky was clear. The flashes were of such brilliance as to be seen by the man at the wheel, whose eyes were not adjusted to the darkness.

Position of Ship : Latitude $28^{\circ} 36'S$, Longitude $37^{\circ} 18'E$.

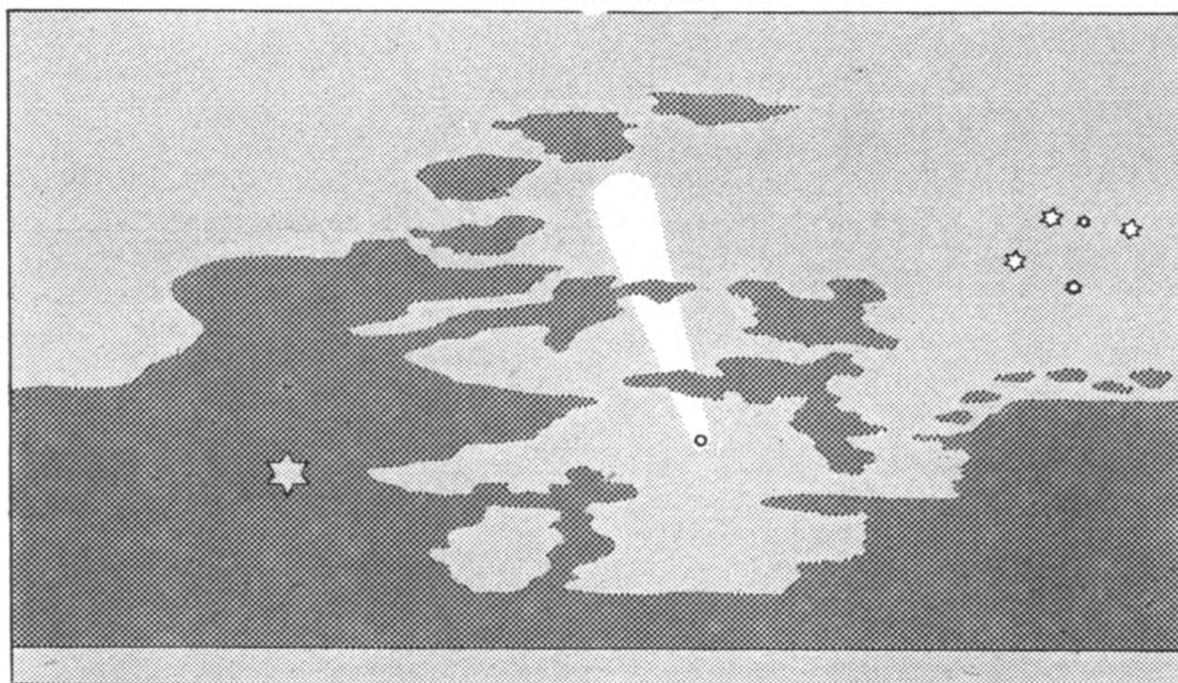
Indian Ocean

S.S. *Recorder*. Captain R. F. Longster. Lourenço Marques to Calcutta. Observer, Mr. P. B. Dilleigh, 3rd Officer.

23rd October, 1948, 1710 G.M.T. A very large and bright meteor was seen bearing ESE, altitude 40° , and travelling in a N'ly direction. As it travelled it gained brilliance until it reached altitude 30° , bearing $E \times S$, then it disintegrated into two large pieces and several small ones. The two large pieces continued to travel on the same line, diverging from each other slightly until they finally disappeared bearing $E \frac{1}{2} N$, with altitudes of 18° and 12° respectively.

Position of Ship : Latitude $2^{\circ} 52'S$, Longitude $59^{\circ} 21'E$.

COMET 1948I



Sketch made on board M.V. *Brockleymoor*, lat. $35^{\circ} 48'S.$, long. $127^{\circ} 02'E.$, 1900 G.M.T., 9th November. The planet Venus and stars of the Southern Cross are shown.

During the total solar eclipse of 1st November, 1948, observed in Kenya, photographs of the sky in the region of the sun showed the presence of a new bright comet. By 6th November the angular distance between the comet and the sun had increased sufficiently to allow of its observation in the night sky, before sunrise, and it provided a magnificent spectacle in the southern hemisphere. Observations of this comet have been received from the following seventy-nine British ships :

S.S. <i>Afghanistan</i>	S.S. <i>Devon</i>	S.S. <i>Orion</i>
S.S. <i>Akaroa</i>	M.V. <i>Dunster Grange</i>	S.S. <i>Pakeho</i>
S.S. <i>Andes</i>	M.V. <i>Durango</i>	M.V. <i>Palana</i>
S.S. <i>Artisan</i>	S.S. <i>Empire Kinsman</i>	S.S. <i>Paparoa</i>
S.S. <i>Asturias</i>	S.S. <i>Empress of Australia</i>	M.V. <i>Port Chalmers</i>
M.V. <i>Athlone Castle</i>	S.S. <i>Explorer</i>	M.V. <i>Port Hobart</i>
M.V. <i>Auricula</i>	S.S. <i>Fort Spokane</i>	M.V. <i>Port Jackson</i>
S.S. <i>Balantia</i>	M.V. <i>Glenorchy</i>	M.V. <i>Port Lincoln</i>
S.S. <i>British Commodore</i>	M.V. <i>Gloucester</i>	S.S. <i>Rajput</i>
M.V. <i>British Piper</i>	M.V. <i>Highland Brigade</i>	M.V. <i>Rakaia</i>
M.V. <i>Brockleymoor</i>	S.S. <i>Hubert</i>	S.S. <i>Rimutaka</i>
S.S. <i>Byron</i>	M.V. <i>Hurunui</i>	M.V. <i>San Adolfo</i>
M.V. <i>Capetown Castle</i>	M.V. <i>King William</i>	S.S. <i>San Gaspar</i>
S.S. <i>Carlton</i>	S.S. <i>Lachlan</i>	S.S. <i>Silverbriar</i>
M.V. <i>Carnarvon Castle</i>	S.S. <i>Lassell</i>	M.V. <i>Silverteak</i>
S.S. <i>Cavina</i>	S.S. <i>Linguist</i>	S.S. <i>Sovac</i>
M.V. <i>Chinese Prince</i>	S.S. <i>Loch Garth</i>	M.V. <i>Stanhall</i>
M.V. <i>City of Chester</i>	S.S. <i>Machaon</i>	M.V. <i>Suffolk</i>
M.V. <i>City of Johannesburg</i>	S.S. <i>Macharda</i>	S.S. <i>Sutherland</i>
S.S. <i>City of Paris</i>	S.S. <i>Magdapur</i>	S.S. <i>Tamaroa</i>
S.S. <i>Clan Chattan</i>	S.S. <i>Margay</i>	M.V. <i>Taranaki</i>
S.S. <i>Clan Chisholm</i>	S.S. <i>Marietta Dal</i>	M.V. <i>Telemachus</i>
M.V. <i>Clan Macdonald</i>	S.S. <i>Markab</i>	M.V. <i>Trevaylor</i>
S.S. <i>Clan Macrae</i>	S.S. <i>Mataroa</i>	M.V. <i>Vancouver City</i>
M.V. <i>Clydebank</i>	S.S. <i>Mooltan</i>	M.V. <i>Waipawa</i>
M.V. <i>Darro</i>	M.V. <i>Napier Star</i>	M.V. <i>Yenangyuang</i>
M.V. <i>Denbighshire</i>		

These observations cover the period from 6th November to 5th December, 1948. Much interesting information about the comet has thus come to hand, including the apparent brightness of the head of the comet and the apparent length, brightness and shape of the tail. Many sextant observations of the comet's position and a number of sketches have also been given. Two of the sketches are reproduced here. In addition, the observations of twenty-four foreign ships, published in issues of the United States Hydrographic Bulletin, are available.

A summary of the essential information from ninety-five British and foreign ships was sent to Dr. Merton, the Director of the Comet Section of the British Astronomical Association. A few of the observations (three British and five foreign) were not received till later. Dr. Merton's reply is given below.

"Thank you very much indeed for sending me the extracts from the observations of the eclipse Comet 1948I from ninety-five British and foreign ships. They were of more use to me, especially the early ones, than I expected, as they gave me some checks on the estimated magnitudes and lengths of tail when observations by astronomers were scarce—and unreliable!

"The first report after the eclipse came from an American airways skipper flying at 16,500 ft. near Kingston, Jamaica, on 4th November, then comes your first ship (*Empire Kinsman*) and then J. D. Pope, Atkinson's assistant at the eclipse who was on the lookout for it in Kenya and saw it on 6th November at about 0700 G.M.T.—Dr. Harley Wood in Australia probably saw it that night, 6th November, at about 2130 G.M.T.

"The most reliable estimates of length of tail by astronomers gave it as 20° , though I have other estimates over that and one Russian one of 30° . I have put it at 20° in my R.A.S. annual report, and the magnitude at 1 when first seen again, 6th and 7th November, as the best estimates seem to cluster around that. It is, of course, very hard to estimate such a bright object of some size even if you have suitable stars around, because the stars are points, and I think most inexperienced observers would tend to over-estimate on account of size of the head compared to a star point. Altitude of course also affects comparisons, especially when there is horizon mist; and I think Venus was at low altitude then for them—nearing their mid-summer.

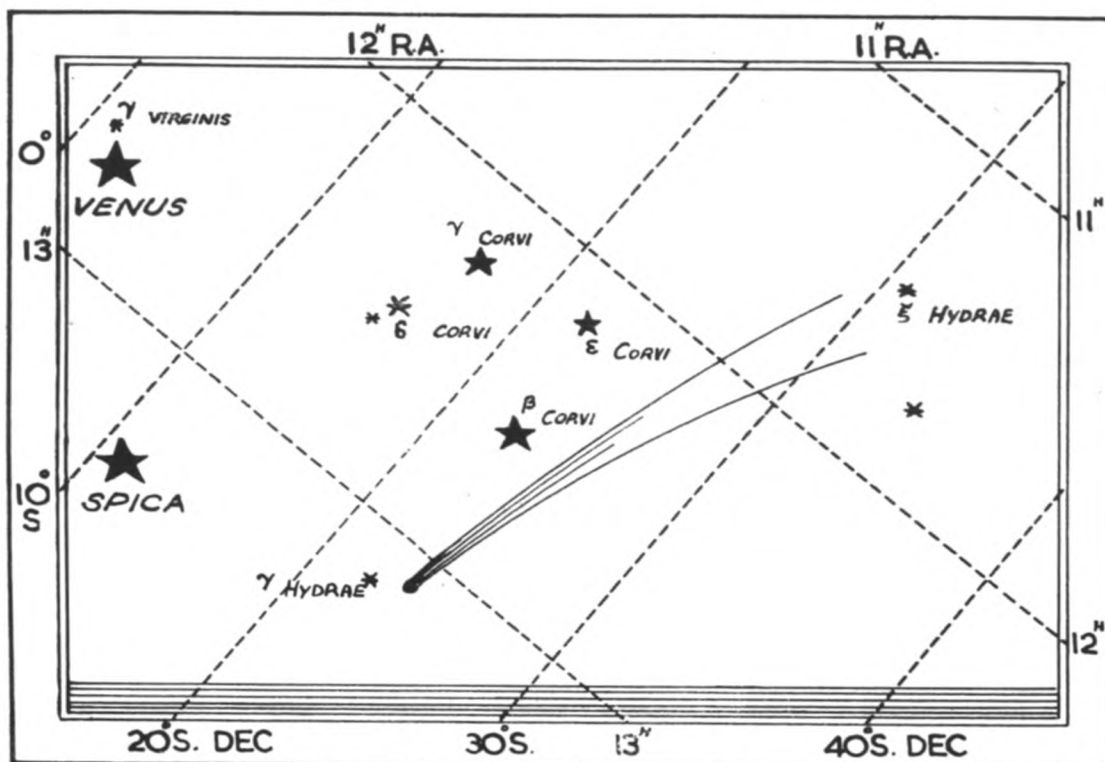
"Observations I have show the comet was at magnitude 5.0 about on 5th December and 5.5 on 10th December, which agrees with the reports of it last being seen with the naked eye about that time."

The observation of the S.S. *Empire Kinsman* is thus seen to be the first made at ground level after the initial day-time discovery of the comet during the total solar eclipse of 1st November. The observation was recorded as follows:

"Vessel lying at anchor in Port Elizabeth roads, 6th November, 1948, at approximately 0200 G.M.T. The Second Officer, who was then on anchor watch, observed a bright comet. The altitude of the body was approximately 5° and the end of the tail approximately 16° . The comet appeared in the constellation of Virgo. It was again observed on subsequent nights, bearing approximately 110° (T), appearing first as a beam of light, then slowly the body coming into view. A report was sent c/o Met. Pretoria as soon as the body was observed."

Space does not permit of giving the other observations in full. Two other ships observed the comet later on 6th November, S.S. *Orion* at 2100 G.M.T. and M.V. *Port Jackson* at 2130 G.M.T. Observations by seven British ships were made on 7th November. After about 8th November the head of the comet began to decrease in brilliancy. In the middle of the month a period of bright moonlight temporarily reduced the effectiveness of the comet as a

spectacle. Towards the end of the month the comet had become much fainter, about magnitude 5, and the tail much shorter. It was then approaching the limit of naked-eye visibility, which is from magnitude 6 to about $6\frac{1}{2}$, depending on the observer and transparency of the sky. The last naked-eye observations by British ships were those of S.S. *Carlton* on 3rd December and M.V. *Vancouver City* on 3rd and 5th December. The comet was just discernible later, without optical aid, to two American ships, S.S. *Skagway Victory* on 9th December and S.S. *Onwards* on 9th and 10th December. With optical aid it was seen by the latter ship on 15th December.



Sketch made on board S.S. *Explorer*, lat. $24^{\circ} 17' \text{N.}$, long. $17^{\circ} 01' \text{W.}$, 0600 G.M.T., 10th November.

The apparent length of a comet's tail is always difficult to determine exactly, as it fades off very gradually at its extremity. The least trace of twilight will thus have the effect of shortening it to some extent, and a brighter twilight will shorten it markedly. This accounts for the very different lengths of the tail often recorded by different ships on the same date. Eight observations gave the length of the tail as 20° or more, the two longest being 27° on 12th November (S.S. *Loch Garth*) and 26° on 8th November (M.V. *Port Chalmers*).

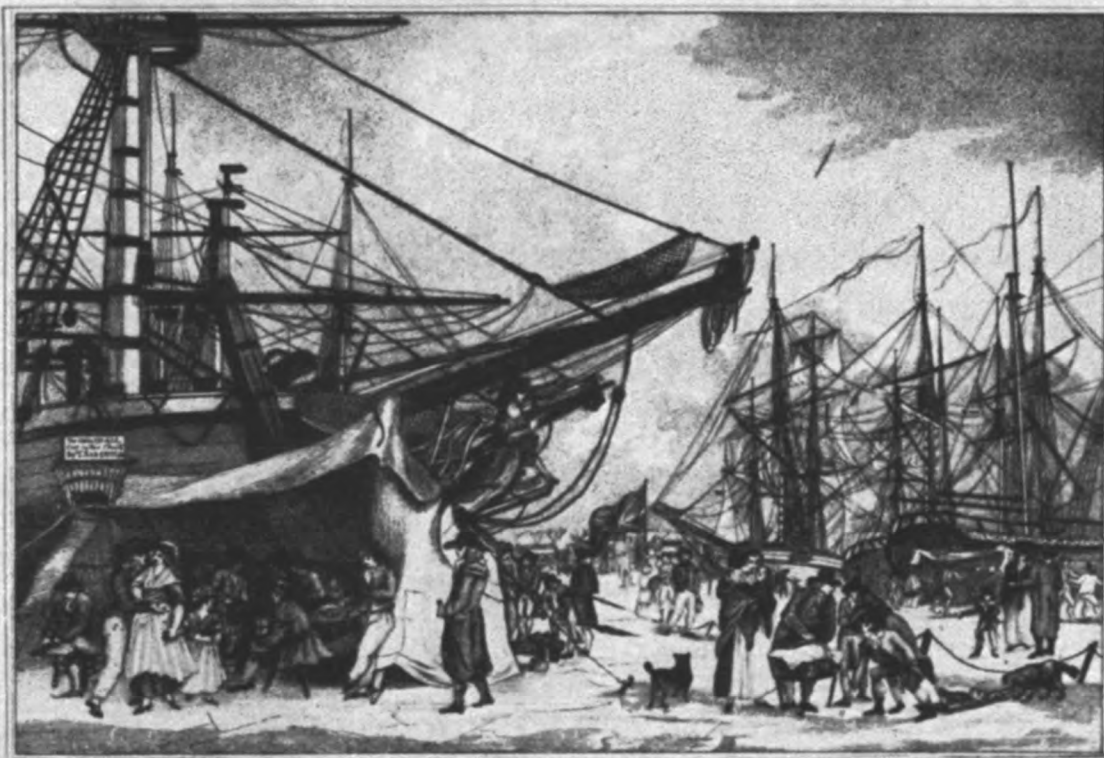
During the eclipse the brilliancy of the head of the comet was estimated to be not far short of that of the planet Venus. Several ships reported it as bright as Venus, or nearly so, on 6th to 8th November, while others gave it as much less, about magnitude 1, on these dates. The difficulty of estimating the brightness of a comet, even by experienced astronomical observers, is referred to in Dr. Merton's letter. Comet 1948I was probably somewhat brighter than Comet 1947n, reported in *The Marine Observer*, October, 1948, page 194, and it was therefore one of the brightest comets seen for

many years past. By the time it had moved sufficiently northward in the sky to be visible in the British Isles it was a telescopic object.

A comet develops its greatest intrinsic brightness about the time it passes through perihelion, the point in its orbit when it is nearest the sun. Comet 1948I passed perihelion on 27th October, five days before it was seen during the eclipse. It was approaching the earth from a direction behind the sun, which explains why it was previously invisible. The period of revolution of a comet, i.e. the time taken to travel once round its elongated elliptical orbit, is in most cases very long, and may be hundreds or even thousands of years.

“ FROST FAIRS ” ON THE THAMES

In this number we are concluding the series of prints depicting Frost Fairs on the River Thames presented to the Meteorological Office by Mr. C. E. Britton (see page 168, July, 1949, *Marine Observer*).



A VIEW of the THAMES, from ROTHERHITHE STAIRS,

DURING THE FROST IN 1789.

Painted by G. Whistler, & engraved by W. Birch, Enamel Painters

Published Aug^r 1789 by W^m Birch, Hamplhead Heath & sold by T. Thornton, Southampton Str^t Cor^r Garden

Frost Fair on the Thames, 1789

SFERICS

BY C. V. OCKENDEN, B.SC.

"Sferic" is the code word which has been used for some years now to designate reports of positions of areas in which thunderstorms are taking place. "Sferic" is derived from atmospheric (the French use "atmos" as the code word), which gives the clue to the basis of the method employed in obtaining the information.

In 1906, in a paper to the Royal Society, Marconi wrote: "It would be exceedingly interesting to investigate whether there exists any relation between the direction of origin of these waves and the bearing or direction of distant terrestrial or celestial storms from whence these stray electric waves probably originate". Twenty years later in the *Meteorological Magazine* for July, 1926, Mr. Bilham reviewed a paper by Watson Watt on "The directional recording of atmospherics", in which it was mentioned that the movement of a trough associated with thunderstorms over Tunis was determined from the directions of arrival of atmospherics at Lerwick, Ditton Park and Aboukir.

Today, in 1949, in the British Meteorological Service, we have regular observations being made twelve times daily by four specially selected stations equipped with modern cathode ray direction-finding sets to "fix" the location of thunderstorms with a high degree of accuracy up to a range of 1,000 to 1,500 miles. Several other countries, notably France, America, Germany and Switzerland, have for a long time been conducting researches into the various methods for "pinpointing" atmospherics, and at a recent Conference of the International Meteorological Organisation it was recommended that efforts be directed towards international exchange of "Sferic" reports for the benefit of meteorological services in all countries. It need hardly be said that in war-time the "Sferics" organisation was of the greatest importance; not only did it provide a means of warning those who had to plan 1,000-bomber raids of the existence of thundery activity over the areas in which they were particularly interested, but it kept forecasters primed with extremely reliable information concerning the positions and movements of fronts over enemy-held territory and over sea areas from which weather reports were unobtainable. The modern "Sferic" sets are costly, but maintenance is a relatively small item and only a few personnel are required to carry out the observations. In view, therefore, of the enormous increase in civil flying over long air routes, and the high frequency of accidents attributable to aircraft being involved in cumulonimbus clouds, a "Sferic" organisation is likely to be a paying proposition in peace-time. Radar methods for storm detection are being developed, but the range of operation is at present less than a tenth of that covered by "Sferics".

The four stations to which reference has already been made are situated at Dunstable (lat. $51^{\circ} 53' \text{N.}$, long. $00^{\circ} 33' \text{W.}$), St. Eval (lat. $50^{\circ} 28' \text{N.}$, long. $04^{\circ} 59' \text{W.}$), Leuchars (lat. $56^{\circ} 23' \text{N.}$, long. $02^{\circ} 53' \text{W.}$) and Irvinestown (North Ireland) (lat. $54^{\circ} 29' \text{N.}$, long. $07^{\circ} 38' \text{W.}$), the "control" station being Dunstable, which is also the central forecasting station and communications centre of the Meteorological Office. The fourth station, Irvinestown, was only established in 1944, and has been found very useful in checking "fixes" from the other three stations, and in enabling good results to be obtained in the event of one of the others being temporarily out

of action through technical trouble or a breakdown in communications.

At each station there are two huts—one containing the cathode ray direction-finding (C.R.D.F.) equipment, amplifiers, display tube, power packs and so on, whilst the other houses the four fixed vertical frame aerials, or “ loops ”, two oriented in a true north-south plane and the other two in a true west-east plane. The co-planar frames are connected in series, and with this symmetrical arrangement the mutual induction between the two pairs of loops can be reduced to less than one part in 1,000. Precautions are taken to avoid errors through local electrical interference. A photograph of a “ Sferic ” set showing the amplifiers, cathode-ray tube and plotting table is shown in Fig. 1. The receivers are arranged to work on a frequency of



Fig. 1—Sferic set showing amplifiers, cathode-ray tube and plotting table

about 10 kc/sec. (30,000 m.) because, although atmospherics can be recorded on practically any frequency, the maximum energy is found between about 8 and 12 kc/sec. Two other advantages in using this frequency are (1) bearing errors due to polarisation are reduced, and (2) this frequency is not much used by commercial W/T transmitting stations. It is possible to tune the sets to stations such as Rugby (16 kc/sec.), Annapolis (17·8 kc/sec.), Varberg (17·2 kc/sec.), etc., and hence obtain a check on bearings found for these fixed transmitters.

The output from the amplifier connected to the N-S frames is fed to the X plates of the cathode-ray tube and that from the amplifier connected to the E-W frames goes to the Y plates. Thus, impulses picked up only on the N-S frames cause the spot of light on the tube to be drawn out into a N-S line, whilst a signal received on the E-W frames gives an E-W line. Signals from any other direction will give a line on the tube in an intermediate position dependent upon the resultant of the two deflecting forces, and the

direction can be determined to the nearest degree from a graduated circle which is engraved on the glass face. The tubes as used at present have a "persistent" fluorescent coating so that, although the duration of a lightning flash may be only between $1/500$ and $1/1,000$ second, the afterglow persists long enough for an observer to make an accurate reading of the bearing. It is hoped soon to make tests with auxiliary tubes, adapted to photograph the flashes on a continuously moving film which can be examined at leisure afterwards and the results compared with the visual observations. No provision is made for determining the "sense" of bearings—there is an ambiguity of 180° , but this is resolved in the plotting operation. The most modern sets are being fitted with a "brilliance modulation" device which secures that the tube is only illuminated for a very short period corresponding to the receipt of the ground wave; polarisation errors due to the arrival of waves reflected back from the ionosphere will thus be considerably reduced.

Observations are normally made twelve times daily, each "run" having a duration of fifteen minutes commencing at the following (clock) times: 0700, 0900, 1015, 1130, 1220, 1400, 1515, 1630, 1830, 1945, 2100 and 2200.

The four stations are interconnected by telephone tie-lines with a switch-board at Dunstable, and the observer at this control station, keeping a constant watch on the tube during a "run", calls out "now" immediately a flash occurs on the tube which is of sufficient length to enable its bearing to be determined. During periods of great activity flashes may be so frequent that it is not altogether easy to be certain that all stations have identified the same flash, but doubtful cases are weeded out during the plotting process. When a flash is "called" bearings from each station are telephoned in turn to a "recorder" in the control office, who logs them, and at the end of the "run" they are all plotted on a sheet of perspex fixed over an outline map covering an area from the western Atlantic to the Ural mountains and from north Norway to north-west Africa. The map actually employed at Dunstable is an Admiralty chart on a gnomonic projection, with point of tangency near the centre of the quadrilateral formed by the four observing stations. In general, the bearings do not all intersect at an exact point, but form a small quadrilateral, and the "fix" is taken to be at the centre of this, unless there are reasons for believing that more weight should be given to the reading from any particular station or stations. The plotting operation occupies about five to ten minutes, and on completion the information is put into a simple coded message for broadcast by teleprinter and W/T. The symbolic form of the code used for W/T issues is:

SFERIC GGG_aA₁ LLL_lk LLL_lk — — SFERIC GGG_aA₁ LLL_lk LLL_lk, etc., where GGG denotes the time in hours and tenths, _a gives an indication of the nature of the distribution of the sources from which activity has been recorded, A₁ gives the probable error of the fix and the degree of activity, while the groups LLL_lk give latitude and longitude of fixes to the nearest $\frac{1}{2}^\circ$. This code has been adopted by America so that no difficulties arise in exchanging reports obtained from their network, which comprises C.R.D.F. stations in Bermuda, Florida and New Jersey.

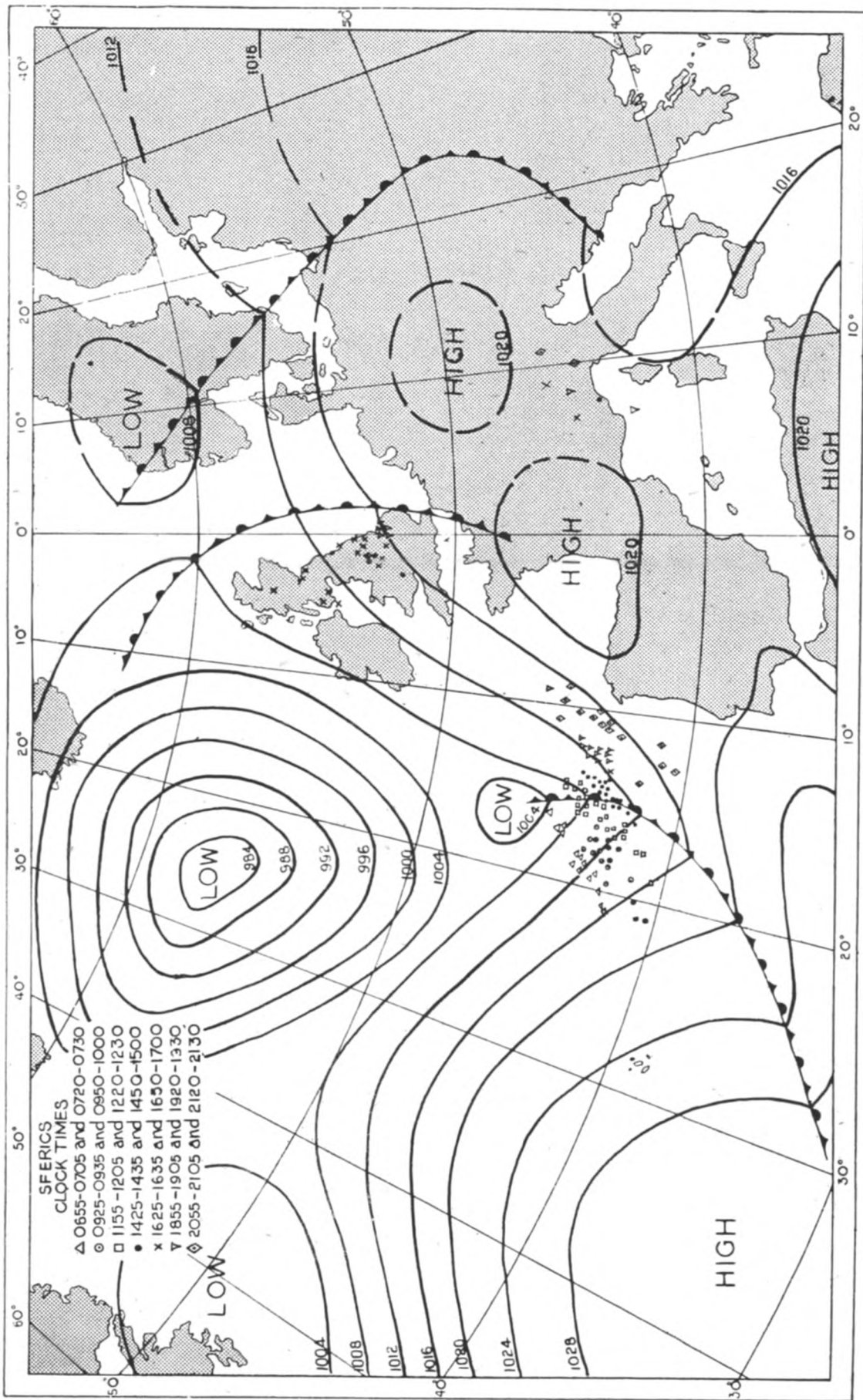


Fig. 2. Weather map for 1300 G.M.T., 11th April, 1944. Positions of storms found by "Sferics" fixes during the day.

Fig. 2 is a reproduction of the synoptic chart for 1300 G.M.T. on 11th April, 1944, on which have been plotted the positions of thunderstorms found by "Sferics" fixes on that day. It will be noted that there were sporadic storms over Britain in the late afternoon in the rear of the occlusion which had reached the North Sea by 1300 G.M.T. and that isolated centres of activity were located just south of the Alps. The most interesting feature of the chart, however, is the regular progression of storms associated with the cold occlusion which was moving quickly eastwards along with the secondary depression centred about 500 miles off north-west Spain. The chart forms a good example of the way in which "Sferic" reports can be used by forecasters to determine the probable position and movement of a "front" when no other evidence is available.

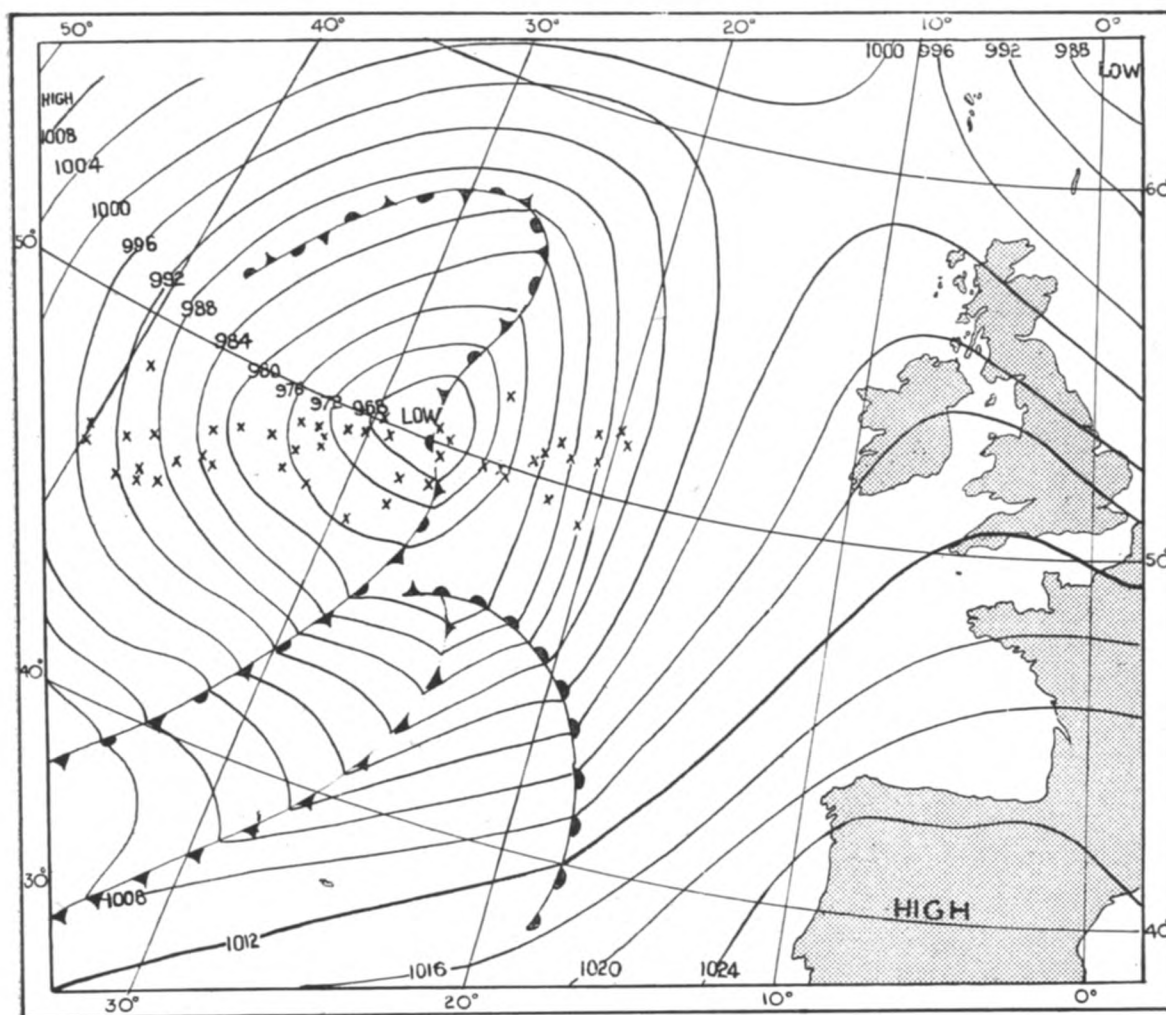


Fig. 3. Weather map for 1800, 22nd November, 1946, showing positions of thunderstorms found during the day.

Figs 3 and 4 show charts for 22nd and 23rd November, 1946. Numerous "Sferics" were associated with the very deep depression in the Atlantic, and it is remarkable that whilst cumulonimbus cloud was reported, none of the ships' observations gave any indication of actual thunderstorms which were of vital concern to aircraft on the North Atlantic air route. Douglas has pointed out that thunderstorms have a far closer relation with cyclonic vorticity than with any particular kind of air mass, but it is rather unusual

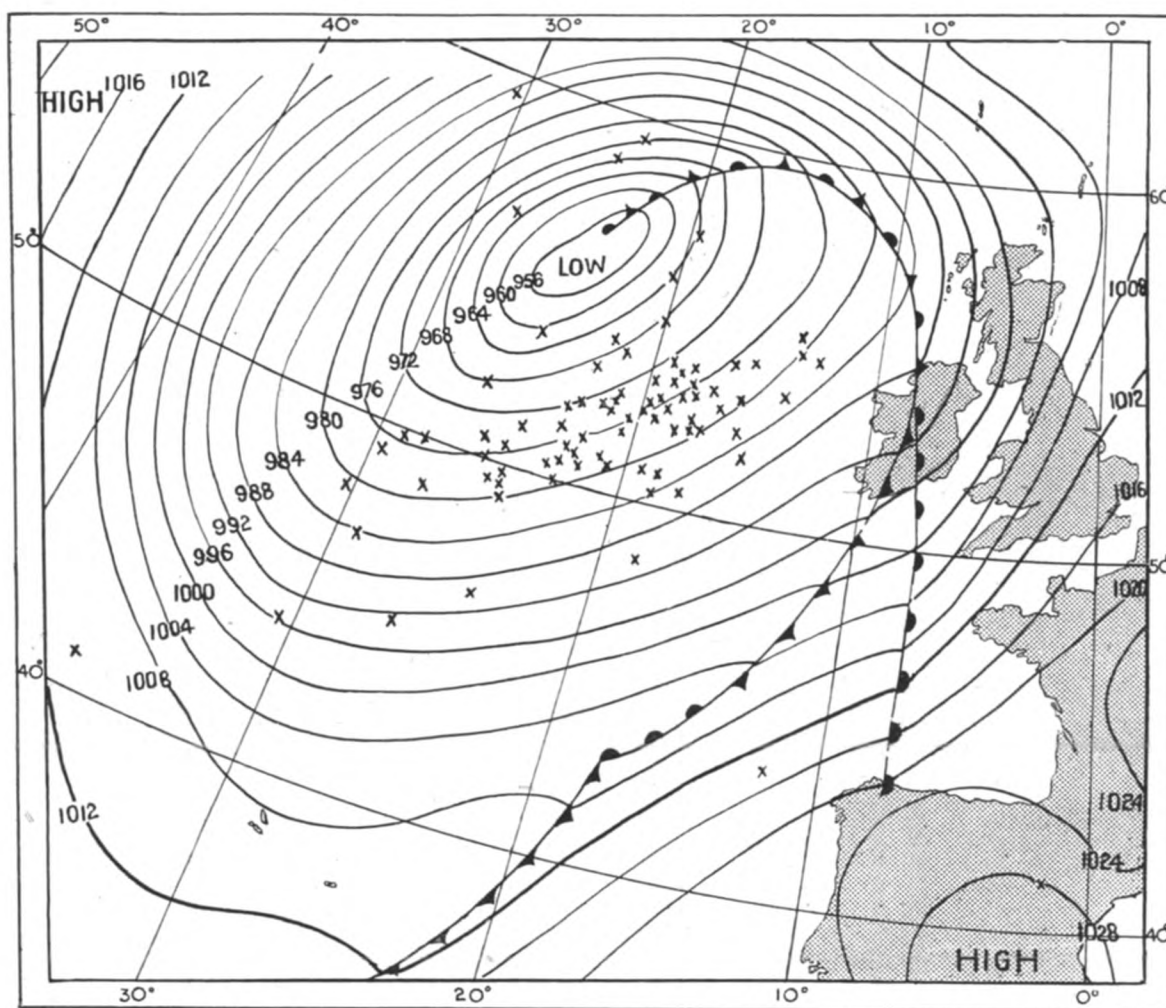


Fig. 4
Weather map for 1200, 23rd November, 1946, showing positions of thunderstorms found during the day.

to find so much activity not associated with a front as far north on the Atlantic. On the following day, Sunday, 24th November, the activity occurred chiefly along a cold front associated with a wave disturbance which moved north-eastwards across the British Isles. The storms were mostly confined to the portion of the front between latitudes 40° and 50° N., as is usually the case, but the north-easterly movement of the main area of activity towards the Brest peninsula and extreme south-west England is clearly shown on the chart (Fig. 5). Broadly speaking, atmospheric activity that occurs with cyclonic waves appear as rather distinct concentrated and elongated groups travelling with the speed of the wave. The maximum is found at or near the apex of the warm sector, and since very often much "Sferic" activity is reported even before the wave has developed closed isobars, this is of great assistance in identifying young waves on fronts. In the case of well-established cold fronts it is found that there is a maximum of "Sferic" activity at or immediately in the rear of the front, a minimum between 200 and 300 miles behind the front and a secondary maximum between 300 and 500 miles within the cold air.

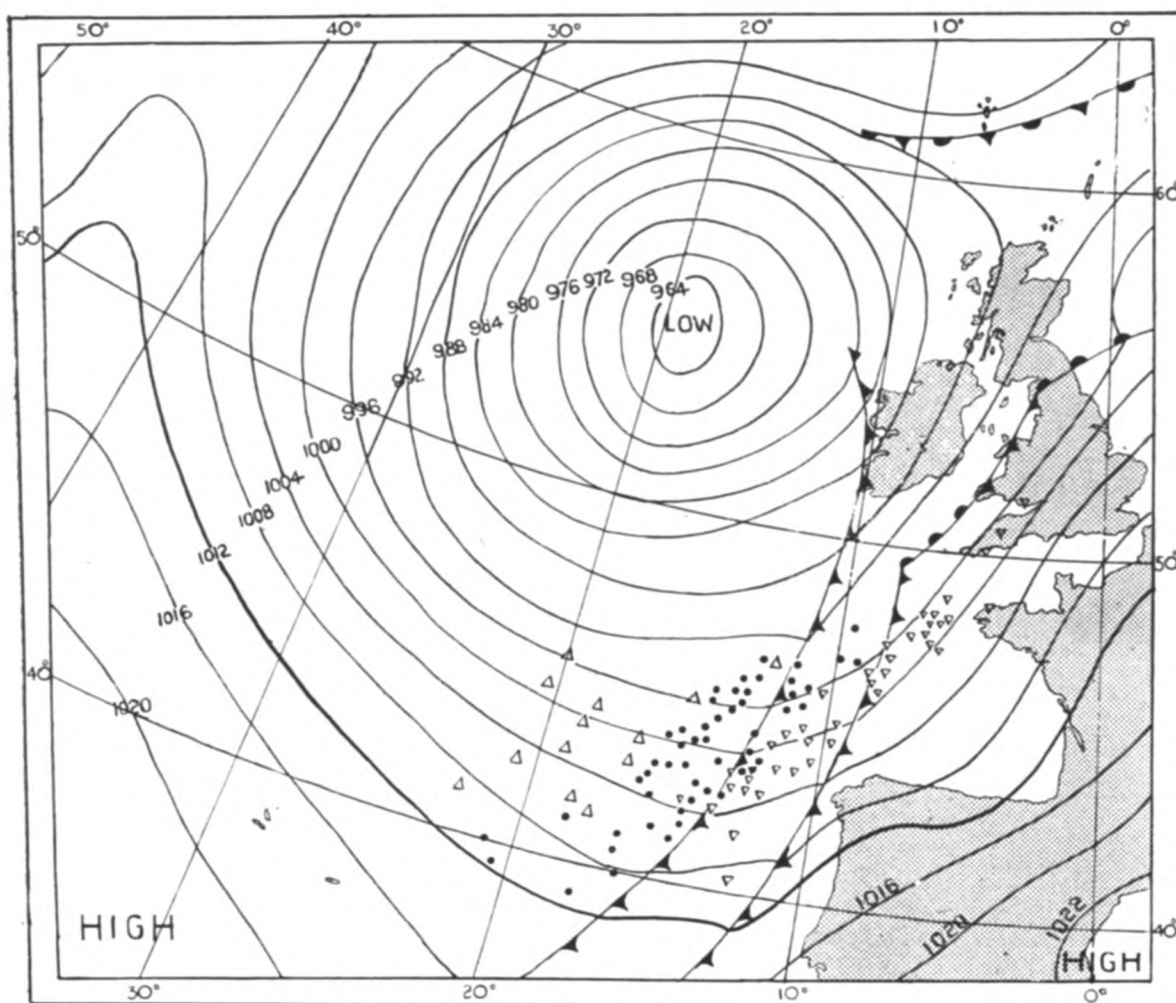


Fig. 5. Weather map for 0600, 24th November, 1946
 Δ indicates fixes obtained between 0700 and 1030
 · indicates fixes obtained between 1130 and 1645
 ▽ indicates fixes obtained between 1830 and 2215

It will be realised that the " Sferics " organisation, whilst it is of the greatest value in giving information regarding the existence and movement of storms which have already broken out, cannot be of assistance in forecasting whether storms will or will not develop and it cannot distinguish between high-level and low-level storms. However, for comparatively short air routes to the Continent " Sferic " observations are of the greatest use to briefing officers at terminal airports in advising pilots the best route to fly to avoid encountering large banks of cumulonimbus clouds with their associated severe turbulence, icing and " static ". In view of the danger attaching to flying in such conditions and in order to avoid discomfort to passengers, pilots will be prepared to make considerable detours if by so doing storm areas can be avoided. Successful tests have been made in transmitting " Sferic " charts (as well as " prebaratic " and other charts) by facsimile apparatus direct from the control station to selected receivers, including a despatching airfield, and there is a great future for direct picture transmission, which eliminates laborious coding, decoding and plotting ; a pilot can be shown the exact " fixes " of any large number of storms just as they have been plotted at the " Sferic " control station.

In concluding this account of the "Sferics" organisation as it exists at present, it may be mentioned that plans for the future, besides including photographic recording already mentioned, envisage the use of a spaced-loop aerial system which would reduce polarisation errors and enable a twenty-four hour thunderstorm location service to be provided. The possibility of measuring the intervals between the time of arrival of successive "echoes" from the ionosphere (as many as twenty have been recorded) is also being considered as a means of calculating the distance of the source: if successful, this would mean that fixing the position of a storm could be done from a single station.

LIGHTHOUSES OF THE BRITISH ISLES



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OIGH SGEIR

Oigh Sgeir Lighthouse is here viewed from the ENE. The light (lat. $56^{\circ} 58' \text{N.}$, long. $6^{\circ} 41' \text{W.}$) is 136 ft. above sea level. Oigh Sgeir is a group of islets situated about five miles from the south-western end of Canna (west coast of Scotland)

NAVIGATION BY WEATHER CHART

BY CAPTAIN R. C. VIGURS AND COMMANDER C. H. WILLIAMS, R.N.R.

These notes were inspired by an article entitled "Pressure Pattern Flying" by J. S. Sawyer, M.A., which appeared in the October, 1948, number of the magazine *Weather*. In a foreword to it Air Marshal Sir William Elliot, K.B.E., C.B., D.F.C., Air Officer Commanding-in-Chief, Fighter Command, quoted the following words written in the days of sail by Joseph Conrad, the sailor author of *Typhoon* and many other books :

"Gales have their personalities, and after all, perhaps it is not strange ; for when all is said and done, they are adversaries whose wiles you must defeat, whose violence you must resist, and yet with whom you must live in the intimacies of nights and days."

Navigators by sea and air will recognise the truth of Conrad's words. Both have acquired, and with good reason, a wholesome respect for the awe-inspiring powers of nature as manifested in severe storms.

What is called pressure-pattern flying is, roughly speaking, a flight planned mainly with regard to the atmospheric pressure distribution existing over the area to be traversed, with a view to utilising the favourable winds at a certain pressure level. It has, of course, been made possible only in recent years, with the improved information of the upper air conditions now available to the meteorologists. It entails much work at the planning end, as many factors have to be considered ; also a good deal of skill is necessary on the part of the navigator.

Many aircraft are now routed across the Atlantic on tracks which take them considerable distances from the direct route, but by which they reach their destination sooner or obtain better weather.

In the article mentioned above it was shown how an aircraft bound from London to New York at 200 knots air speed, in the weather conditions aloft over the Atlantic on that particular day, would have taken twenty-one hours flying time if she followed the Great Circle track. If, however, she was routed to get the full advantage of the existing winds she would, at the same air speed, have done the journey in 18.4 hours, with a consequent considerable saving in fuel. This latter track would have taken her over Northern Ireland, Southern Greenland, Northern Labrador and Quebec, a much greater distance over the ground.

Alas, the sailor cannot hope for anything like such tangible benefits from the science of meteorology, but at times there is some slight similarity in the use of "met." by both the air and the sea navigators. What smart passages would have been made in the days of the clipper ships if they had been able to thus find good favourable gales ! They would have indeed been able to make good their boast of "Hell or Melbourne in sixty days". Had radio weather reports and forecasts been in existence in their day, one can imagine the masters of the famous sailing clippers making the fullest use of such aids, but whether these officers would have agreed to transmit by radio for the benefit of their rivals any reports of the weather they themselves were experiencing is another matter. If they had done so there would have been sore temptation for some of them to "cook" the messages, at least in reporting the direction and force of the wind.

Although not nowadays vital to a ship's progress, wind and weather are

still matters of importance to the sea navigator. The wind can raise in a few hours a sea that may force many good ships to heave-to—the largest and most powerful ships afloat cannot with impunity butt themselves into the centre of a hurricane. Besides stormy weather there is also fog, foreknowledge of the likelihood of which can be extremely useful.

While it is certainly true that ships are not as a rule fast enough to be able to evade any large area of strong headwinds and heavy seas, it is on rare occasions possible to keep clear of the worst of it. This obviously requires a knowledge of the whereabouts and extent of the bad weather area. The weather chart is the answer. If the area of bad weather is a small one, such as, for example, the small deep depression discussed later in these notes, a ship may even be able to utilise it by steering to pass to one side or other of the centre and thus ensure a fair wind, or at least avoid the worst weather. A weather chart is in such a case essential ; it would be preferable to have a series of such charts to show the trend of events.

In the North Atlantic area the weather bulletins issued by Great Britain and by the United States supply sufficient information for reasonably comprehensive weather charts to be made by ships at sea. [Practice soon improves one's speed of decoding and plotting.] The bulletins are arranged so that the user can select the parts which concern him most ; the plain language statements of the general synoptic situation, the forecasts for different areas, the coded reports of shore station observations and ships' observations, and the analysis indicating the positions of fronts and movements of systems.

As examples of the possible use of these weather bulletins to a medium-sized ship, the following notes by Captain Vigurs, of the S.S. *Eros*, and charts made by him on voyages from London to the West Indies and back may be of interest. (For the sake of clarity in reproduction, tracings of only small portions of the weather charts are shown, the whole charts which cover most of the North Atlantic area being too large for the pages of this journal.)

“ It is, of course, very seldom that the route is altered on account of a weather chart, as the areas covered by depressions and anti-cyclones are too great. Also very often in a vessel of this size, in ballast, the state and direction of the sea may govern the course to be set.

“ Unless prevented by fog or other diversion I always make a weather chart from the Atlantic Weather Bulletin the morning after leaving London, when the vessel is usually in the eastern part of the English Channel. This always gives a better idea of the weather to be encountered than the forecasts in plain language for the ocean areas, even if no advantage can be taken of it. The morning is the best time if only one map is to be made every day. The radio officer on singly-manned ships is on watch and it is usually not inconvenient for him to get the late ships and stations two hours later. Part IV comes with this and helps to complete and make the chart as accurate as possible. I usually have the rough chart made within half an hour of receiving Parts V and VI, which start at 0930. When the vessel gets farther out into the Atlantic and a chart is wanted it is often advisable to take Part III of the Washington message. This contains the ship's observations only, and taking it requires a certain amount of sorting from the rest of this somewhat lengthy message. After a time the operator can learn exactly when to start listening for the relevant parts and ignore the rest.

“ A chart made shortly before or after a vessel leaves the Caribbean Sea (or, say, the Mediterranean), can also be of considerable assistance, especially as storms in the more southern latitudes cover a smaller area. I do not always

attempt to mark in the fronts, as often there is not sufficient data from one lot of observations and the positions of these are not quite as important to a seaman as to an airman. Chart I, made from the Atlantic Bulletin, shows an anti-cyclone between the Channel and the Azores. The *Eros*, outward bound, would obviously try to keep to the south of the centre with fair winds.

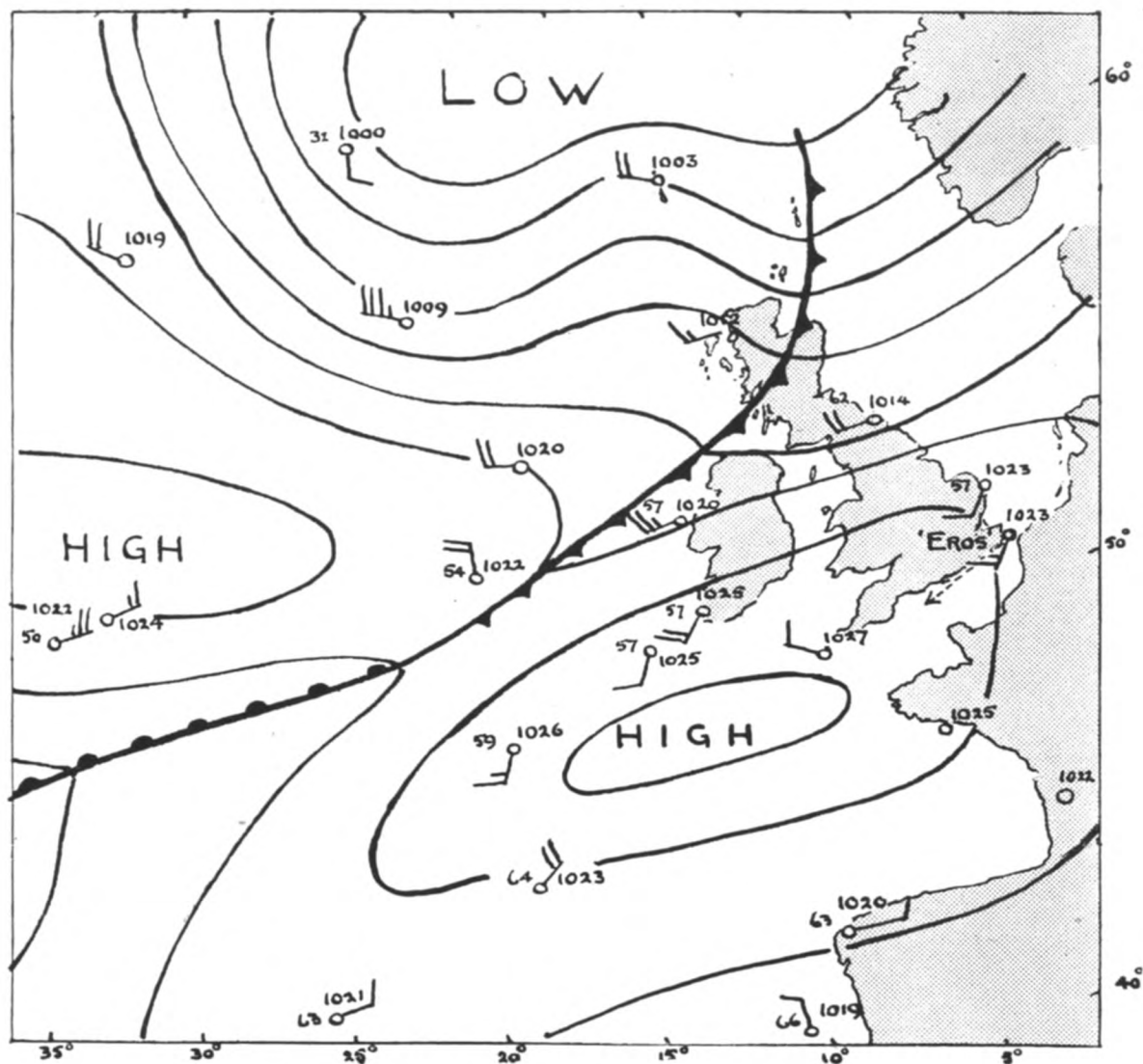


Chart I. 0600 G.M.T., 19th September, 1948

“Where a weather chart shows a depression centred in the not uncommon position near the Azores, and further charts and the forecast in the Atlantic Bulletin indicate that it is remaining stationary or moving slowly east, as they sometimes do, the course on leaving the English Channel would be set nearer to the Great Circle track, i.e. more to the northward.

“Chart II shows an intense secondary depression similar in size to a tropical cyclone approaching the English Channel. The *Eros* was well down the Channel before this map was made, but as a depression was reported to

be forming in the Bay of Biscay, course was altered from the usual 242° from St. Catherines to 258° . Several small vessels were in distress in this storm, but this ship had a fair wind the whole of the time while in its influence."

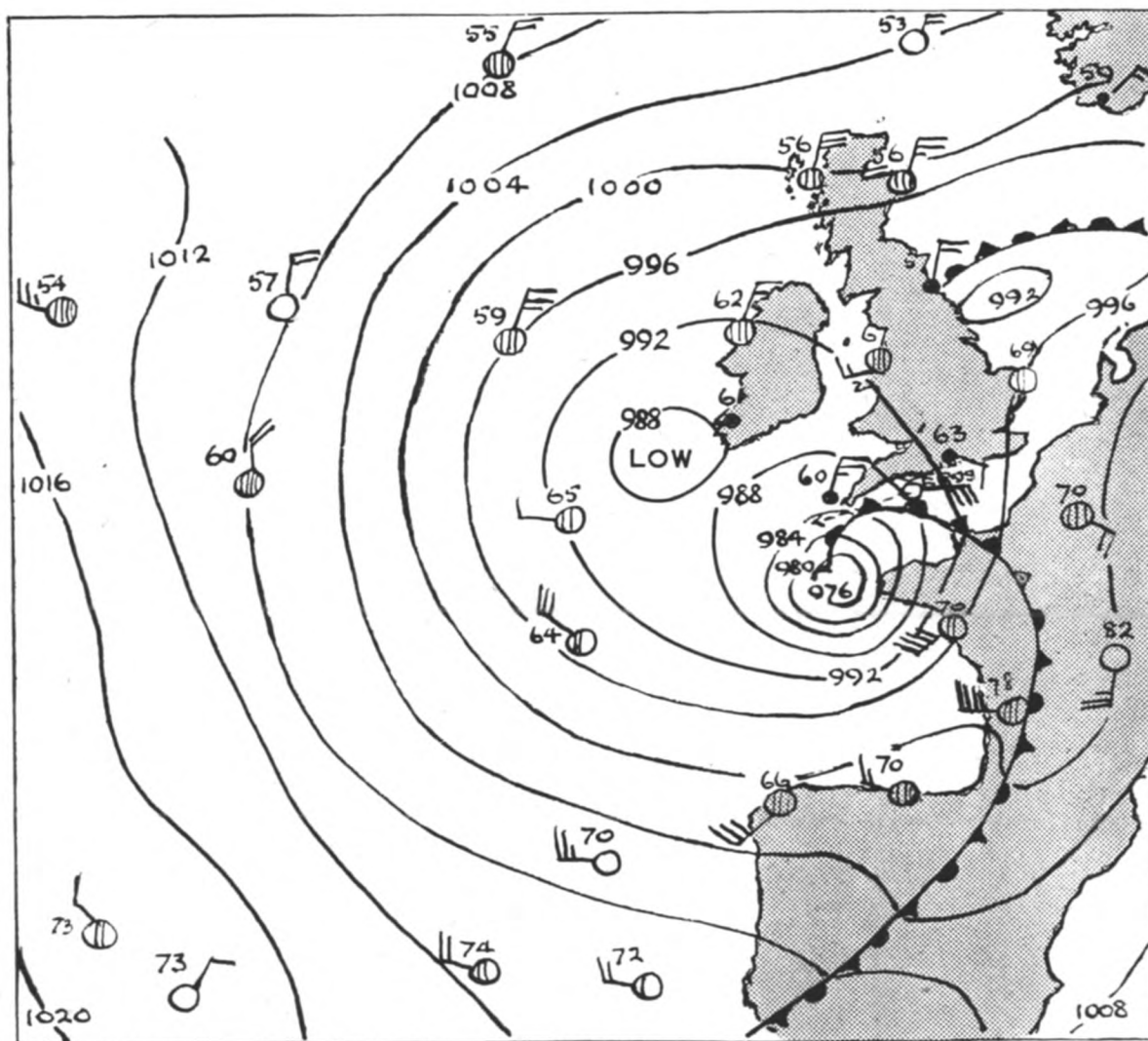


Chart II. 1800 G.M.T., 7th August, 1948

The gale referred to by Captain Vigurs was that of the 7th August, 1948. His ship sailed from London at 1610 on the 6th August bound for the West Indies. In the forenoon of the 7th, while steaming down Channel, a weather chart was made from the observations in the Atlantic Bulletin, as shown in the tracing reproduced above (Chart II). Winds from SW and W, force 8, were indicated in the southern half of the small depression off Ushant.

In the Shipping Forecast for Coastal Areas for the twenty-four hours from the morning of the 7th August, the following was broadcast : "*West Channel, Portsmouth.* Moderate west or south-west winds. Periods of thundery rain. Visibility moderate to good. *Biscay.* Moderate to fresh south-westerly winds, becoming strong in the south later. Rain at times with local thunderstorms. Visibility otherwise moderate to good".

At noon the forecast gave : "*Biscay.* Fresh to strong southerly winds veering westerly with local gales. Period of rain followed by showers, otherwise good visibility".

Forecast of the evening of 7th August : “ *West Channel*. Light or moderate winds between east and south increasing to strong to gale and backing north to north-east. Showers at first, more general rain this evening and tonight otherwise moderate to good visibility. *Biscay*. Southerly gales veering westerly and slowly moderating. Rain at first, showers later, otherwise good visibility ”.

These forecasts for the night of the 7th for West Channel and Biscay were important ones for the *Eros* : winds easterly and increasing in the Channel and southerly gales veering westerly in the Bay of Biscay ; an obvious indication of the anticlockwise circulation of a “ low ” off Ushant.

The following morning, the 8th, the relevant part of the shipping forecast was : “ *Fastnet*. Variable moderate winds at first, freshening from north-west or north and reaching gale force at times later. Rain or frequent showers. Otherwise moderate visibility. *Shannon*. Moderate to fresh north-westerly winds. Frequent showers. Moderate to good visibility. *West Channel*. Fresh to strong west to north-west winds. Gales severe at times. Frequent showers. Visibility moderate. *Biscay*. South-westerly or westerly winds. Moderate in south, fresh to strong in north. Fairly frequent showers. Visibility mainly good ”.

These extracts from the shipping forecasts confirm the picture of the situation as shown by the *Eros* chart, on which the relative positions of the ship and the depression are clearly shown. This example is a particularly good one : it shows clearly the very real use to which the weather bulletins can be put on the rare occasions when the area of adverse weather is small enough for a ship to be able to avoid it. The ship’s distance “ over the ground ” was not increased, as the alteration was to a course nearer to the Great Circle track.

Someone once made the remark that “ the winds and waves are on the side of the ablest navigators ”, or words to that effect, and here surely is a case in point. By steering to skirt the northern part of the depression, instead of passing through or near to the centre, Captain Vigurs had obviously made the best of the situation.

As Captain Vigurs states in his notes, the occasions will be rare on which a ship may be able to avoid an area of strong headwinds and heavy seas, but it is obvious from his charts that he was at least usually able to predict with some accuracy the kind of weather ahead of him. All such knowledge can be useful ; for instance, it may be possible to avoid a small area of fog, or to push on and make a different landfall before fog commences. Even if it cannot be avoided, the knowledge of its likelihood can be taken into consideration when reporting by W/T to her owners the ship’s “ E.T.A. ”.

Weather forecasts in the weather bulletins for shipping are made much more comprehensive when read in conjunction with the weather chart of the area. With a little practice such weather charts can be made in any ship having W/T.

Given similar knowledge, experience and information, a weather forecaster aboard a ship would have a somewhat easier task than the official forecasters ashore. The former would have to forecast for his own ship only, whereas ashore they have to satisfy many areas and many different needs—aircraft, shipping, fishing, agriculture, etc.

As a further indication of the use of weather charts to a shipmaster the following will serve to illustrate a typical problem.

We will suppose a low-powered ship is about to sail from Liverpool bound for New York in ballast. A decision must be made as to whether to go north or south of Ireland. The difference in distance is not great, so the deciding factor would probably be the weather. The weather bulletin for shipping, Coastal Areas (say Irish Sea, Malin, Rockall, Lundy, Fastnet, Shannon) would give a good idea of the situation. If, in addition, a weather chart of the eastern North Atlantic could be seen, there is no question but that the captain would find it easier to decide. A glance at the section of weather chart reproduced below will show this clearly; the depression in question was stated in the bulletin to be almost stationary.

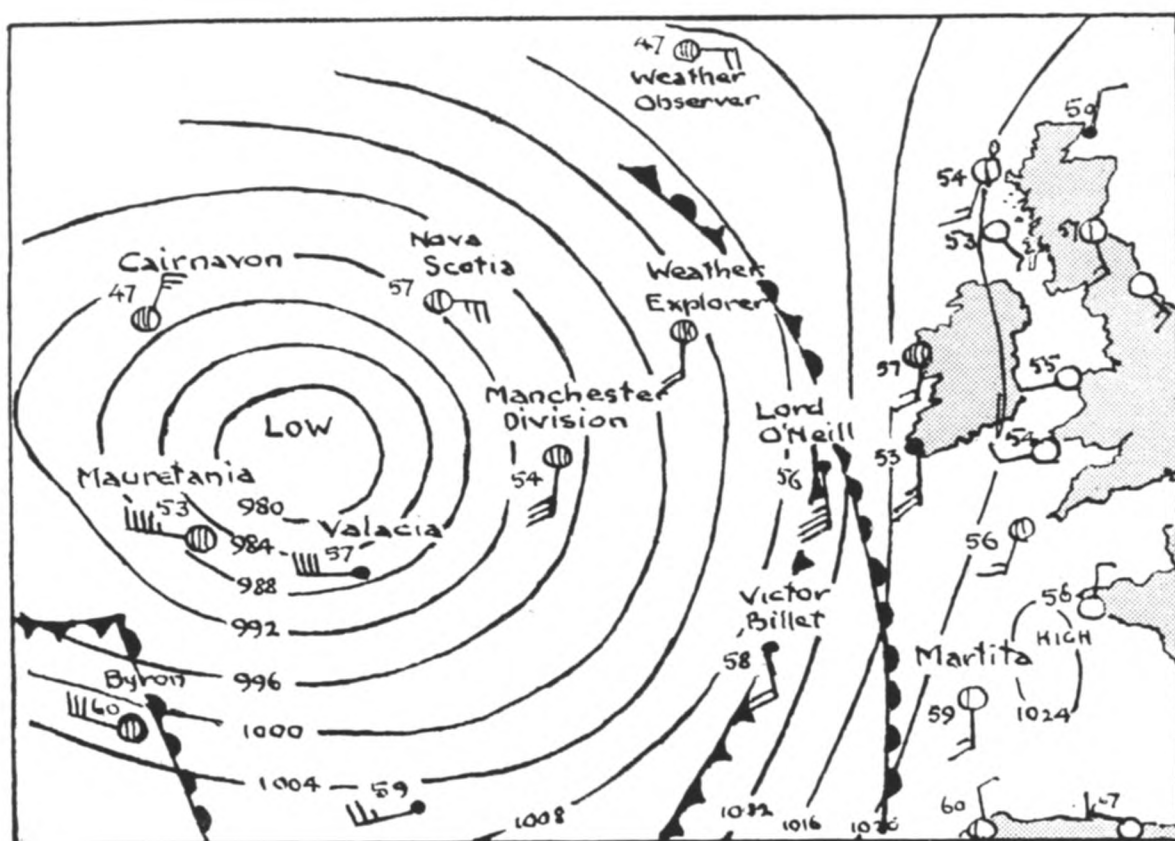


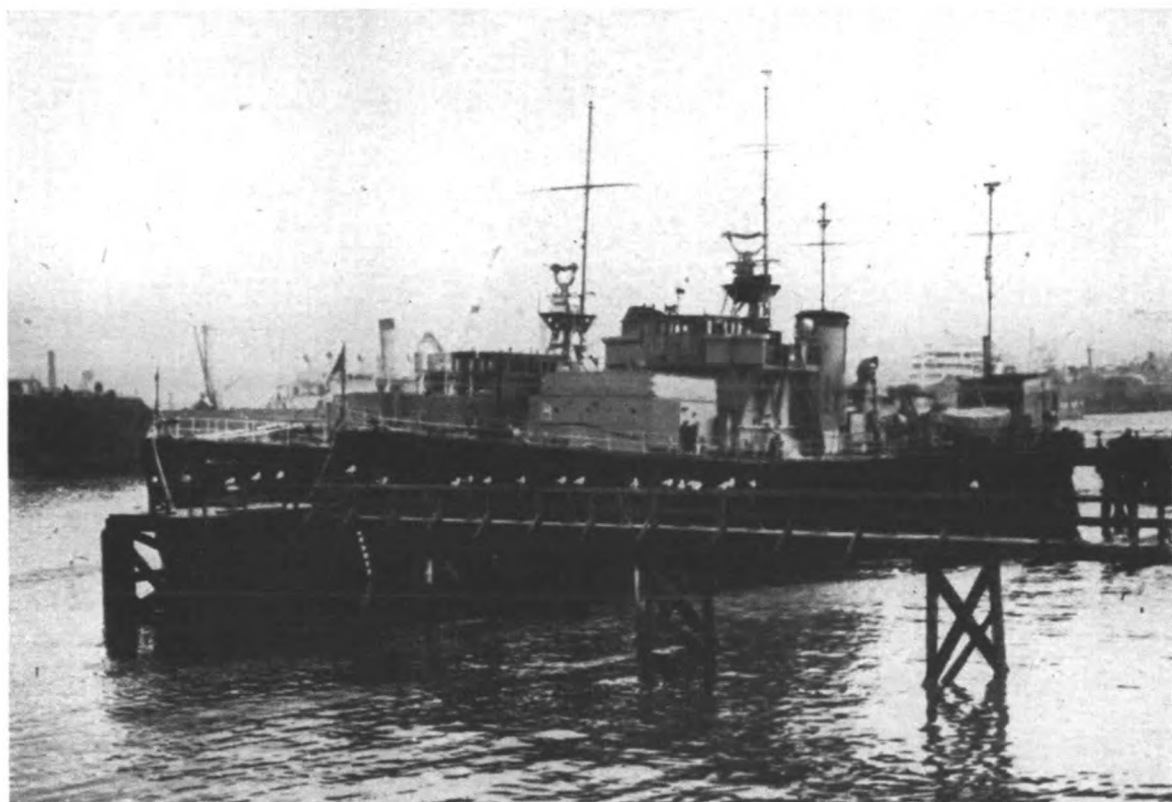
Chart IV (section of Daily Weather Report Chart, 0600, 20th May, 1949)

In this case he would undoubtedly choose the north-about route to pass to the north of the depression and so ensure a more or less fair wind for a day or so at least. In fact, this particular system later moved slowly north-east, but a succession of secondary depressions moving in an easterly direction to the south of it still made the northward passage preferable.

On other occasions south-about may be the wiser course.

In the North Atlantic area, weather bulletins in English are issued by W/T by Great Britain, the United States, Canada, the Azores and Bermuda.

These bulletins are described in the *Marine Observers Guide* (M.O. 477) and in the *Admiralty List of Radio Signals*, Vol. III, Part A, 1949. The numbered shore observing stations used in these bulletins are printed on the North Atlantic plotting chart, Form 1258, supplied to observing ships. These charts may also be purchased from the Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2, price 15s. per hundred. Examples of the use of simple weather charts such as can be made at sea are given in the *Marine Observer's Guide* and in the *Decode for use of Shipping* (M.O. 509).



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Ocean Weather Ships *Weather Recorder* and *Weather Watcher* lying side by side at their base in Greenock.

THE EARTH'S MAGNETISM

BY R. A. WATSON

For a very long time navigators have relied on a magnetic needle to indicate to them the north. Indeed it is difficult to imagine one so foolhardy as to venture out of sight of land without a compass, unless he were sure that the sun or the stars would be visible in his necessity. Claims have been put forward that the Chinese knew, many thousands of years ago, that a natural magnet would point southwards if properly suspended. This, however, has been disputed, and it appears doubtful if the Chinese knew of the directive property of the loadstone any sooner than early in the twelfth century, when it was evidently widely known and used in navigation in western Europe and the Mediterranean. The first arrangement appears to have been that of a piece of loadstone or steel magnetised from a naturally occurring magnet placed in a wooden bowl floating in water. The arrangement must have been exceedingly awkward, and pivoted needles made their appearance about the year 1200 A.D. Two great advances in knowledge were made in the next 300 years; first that the needle did not point exactly along the geographical meridian (magnetic declination) and second that the declination* was not constant over the earth's surface. Exactly when or by whom these discoveries were made is not known, but towards the end of the fifteenth century the manufacturers of portable sundials were marking the difference between the true and magnetic meridians on the magnets they included in their dials. From these and the measurements made by seamen we know that, at that time and in the west of Europe, the compass needle pointed to the east of true north. Columbus has been credited with the discovery that the declination changed from easterly to westerly somewhere about the longitude of the Azores as he voyaged from Europe to the West Indies. This is doubtful, but certainly about the time of his voyages the discovery was made. It aroused an interest even greater than its immediate practical value, because it seemed to promise a means of determining longitude at sea. Although the promise was never fulfilled, it probably encouraged the measurement of declination by voyagers and increased more quickly the knowledge of the earth's magnetic state. Thus by the time (1600) Gilbert, Queen Elizabeth's physician, wrote his great treatise "De Magnete" there was a considerable body of knowledge amassed.

It is curious to reflect that there is only one naturally occurring substance which could have been of use in making a compass, that until the nineteenth century no substitute could conceivably have been manufactured, and from this to speculate what would have been the history of navigation and hence of the world if loadstones had not been available for the use of mankind.

From 1600 to the present time the mass of knowledge of the magnetic effects on the earth has grown steadily. A subject which at once arouses interest from its mystery and offers immediate practical applications will find no lack of investigators. It is easier to summarise existing knowledge from our present standpoint than to pursue a historical sequence.

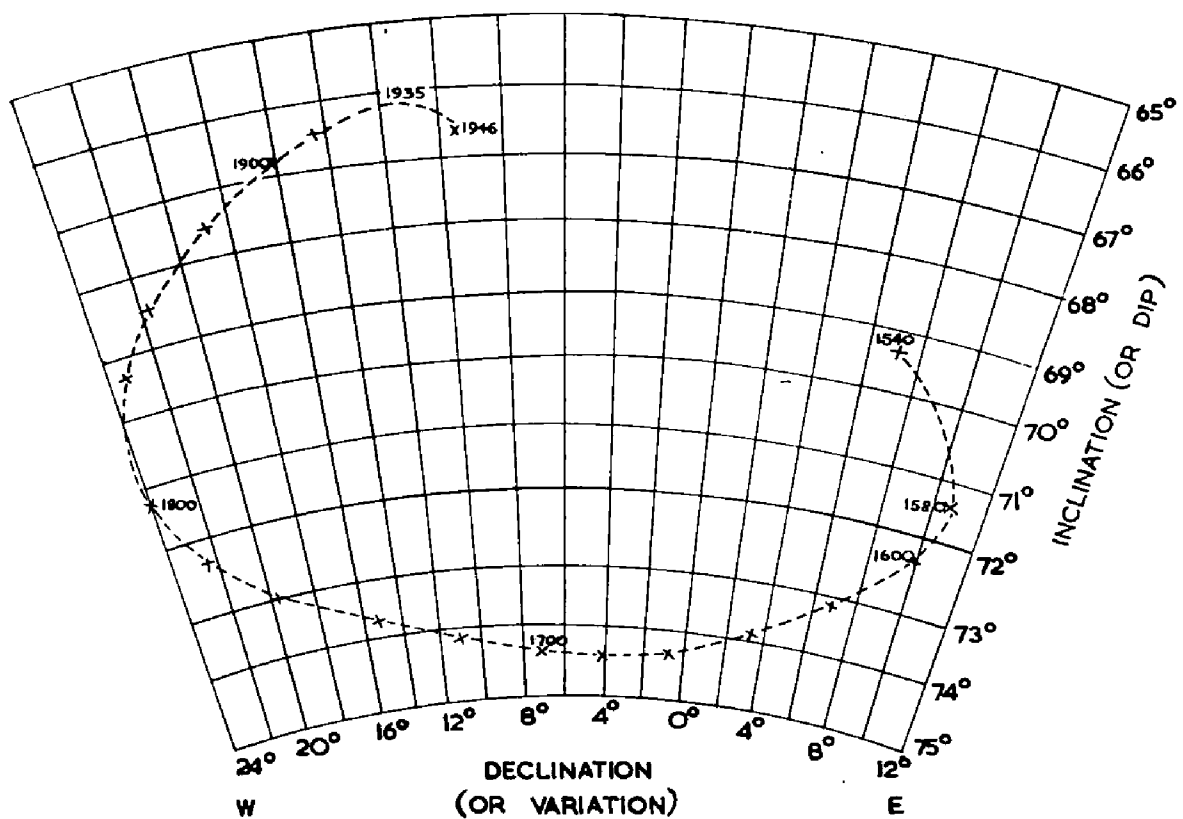
The earth behaves very much as though it were composed of material rather feebly magnetised, with the axis joining the magnetic poles inclined

*Throughout this article the word *declination* refers to magnetic declination, commonly known to seamen as *variation*.

at an angle to the geographical axis. Models of this sort have been made to demonstrate the magnetic conditions actually found, and a fairly close approximation can be made. If little magnets freely pivoted about the centre are put in various positions on the model's surface they will bring out the main features. Along the "magnetic equator" they will lie horizontally. Nearer the poles they will still lie in the magnetic meridian but will dip more and more ("inclination"), and at the two (magnetic) poles the little magnets will be vertical. The general pattern of the isogonic lines (the lines of equal declination) can be fairly closely imitated. It appears reasonable to say the earth shows a magnetic field because it is composed of magnetic material which has somehow or other become magnetised, but there are considerable difficulties in an explanation so simple. So far as is known the surface layers of the earth do not contain anything like sufficient magnetisable material to account for the intensity of magnetic force actually observed. But at quite small depths compared with the radius the interior of the earth is so hot that it is above the temperature at which iron can be magnetised at all. It is true that this critical temperature has not been determined at the tremendous pressures which must exist in the interior of the earth, but, subject to this doubt, it does not seem likely that matter capable of magnetisation could exist far below the surface of the earth. Recently it has been suggested that magnetism is a fundamental property of rotating matter as gravity is of all matter. The strength of the magnetic field should depend on the moment of inertia and the speed of rotation. There are difficulties in devising satisfactory tests of this theory because we know so little of the magnetic condition of other celestial bodies: an obvious difficulty in the case of the earth is the fact that its magnetic field is not symmetrical round the axis of rotation. We can sum up that, although we know for certain that the main part of the cause of the earth's magnetic field resides within the earth, we do not as yet know the cause of the field.

The magnetic field of the earth is constantly changing. There is a secular change going on which is illustrated by the diagram opposite showing the direction of the magnetic force in London since 1580. It is tempting to close the gap and say that the circuit will be completed after about 480 years, but we know no reason why it should. Attempts have been made to infer the former magnetic state of the earth from the orientation of old churches, the magnetic axis of ancient pottery made of magnetic materials and even, going back into geological times, of the direction of magnetisation of beds of intrusive rock. The subject is fascinating, but no great certainty can be claimed for the conclusions reached. The existence of the secular change and the fact that it cannot be predicted entails the constant revision of navigational charts by new magnetic surveys.

A feature of the secular change is that although it may affect very large areas, for instance a whole continent or ocean, in a regular way in the sense that one can draw smooth "isoporic" lines or lines of equal change, one cannot infer the changes in the Pacific, say, from those in the Atlantic. If the cause of the secular variation were a mere shifting of the magnetic poles of the earth, the changes of one region would be simply related to those of another region. There is another curious feature. Although we have a fairly accurate knowledge of the declination over several hundred years, it is only during a much shorter length of time that we have sufficiently reliable observations of force from which to compute the magnetic moment of the



Direction of the Magnetic Force in London
since A.D. 1580 (After L. A. Bauer)

earth. These suggest that the moment is decreasing by about $1/1,000$ every year. It appears hardly possible that such a decrease could have been maintained even during historic times, and going farther back it would imply an impossible degree of magnetisation in, geologically speaking, very recent ages.

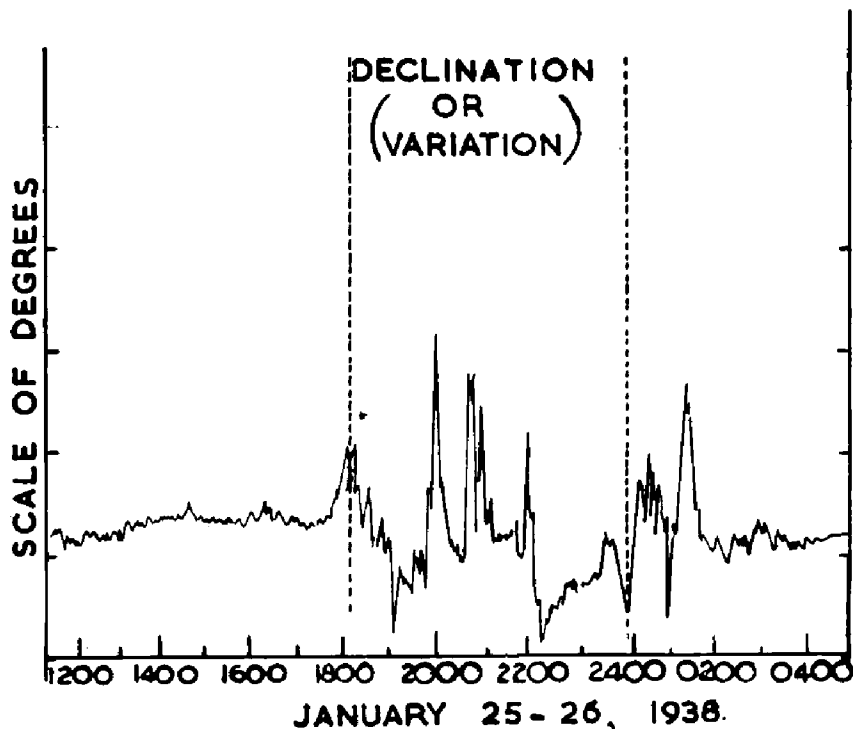
In addition to the secular change there are fairly regular diurnal changes having the period of a solar or lunar day. The solar diurnal change varies with the seasons and amounts to a few tenths of a degree of declination. It is appreciably bigger at times of sunspot maximum than at sunspot minimum. The lunar diurnal change is very much smaller but is interesting because it helps to elucidate some of the problems of the upper atmosphere which are of importance in radio work.

These diurnal changes are caused by the movement of the heavily ionised layers of the earth's atmosphere at very great heights (100 km. and more) under the influence of the thermal or gravitational tides caused by the sun or moon. The more or less regular movements of these ions in girdles round parts of the earth will cause a modification of the permanent field of the earth just as electric currents in the degaussing equipment of a ship would modify the magnetic field round a ship. Although these changes are small in themselves, they are of much less immediate practical importance and have only been discovered or investigated for a comparatively short time, much more is known about them and their causes than about the main problem of the earth's magnetism or its secular change.

Superimposed on these fairly regular diurnal changes there is always some degree of irregular "disturbance". When the disturbance is sufficiently great there is said to be a magnetic storm. In general the degree and the frequency of disturbance increase from the Equator to polar regions. Disturbance is a world-wide phenomenon in the sense that a particular period will be quiet or disturbed all over the world, but the degree of disturbance at any moment will vary very considerably from one place to another. There is a close connection between magnetic disturbance, sunspots and auroral activity. All tend to increase and decrease together, but severe magnetic storms have occurred with no sunspots of note and without displays of aurora. Conversely, fine displays of aurora and large sunspots have been observed without magnetic storms. Although the variation of magnetic force in even the greatest storms only amounts to 1 or 2 per cent of the total, it changes very rapidly with wild fluctuations in even a few seconds. By the currents induced it can cause considerable dislocation in communication circuits, and the effect of a "storm" on wireless transmission is very great. The actual change of the declination during a magnetic storm rarely exceeds a degree or so, but as the storm is, in general, not accompanied by any other visible or audible manifestation, the cause of the erratic behaviour of the compass has not always been immediately appreciated. Anomalies have at times been reported on Admiralty charts which other ships, subsequently in the same neighbourhood, have failed to confirm.

The greater part of the changing field superimposed on the permanent earth's field in a magnetic storm can be shown to have its cause external to the earth and is in fact due to a stream of electrified particles ejected from the sun. Storms are liable to recur at intervals of about twenty-seven days, as the same disturbed portion of the sun again faces the earth. The diagram opposite is a reproduction of the magnetogram from the observatory at Eskdalemuir for 25th-26th January, 1938. It shows a photographic recording of the declination. The instrument consists simply of a small magnet on a torsionless suspension. The movement of the magnet is recorded by a spot of light reflected from an attached mirror. Lest an unwary reader is led to expect his ship's compass to behave in this wild manner, attention is directed to the line on the left, which shows the scale of the movement and the fact that ships' compasses are constructed so as to discourage rapid oscillations.

Nothing has been said about applications of our knowledge of earth magnetism to problems other than navigation. The miner shut off from celestial objects in his mole-like activities is entirely dependent on the compass for his direction, but this is perhaps a type of navigation. An increasing use of magnetic instruments and intensive magnetic surveys is made in prospecting for all sorts of minerals, not only those with pronounced magnetic properties. It is, however, the use of radio which has brought a new interest to the problems of the earth's magnetism. The propagation of wireless waves for long distances over the earth's surface depends on the existence of the various heavily ionised layers at great heights in the earth's atmosphere, but it is the state of ionisation under the sun's influence and the movement of these ions which are the cause of the variations in the earth's magnetic field. Thus the phenomena of the two sciences are closely related and the technique of each serves for the advancement of knowledge of the other.



Reproduction of Magnetogram, Eskdalemuir Observatory

An exceptionally fine display of aurora was visible over the British Isles on 25th and 26th January, 1949, accompanied by a magnetic storm of very great magnitude. There happened to be severe gales immediately following the display and many enquiries were made whether there was any connection between the magnetic storms and the wind storms. We have seen that magnetic disturbances are world-wide, so that any direct connection with the weather of one locality is hardly to be expected and no claims that such a connection has been found will bear investigation. On the other hand the variations of the earth's magnetic force are due to movements of the earth's atmosphere at very great heights under the influence of energy from the sun, so that some connection between weather and earth's magnetism may well exist but probably in a very remote and complex form.

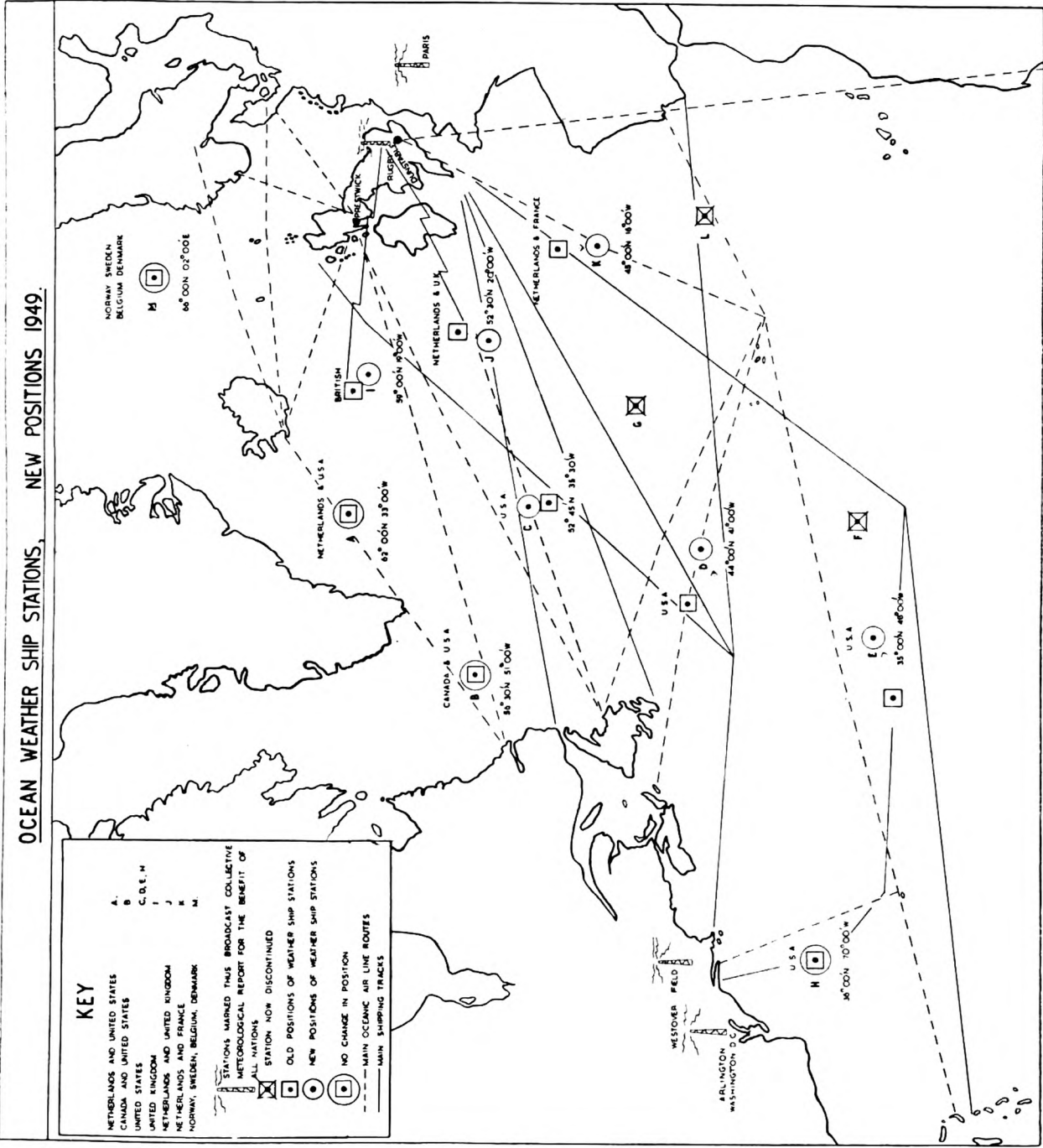
Some of the problems for students of the earth's magnetic state have been indicated in this article. They are of a different nature from those confronting the astronomer Halley, who produced world isogonal charts 250 years ago, but the need for facts as is great as when he wrote: "Here I must take leave to recommend to all masters of ships and all others, lovers of natural truths, that they use their utmost diligence to make, or procure to be made, observations of these variations in all parts of the world . . . and that they please to communicate them . . .".

ERRATA

- (1) We should like to correct an error which appeared in the July *Marine Observer* on page 140. The captain of M.V. *Accra* should read "A. Smith" instead of "C. C. Cave" as printed.

We wish to express our apologies to both captains concerned.

- (2) The position of the Ocean Weather Station I (Item) is 60°00'N, 20°00'W, (not 20°20'W as printed on page 131 in the July *Marine Observer*).



THE I.C.A.O. CONFERENCE ON OCEAN WEATHER STATIONS, LONDON, 1949

BY C. E. N. FRANKCOM, O.B.E.

At the invitation of the Council of the International Civil Aviation Organisation, a Conference on Ocean Weather Stations opened in London on 20th April, 1949. Representatives of the following countries attended the Conference : Belgium, Canada, Denmark, France, Iceland, Ireland, Mexico, Netherlands, Norway, Portugal, Sweden, United Kingdom and the United States of America. Representatives of the International Meteorological Organisation attended as observers.

Brigadier Booth, head of the Canadian delegation, was elected chairman.

The object of the Conference was to consider the Ocean Weather Station plan which had been originally set up by the 1946 Conference, to see if it would be practicable to reduce the number of stations and to consider any possible improvements or modifications to the scheme.

In an ambitious and unique international scheme of this nature, it was obvious that there would be many financial aspects to be considered, particularly in view of the fact that the ships are very expensive to operate. One of the difficulties the Conference encountered was that of deciding how to proportion the benefits derived amongst the various countries concerned. It was found impracticable to assess any non-aeronautical benefits, owing to the fact that there were no statistical figures available. After lengthy discussions the Conference came to the conclusion that the only practicable basis upon which any assessment could be based was that of the number of scheduled flights of aircraft belonging to each nation across the Atlantic. It was on this basis, and in a very broad sense, that the proportionment of responsibility for operating the weather ships in the future was decided.

In deciding the number of stations to be operated, it was generally agreed that from a meteorological viewpoint thirteen stations, as previously established, were really desirable. Having in mind, however, the financial problems, it was decided that it would be reasonably safe to reduce the number of stations from thirteen to ten, but that below that number it would not be practicable to go, as the resulting network would be far too widely spaced. Apart from the meteorological value of the weather ships, all delegations emphasised their value from the air-sea rescue viewpoint and also with regard to their use as navigational aids to aircraft in flight.

As a result of the reduction from thirteen to ten stations some readjustment in the position of the stations was necessary, and their final positions are shown on the map on page 220, together with the former positions in the thirteen-station network.

As a result of the agreed reallocation of responsibility and of the reduction of stations, the new stations will be operated as follows :

<i>Station</i>	<i>Location</i>	<i>Governments responsible</i>	<i>Number of vessels to be operated</i>
A	{ 62° 00'N. 33° 00'W.	Netherlands United States	1 2
B	{ 56° 30'N. 51° 00'W.	Canada United States	1 2
C	{ 52° 45'N. 35° 30'W.	United States	3

<i>Station</i>	<i>Location</i>	<i>Governments responsible</i>	<i>Number of vessels to be operated</i>
D	{ 44° 00' N. 41° 00' W.	United States	2½
E	{ 35° 00' N. 48° 00' W.	United States	2½
H	{ 36° 00' N. 70° 00' W.	United States	2
I	{ 59° 00' N. 19° 00' W.	United Kingdom	2
J	{ 52° 30' N. 20° 00' W.	United Kingdom	2
K	{ 45° 00' N. 16° 00' W.	France	2
M	{ 66° 00' N. 02° 00' E.	Norway	2

} Netherlands to perform
7 patrols annually.

In co-operation with
Sweden, Belgium and
Denmark.

It will be noted that the former stations G (U.S.A.) and L (France) disappear and stations E and F (U.S.A.) are amalgamated into one station, E (U.S.A.). France moves from station L to K. Belgium withdraws her ship, which formerly operated at K, from service and becomes a cash contributor instead. Netherlands moves her one ship from K to assist in operating station A (with U.S.A.) and provides another ship for part-time operation at J and K (with United Kingdom and France).

The responsibility allocated to any country is in terms of number of vessels rather than in actual stations. In deciding the number of vessels necessary to operate a particular station the primary factor was distance of the station from the base. It was agreed that the operation of stations J and K would be shared amongst the vessels of France, the Netherlands and the United Kingdom, and that the Netherlands vessel would, in effect, perform two patrols annually at station K and five patrols annually at station J. As far as station M is concerned, the vessels for operating that station are the two "Flower Class" corvettes which were fitted up by the United Kingdom. In future these vessels will continue to be operated by the Norwegian Government but the cost will be borne jointly by Norway, Sweden, Belgium and Denmark.

Particulars of the different types of vessels used by the participating countries as Ocean Weather Stations vessels are as follows :

<i>Country</i>	<i>Type of Vessel</i>	<i>Length (feet)</i>	<i>Displacement (tons)</i>
Britain and Norway	"Flower Class" corvettes	205	1,340
U.S.A.	Coastguard cutters	{ 327 311 255	2,585 2,432 1,913
France	Frigates	278	2,200
Netherlands	Frigates	287	2,300
Canada	Frigate	301	1,445

In addition it was agreed that a cash contribution would be paid by Belgium towards the financing of the vessels operated by the Netherlands. The Governments of Ireland and Portugal each agreed to pay to the organisation an annual cash contribution of £1,000.

The net result of this agreement, as far as the United Kingdom is concerned,

is that the four British Ocean Weather Ships will continue to operate at the new stations I and J, but that they will be relieved from this duty for five voyages during the year, which will mean a very considerable economy in the matter of fuel, meteorological stores and repairs. Great Britain is also relieved of her responsibility of contributing towards the joint operation of station M.

Amongst the other financial decisions reached by the Conference was one which accepted the principle that contributions from other countries which operate aircraft across the Atlantic would be welcomed and, in fact, that steps should be taken by the organisation to encourage such countries to contribute towards the scheme.

The Conference also considered in detail the various functions of the vessels and made certain amendments and improvements to the detailed arrangements concerning these. These functions include :

- (a) Meteorological duties.
- (b) Air-sea rescue, which in the event of an emergency occurring takes precedence over all others.
- (c) Communication services.
- (d) Radio and navigational aids to aircraft in flight.
- (e) Incidental services, including the collection and retransmission of reports of observations from merchant ships when practicable and any supplementary air-traffic control functions which may be prescribed.
- (f) Other services include such oceanographical and other scientific observations as may be found desirable.

From the meteorological viewpoint the only notable change in the programme is to encourage the taking of radiosonde observations four times daily, as is done aboard the British vessels, instead of the former accepted practice of only twice daily. Another item involving both the meteorological and air-sea rescue aspect was the addition of details as to the meteorological information which should be given to an aircraft which contemplates " ditching " due to an emergency.

The new agreement was signed by the representatives of the participating countries, which included all those present, with the exception of Mexico, on 6th May, 1949. It is intended that the agreement will come into force when accepted by the Governments responsible for operating not less than eighteen of the vessels referred to. The agreement will terminate on 30th June, 1953, and a new Conference will be convened not later than 1st October, 1952, to consider its renewal.

The general spirit of the Conference was a very practical one, which showed its appreciation of the value of the weather ships but at the same time realised the heavy cost of such a scheme and the necessity of reducing the number of ships to a minimum, yet ensuring that the ships were operated with the maximum efficiency and provided the best facilities possible.

FROST FAIR on the THAMES in February, 1814.



The beginning of the year 1814 was remarkable for the severity of the weather. In the beginning of February, the Thames being choked up with Ice, and in many places completely frozen over, Booths were erected in all directions between London and Blackfriars Bridges; Bullocks and Sheep were roasted whole, and all the usual Sports and Festivities of a Fair were kept up for several days.

Frost Fair on the Thames, 1814

OCEAN CURRENTS

BY K. MILBURN AND E. W. BARLOW, B.SC.

The knowledge of ocean currents has advanced gradually since their existence was first appreciated many hundreds of years ago, but the means of estimating them with any degree of accuracy has only existed in comparatively recent times. In the days before the methods of ascertaining longitude by chronometer were known, the only source of information was that obtained from the drift of derelicts and floating objects such as seaweed and drift-bottles, or making comparisons when returning homeward by the same route as the outward passage. The information thus obtained indicated the general trend of certain oceanic circulations but the actual directions and strengths in particular areas were vague.

Christopher Columbus was aware of the existence of the Equatorial Current, and in the account of his third voyage, 1498–1500, he stated: "I regard it as proved that the waters of the sea move from east to west as do the heavens, that is to say, like the apparent motion of the sun, moon and stars". He even attributed the shape of the larger islands of the West Indies and Lesser Antilles to the effect of wearing away by this current. On his fourth voyage, which took him to the eastern shores of Central America, Columbus detected the northward deflection of the Equatorial Current as it approaches this coast.

Baron Alexander von Humboldt (1769–1859), who for many years lent his name to the Peru Current, stated that the effects of the Gulf Stream had been noticed long before the voyage of Columbus to America by such reports as bamboo stems, pine trunks and even living men in canoes washing ashore in the Azores and Canary Islands, and having their origin in the western shores of the Atlantic. In 1770 a small unmanned vessel drifted out to sea from the island of Lanzarote, Canary Islands, and eventually brought up near Caracas, Venezuela.

Benjamin Franklin published the first chart of the Gulf Stream in 1770, after carrying out an investigation into the reasons why mail packets travelling from Falmouth to Boston took much longer than ordinary merchantmen sailing from London to Providence, Rhode Island. He derived much information from Captain Folger, a Nantucket whaler, whose spheres of operation lay on both sides of the Gulf Stream. It was apparent that the mail packets were feeling the full force of the Gulf Stream, whilst the ships bound for Providence were avoiding it entirely. Franklin was able to give a fair estimate of the limits of the Gulf Stream, but its thermal properties he kept secret until 1795, when in conjunction with Mr. Jonathan Williams he published a work called *Thermometrical Navigation*, with the object of shortening ships' passages. About the same time as Franklin published his investigations of the Gulf Stream, Major Rennell published his findings and a chart of the *Bank and Current of Cape Lagullas* (Agulhas), and these were probably the first scientific investigations of ocean currents.

The fact that current charts covering most of the navigable waters of the world exist today, and are used by the modern navigator, is in itself a tribute to the thousands of seafarers who over the years have contributed the data from which these charts are compiled. The hazards of the sea exist just as surely today as they have ever done. These hazards tend to alter their perspective with the years, first with the transition of sail to steam and now

with the relentless urge for speed and increased efficiency so necessary in this highly competitive age. Time was not such an important factor in the more leisurely days of sail. Each voyage accomplished was undoubtedly a fine achievement. The masters were more concerned with the vagaries of the wind than currents in planning their tracks, and the fact that they often go hand in hand was a happy coincidence. Lieutenant Maury first saw the possibilities of collating the experiences of mariners with a view to expediting sea passages, and first introduced the system of meteorological and current reports from merchant ships in 1854.

Captain P. D. Porter of the American steamship *Golden Age*, bound from Liverpool to the Cape of Good Hope, in a letter to Lieutenant M. F. Maury, Superintendent of the Observatory, Washington City, dated 6th January, 1854, wrote: "I find little or no information to be depended on relating to the currents of the African coast. I have kept a faithful account of them since leaving the Cape de Verd Islands, and you may find them worth recording. You will see by my track that I made a course into the coast. This I did to get the inshore current, as I found the current against me, or rather to the westward, in longitude 4° West, and when I got to longitude 5° East I was out of its influence and soon fell in with a southerly set". And to a subsequent letter from Panama, June, 1854, he adds a postscript: "I sent you my log from Liverpool to Cape of Good Hope, from the Cape. Please inform me if you have not received it, and I will send you a duplicate. It contains something that may interest you in the way of currents on the coast of Africa, being a route scarcely yet travelled, and never before by a steamer".

The modern navigator is not so concerned with favourable winds as his predecessors, and is only anxious to avoid headwinds when they are of sufficient strength and fetch to raise a hostile sea. On his voyage from A to B he is concerned with steaming through the least possible amount of water; this track will not necessarily be the shortest distance between the points, for it occasionally happens that a deviation involving increased distance over the earth's surface may be justified where the advantage of favourable currents or avoidance of adverse currents is gained. This is the first useful function of a knowledge of oceanic circulation.

There are various examples shown on the Admiralty charts of steamship tracks where advantage is taken of the current flow. The Great Circle track from the English Channel to Florida Strait is not recommended for a west-bound vessel as it would run into the full strength of the Gulf Stream, apart from considerations of avoiding the ice area of the Newfoundland Bank. The track from Iquique to New Zealand ports for a steamer east-bound follows the Great Circle, but west-bound, in order to avoid the main strength of the Southern Ocean Current, the track is Great Circle to 30° S., 120° W. and then along the 30th Parallel as far as 140° W., from whence a Great Circle track may be followed to the destination.

The idea of utilising knowledge of oceanic circulation to expedite the vessel's progress and increase her effective speed is now a common practice of seamen. A rather different application is its safety factor when making a landfall, or navigating in the vicinity of shoals or reefs, or coasting in reduced visibility. The Agulhas current, for instance, has been responsible for the loss of a large number of vessels between Cape Agulhas and Algoa Bay, for the current in this area is occasionally deflected on shore. There is an area

of very strong mean current about 170 miles due south of Socotra in lat. 9°N. to 10°N. , long. 53°E. to 55°E. , during the south-west monsoon period, when the current sets between east and south-east. The mean current in this region is the strongest known in the world in the open ocean and at times exceeds 4 knots. The strongest current recorded here was one of 7 knots.

Currents are often subject to seasonal fluctuations affecting their strength and direction, and it is of fundamental importance that the mariner should be forewarned of their probable effect on his course, particularly when navigating an area where hazards exist, and when he is obliged to rely on dead reckoning to estimate his position. Every effort is being made to collate the experiences of navigators and improve on existing records so that the maximum benefit may be derived.

It is the aim of the Marine Branch of the Meteorological Office to provide monthly current charts of all navigable waters as soon as sufficient information is available to make this possible. Nothing can be achieved, however, without the assistance of the masters and officers of ships in submitting their observations to this office so that investigations may continue. It is remarkable that so much information is already available on the subject when one considers that it is entirely based on data calculated and submitted voluntarily by seamen, mainly during recent years, a fact which shows that the traditional thoroughness of the sailor has not diminished.

Methods of Calculating Currents

The current meter is the most accurate means of obtaining the direction and velocity of current both at the surface and in the depths, for it measures the rate at which the water passes it in much the same way as the patent log measures the rate at which it is being towed through the water by a ship. The direction is indicated by means of a compass attached to the meter, and thus positive measurements are obtained, but the use of this instrument is only practicable in surveying vessels and other special service ships. A ship needs to be anchored when the current meter is used.

Set and drift is usually estimated by comparison of a "fix" (observed position) with the dead reckoning position at the time of observation, calculated from the last previous "fix", due allowance being made for leeway. For example, a vessel obtained a position by stellar observations during the morning watch. She then steamed $073^{\circ}(\text{T})$ until 1900, when another star fix was obtained. During the two positions the ship had experienced a south-easterly wind, force 5, and it was estimated that she had made 3° leeway. The course used to estimate her dead reckoning position at the time of the second observation is therefore $073^{\circ}-3^{\circ}$ (i.e. 070°) and the distance used is that steamed through the water, obtained either by patent log or calculated from the engine revolutions, making due allowance for "slip," bearing in mind draft, trim, length of time out of dry-dock, state of sea and swell, etc.

The bearing and distance between the dead reckoning position and the second fix is the set and drift experienced since the morning stars. It can be found either by plane trigonometry or by inspection of traverse tables. As the values are usually relatively small it may be advisable to shift the decimal point one place to the right in the values of D. long. and D. lat. and dividing the resulting drift by ten, a useful aid to accuracy.

There is no criterion for leeway, but the mariner knows his ship and what to expect under various conditions of loading and trim and the strength and relative direction of the wind, and makes allowances accordingly. A vessel in light condition can be expected quite naturally to make more leeway than when under similar weather conditions she is deep in the water. Vessels with little top hamper may make no leeway ; in some cases they may creep to windward, a very noticeable feature during the war years when ships were zig-zagging, and due no doubt to the quicker response under lee helm.

The ideal fix is obtained from the true intersection of three or more position lines, whether it is obtained from visual bearings of terrestrial objects or from hyperbolic position-lines of Loran, Decca, Consol or Gee, or from simultaneous observations of celestial bodies. There is some divergence of opinion as to just how accurately a position can be fixed at sea. The position-lines do not always pass through a point, but when they do there can be no doubt of the accuracy of the position obtained. "Cocked hats" do appear for a variety of reasons and are commonly due to slight inaccuracies in the observed altitudes. As these errors are unknown quantities, there are no means of estimating the true position, but the centre of the triangle, providing it is of reasonable proportions, is sufficiently accurate for practical purposes. Under favourable observing conditions with a good hard horizon, a position obtained from two position-lines should be quite accurate, and few mariners would complain of such a "fix".

The most reliable current observations for statistical purposes are those calculated between successive land fixes, or between successive celestial fixes with a reasonable run between them. "Reasonable" is an ambiguous word, but there are no hard and fast rules as to the limits of run between fixes to ensure that the current obtained is truly representative of the area. If the run is short, then slight errors in the positions by observation will be magnified in the estimation of the current. If the run is a lengthy one it may cross two or more areas with entirely different prevailing currents which may be quite important in their own rights but when considered overall may cancel out. Circumstances alter cases, and where there is not considered to be a variation of current over a twenty-four hour steaming period between fixes then the observed current should be reported. Successive twilight star positions offer ideal opportunities for calculating currents and mariners rarely miss a chance to "take stars". Next in order of importance is set and drift calculated from "morning to morning" or "evening to evening" stars.

When estimating the dead reckoning position the compass error should be accurately known and applied, leeway, if any, allowed for and distance through the water estimated with some care, either by patent log or deduced from the engine revolutions, with due allowance for engine slip. Most ships have charts of speed at various revolutions graduated according to the appropriate slip, which can only be decided by the experienced judgment of the navigator. Reports should include the course and speed of the ship, the direction and force of the wind during the run and the condition of loading, so that a good assessment of the current may be made.

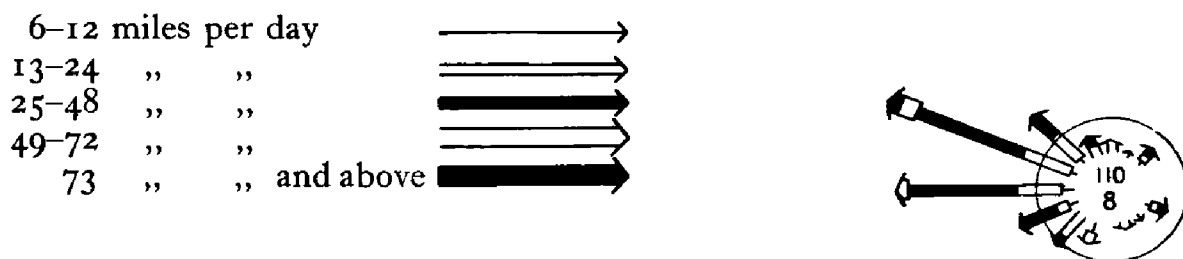
Current Atlases

Prior to 1924 current charts showed the general direction of the current flow. This was obtained by plotting all the available observations for the

area, and estimating by eye the general trend. Since that time the numbers of current observations have been more numerous and methods of statistical computation have been introduced.

Modern current atlases represent the current for an area in three different ways :

- (a) The current rose, which shows the percentage frequency of direction at sixteen points of the compass and the frequency of various current strengths in each direction. It summarises observations made inside the pecked-line area surrounding the rose.



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

Distance from tail of arrow to circle represents 5 per cent.

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

- (b) Predominant direction charts* are compiled by taking the numbers of currents reported in successive 90° sectors round the whole compass, each sector being displaced 15° from its predecessor.

The mid-direction of the sector containing the largest number of reported currents is the direction on which the flow-lines are based.

The predominant directions are usually computed for areas of 2° of latitude by 4° of longitude.

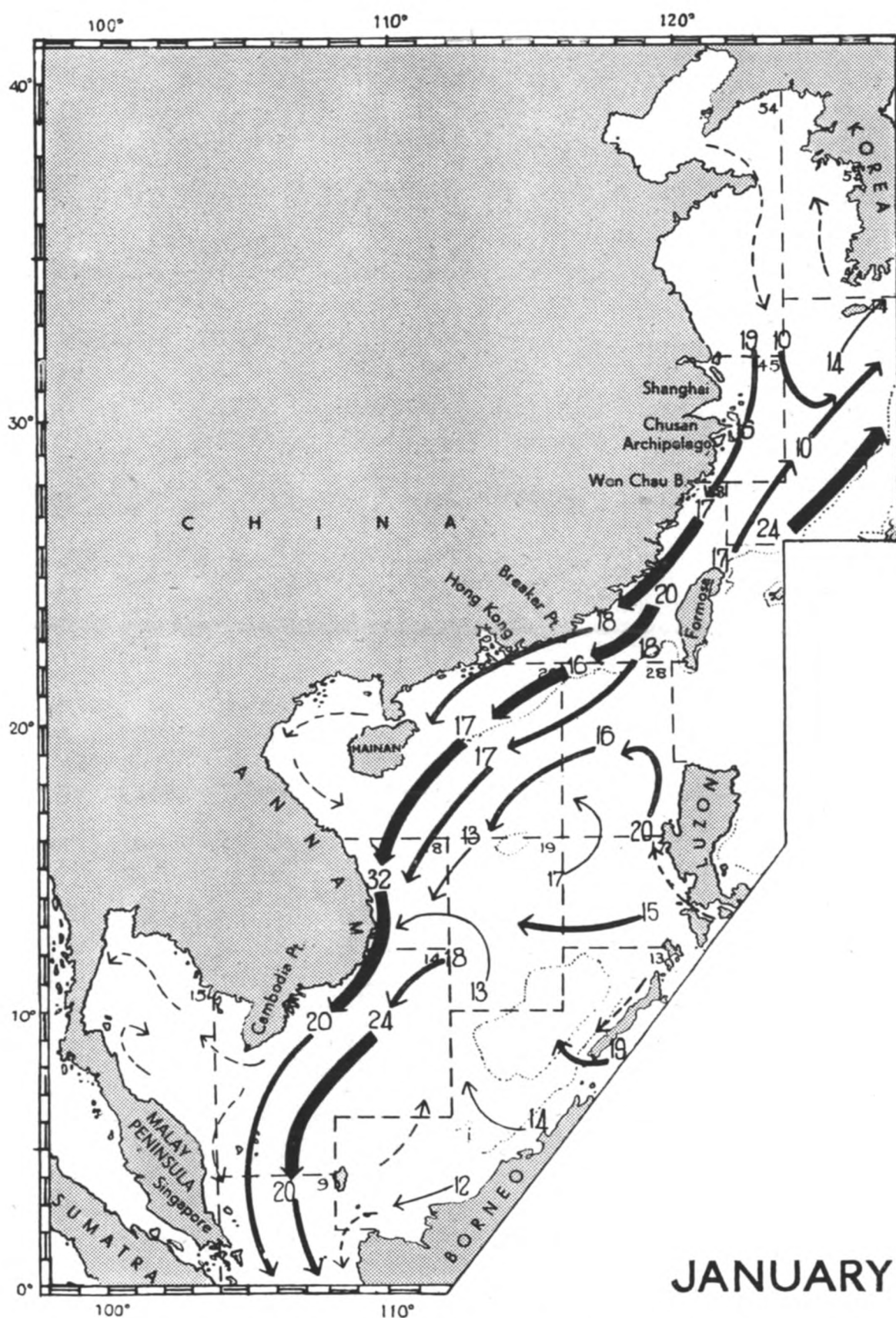
The rate shown is the average rate in miles per day, of all currents within 45° of the predominant direction.

- (c) Vector mean charts represent the resultant flow of surface water in the area over a protracted period. They are tabulated by considering each current separately in the same way as a "day's work" is calculated. Opposing currents tend to cancel each other out, and the vector mean is therefore always less in intensity than the predominant current, but is usually in much the same direction.

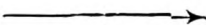


The rose chart and predominant direction chart should be used in conjunction for day-to-day navigational purposes, so that the mariner may to some extent anticipate the current he is most likely to encounter.

The vector mean chart would be best utilised for estimating the drift of floating objects such as derelicts, lifeboats, icebergs, etc., and perhaps for planning a voyage or for research work on currents.

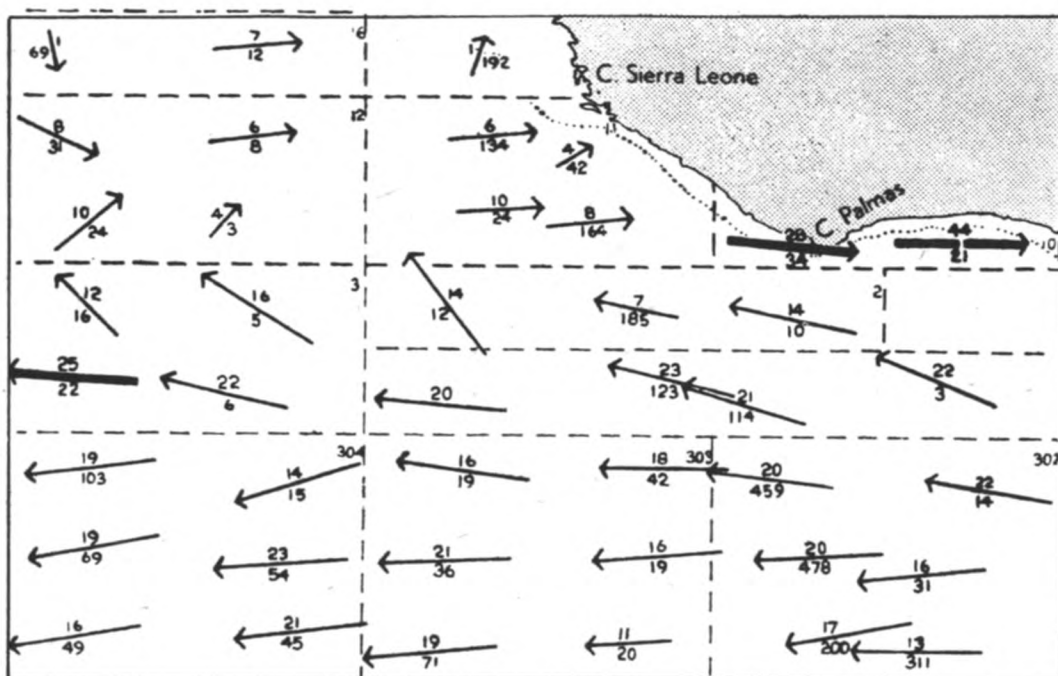
* For examples, see pages 230 and 231.



The thickness of the arrows indicate the constancy of the predominant current in the direction shown as follows :

25-49 per cent	
50-74 per cent	
75-100 per cent	

Constancies of under 25 per cent are not shown.



Vector Mean Chart for May—July.

Arrows flow with the current and represent its mean resultant direction and strength in each region. The mean position of the observations is at the centre of each arrow. The upper figure is the strength in miles per day, to the nearest mile; the lower figure is the number of observations. The length and thickness of each arrow represents strength, on the following scale:

1- 5 miles per day	→
6-12 „ „	→
13-24 „ „	→
25-36 „ „	→
37 „ „ and above	→

With all the modern aids to navigation at his disposal the mariner is better fitted now than ever he was for making current observations, but there are still large areas in all oceans from which information is sparse.

The following current atlases are now available :

- (1) M.O.485, 1948 Quarterly Surface Current Charts of the Western North Pacific, with Monthly Chartlets of the China Seas.
- (2) M.O.466, 1945 Quarterly Surface Current Charts of the Atlantic Ocean.
- (3) M.O.392, 1943 Indian Ocean Currents.
- (4) M.O.435, 1938 South Pacific Ocean Currents.

Work is proceeding on the eastern North Pacific. The South Pacific is also being revised. In general, each atlas is revised after a period of years when a sufficient number of new current observations has been received. At present only the first two atlases contain predominant charts ; these will be included in all future issues or revisions.

Monthly chartlets of the China seas have been compiled because of the changes that occur from month to month during the monsoons and the complexity of the transitional periods. The charts of predominant currents for this region for the months of January and July are shown on pages 230 and 231.

DUTCH OCEAN WEATHER SHIP IN THE INDIAN OCEAN

On 22nd December, 1948, air communications between the Netherlands and Indonesia were seriously hindered by a "landing and passing over" prohibition on the part of India and Pakistan. This was followed by the closing of Colombo airport in Ceylon to Netherlands aviation shortly afterwards. The only other possibilities for air bases in the Indian Ocean were Mauritius and the Cocos Islands—for various reasons the latter were not suitable.

The air route from Mauritius to Batavia is 5,520 km. (2,833 nautical miles), or about fifteen hours flying time. The difficulties of navigating this route over an area where meteorological conditions are almost unknown because of the scanty observations from merchant ships can be imagined. The Dutch Government therefore decided to place an Ocean Weather Ship at 13° 18'S., 82° 29'E., approximately halfway along the route to function as a radio beacon on which planes could home, as a point near which planes could "ditch" if experiencing mechanical difficulties or fuel shortage, and as a meteorological station reporting surface and upper air observations throughout the twenty-four hours.

The weather reports which the meteorological service aboard gathers are transmitted by radio to Batavia, which relays them to Mauritius.

The ship is a former Japanese tanker renamed *Aer Mas*, and carries enough fuel and water to remain for three months on station.

The *Aer Mas* is manned by a crew of nine officers and forty-four seamen. In addition there is a staff of meteorologists and radio and radar mechanics large enough to keep a continuous watch throughout the twenty-four hours.

SPECIAL LONG SERVICE AWARDS TO MARINE OBSERVERS

The Director of the Meteorological Office has been pleased to make a special award in the form of a suitably inscribed barograph to the following voluntary marine observers, in recognition of their long and meritorious service in co-operation with the Meteorological Office extending over a period of at least fifteen years.

Captain E. Holland	New Zealand Shipping Co.
Captain J. L. W. Johnston	Messrs. Alfred Holt & Co.
Captain F. E. Patchett	Cunard White Star Line
Captain C. E. Duggan, R.D., R.N.R.	Canadian Pacific S.S. Co.

Congratulations are extended to these officers, who will be personally notified of the award and the arrangements made for its presentation.

NOMENCLATURE OF METEOROLOGICAL CODES—

The attention of marine observers is drawn to the names of the international weather codes most commonly used by shipping.

Full message (as reported by Selected Ships), *FM* 21 :
Y Q L_aL_aL_a L_oL_oL_oG G N d d f f V V w w W P P P T T N_hC_Lh C_mC_H
D_sv_sapp (8N_sC_hh_s) (9S_pS_pS_pS_p) O T_sT_sT_dT_d I d_wd_wP_wH_w ICE c₂K D_ir e

Abbreviated message (as reported by Supplementary Ships) *FM* 22 :
First six groups of *FM* 21.

Short message (as reported by ships other than Selected and Supplementary Ships) *FM* 23 :

First four groups of *FM* 21.
Full message (as reported from land stations) *FM* 11 :
9 9 9 I I i i i T_dT_d N d d f f V V w w W P P P T T N_hC_Lh C_mC_H
(6 j a p p) (7 R R T_eT_e) (8 N_sC_hh_s) (9 S_pS_pS_pS_p).

In the Atlantic Weather Bulletin a selection of land and ship reports is given in the following form :

9 9 9 I I i i i T_dT_d } N d d f f V V w w W P P P T T
Y Q L_aL_aL_a L_oL_oL_oG G }

International Analysis Code for the use of Shipping. I.A.C. (Fleet) F.M.62

10001	333x ₁ x ₁	OYYG _c G _c		
8P _t P _c PP	YYYYY	(md _s d _s f _s f _s)	8P _t P _c PP	YYYYY etc.
66F _t F _i F _c	YYYYY	YYYYY	.....	(md _s d _s f _s f _s)
44P ₁ P ₁ P ₁	YYYYY	YYYYY	.....
55T _t T _i T _c	(555PP)	YYYYY	.....	(md _s d _s f _s f _s)
987w _s w _s	YYYYY	YYYYY	.....
77744	.....	.....	44777	
19191				

The explanation of the symbols used in the codes is given in the *Marine Observer's Guide* (M.O. 477), *Decode for the Use of Shipping* (M.O. 509) and the *Admiralty List of Radio Signals*, Vol. III, Part A.

The above are the only meteorological codes likely to be used at sea. All forecasts, storm warnings and summaries of existing weather broadcast by radio for the use of shipping will be given in plain language.



CAPTAIN T. M. GODDARD

PERSONNEL



CAPTAIN E. HEWITT

APPOINTMENT.—On the 1st August, 1949, CAPTAIN E. HEWITT assumed command of H.M.S. *Conway*.

Born in 1904 he was educated at Orme School, Newcastle-under-Lyme, and H.M.S. *Conway*. Upon leaving the ship he had six months training in the Royal Navy before serving his apprenticeship in the Glen Line. He passed for second mate in 1924 and joined the Royal Mail Steam Packet Company, obtaining his master's certificate in 1928. During his service with the Royal Mail Line he carried out periodic training in the R.N.R., including a year in submarines, being promoted to Lieut.-Commander in 1936.

By the outbreak of the war in 1939 he had served a short period as Chief Officer in Royal Mail liners, then on mobilisation he was appointed to the armed merchant cruiser *Alaunia*. His war service was mostly in small ships engaged in convoy and escort work and he commanded the corvette *Aster* and the sloops *Shoreham* and *Whimbrel*.

In June, 1945, he was promoted to Acting Captain, R.N.R., and appointed Divisional Sea Transport Officer, Singapore. In May, 1947, he returned home and then went to Delhi to supervise sea transport arrangements attendant on the withdrawal of British Forces from India.

He received confirmation in the rank of Captain, R.N.R., at the age of 42, and in March, 1948, he again returned home, this time to take up an appointment as Staff Captain of H.M.S. *Conway*, in which position he served until he took over command.

RETIREMENT.—On 31st July, 1949, CAPTAIN T. M. GODDARD retired from H.M.S. *Conway* after fifteen years as Captain-Superintendent.

Born in 1888 he was educated at Rugby Lower School and H.M.S. *Conway*, where he was awarded the King's Gold Medal in 1907.

He was an apprentice in the barque *Inverness*, then from 1910 to 1914 served in the Wilson Line and the P. & O. Branch Line. Upon obtaining his master's certificate he joined the Royal Naval Reserve, and during the 1914-18 war saw service in the armed merchant cruiser *Oceanic* and H.M.S. *Donegal*.

In 1919 he passed for extra-master and resumed duty in the P. & O. Branch Line until 1921, when he was appointed to command the South African training ship *General Botha*. In 1922 he left her to join the Royal South African Navy, where he

remained until 1934, when it was disbanded. Much of this time was spent in survey work and in minesweepers. Returning home in 1934 he was appointed in command of H.M.S. *Conway*.

The school-ship now has a record number of cadets aboard, with a long waiting list of applicants. To meet this demand a shore establishment has recently been obtained, and this necessitated shifting the ship along the Menai Straits through the dangerous Swellies Channel. Captain Goddard's survey experience was of value in this operation, which was successfully carried out with the aid of tugs on 13th April, 1949, and H.M.S. *Conway* is now moored in mid-stream off the shore establishment at Plas Newydd, Anglesey.

The many marine observers who are "old Conways" will no doubt join with the nautical staff of the Meteorological Office in wishing Captain Goddard good health and happiness in his well-earned retirement, and Captain Hewitt the best of good fortune in the years ahead in command of *Conway*. M. C.

OBITUARY.—We regret to announce that the master of the Royal Mail liner *Atlantis*, CAPTAIN BASIL AMES GAMMON, died suddenly from heart failure on the 12th June and was buried at sea the same day. At the time the vessel was homeward bound from New Zealand, between Fremantle and Aden.

Captain Gammon was 54 years of age, and commenced his sea training in the *Worcester*, joining the Royal Mail Line in March, 1915, as Third Officer. He obtained his master's certificate in 1921 and his first command was the *Culebra*, in April, 1940. He subsequently commanded the *Somme*, *Palma* and *Darro*, before joining the *Atlantis* in August, 1948.

OBITUARY.—The death of CAPTAIN H. S. COX, which occurred suddenly on the 19th March, 1949, on board his command the S.S. *Tamaroa* in Auckland, New Zealand, is noted with regret. He had joined Messrs. George Thompson as a junior officer in 1914, and served in that company and in the Shaw Savill & Albion Co. Ltd. from then until his death. Promoted through the usual grades, and in various ships, he became Chief Officer of the *Themistocles* in 1918. He was Chief Officer of several other ships, including the *Demosthenes*, *Euripides* and *Jervis Bay*, until he was promoted to command in 1934 in the S.S. *Kumara*.

From October, 1936, to February, 1938, Captain Cox held a shore appointment in the company's import department, and then returned to sea as Captain of the *Maimoa*, in which ship he was serving at the outbreak of war the following year. The *Maimoa* was lost by enemy action in November, 1940, and Captain Cox was taken prisoner. He was released and returned to England in May, 1945, since when he commanded the *Mahana*, *Taranaki*, *Wairangi* and *Tamaroa*. C. H. W.

RETIREMENT.—In June, 1949, on the arrival of his ship the M.V. *Rangitiki*, which he had commanded since 1946, CAPTAIN E. HOLLAND retired from the New Zealand Shipping Company.

Edward Holland first went to sea in the sailing ship firm of J. Hardie and Co. of Glasgow, serving in their ships as apprentice, third mate and second mate. He then joined the New Zealand Shipping Co. in 1911 and served in that company for the remainder of his sea career. He passed for Master in 1915. His first command was the *Surrey* in 1920, and he subsequently commanded a number of the company's ships.

The first record we have of Captain Holland as a voluntary observer was in 1921, when he was in the *Surrey*. Returns were later received from him aboard the *Hororata*, *Rimutaka*, *Rotorua*, *Remuera*, *Westmoreland*, *Rangitani*, *Rangitata* and his last ship. Many of these meteorological logs were classed "Excellent".

During most of the recent war he commanded the *Rangitata*, and was appointed C.B.E. in the Birthday Honours of 1943 for his war services.

We wish him the best of health and happiness in his retirement. C. H. W.

SOUTHERN ICE REPORTS

During the year 1948

OCTOBER

Reported by S.S. *Saluta*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
3	51 50S	36 00W	Bergs.	Large icebergs.

NOVEMBER

Reported by S.S. *Ketos*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
29	50 40S	33 30E	Growlers.	Estimated 40-50 ft. long ; 20-30 ft. high.
29	51 18S	34 40E	Berg.	Estimated 300 ft. long ; 150 ft. high.
30	52 20S	36 10E	Bergs.	

DECEMBER

Reported by S.S. *Ketos*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
1	55 50S	42 00E	Growlers.	50-60 ft. long ; 40-50 ft. high.
1	56 28S	43 00E	Bergs.	
3	58 28S	44 55E	Bergs and pack-ice.	Pack-ice extending E and W, horizon to horizon.
3	58 28S	45 03E	Bergs and pack-ice.	
5	58 10S	50 31E	Growlers.	
5	58 10S	51 50E	Growlers.	
11	60 15S	48 00E	Bergs and pack-ice.	
13-14	58 18S	36 50E	Pack-ice.	Continuous belt of thick pack-ice between these two positions.
	57 38S	34 00E	Pack-ice.	
14	57 48S	34 30E	Pack-ice.	
14-15	57 38S	34 00E	Bergs.	An indefinite number of icebergs observed between these two positions.
	57 45S	28 05E	Bergs.	Estimated 10 miles long ; ½ mile wide.
15	57 20S	29 54E	Pack-ice.	
16	57 58S	26 50E	Pack-ice.	
20	57 33S	16 55E	Bergs and pack-ice.	Number of narrow belts.
22	57 22S	11 28E	Bergs.	Number of bergs surrounded by pack-ice.
23	57 20S	08 12E	Bergs.	Number of small bergs.

Reported by S.S. *Saluta*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
6	54 07S	26 30W	Bergs and growlers.	Occasional bergs and growlers.
6	54 07S	25 14W	Bergs and growlers.	Occasional bergs and growlers.
6	54 07S	23 30W	Bergs and growlers.	Occasional bergs and growlers.
7	54 06S	23 54W	Bergs and growlers.	Occasional bergs and growlers.

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
7	54 00S	22 04W	Bergs and growlers.	Occasional bergs and growlers.
7	54 00S	20 54W	Bergs and growlers.	Occasional bergs and growlers.
7	53 50S	19 06W	Bergs and growlers.	Occasional bergs and growlers.
8	53 48S	17 57W	Bergs and growlers.	Occasional bergs and growlers.
8	53 45S	16 00W	Bergs and growlers.	Occasional bergs and growlers.
8	53 44S	14 40W	Bergs and growlers.	Occasional bergs and growlers.
8	53 45S	13 00W	Bergs and growlers.	Occasional bergs and growlers.
10	54 20S	3 30W	Bergs.	Bergs.
10	54 05S	1 45W	Bergs.	Bergs.
11	54 22S	1 00E	Bergs.	Several bergs.
11	54 25S	2 26E	Bergs and growlers.	Several bergs and growlers.
12	54 45S	5 02E	Bergs and growlers.	Large bergs and growlers.
12	55 00S	6 40E	Bergs and growlers.	Numerous bergs and growlers.
12	55 05S	7 03E	Bergs and growlers.	Numerous bergs and growlers.
12	55 20S	10 00E	Bergs and growlers.	Numerous bergs and growlers.
13	55 28S	10 57E	Bergs and growlers.	Numerous bergs and growlers.
13	55 40S	12 40E	Bergs and growlers.	Numerous bergs and growlers.
13	55 49S	14 00E	Bergs and growlers.	Numerous bergs and growlers.
13	56 10S	16 00E	Bergs and growlers.	Occasional bergs and growlers.
14	56 20S	17 00E	Bergs and growlers.	Occasional bergs and growlers.
14	56 45S	18 54E	Bergs and growlers.	Occasional bergs and growlers.
14	56 55S	20 30E	Bergs and growlers.	Numerous bergs and growlers.
14	57 12S	22 00E	Bergs and pack-ice.	Bergs and field of close pack-ice to S.
15	56 50S	24 00E	Bergs and pack-ice.	Heavy pack-ice and bergs.
15	56 53S	23 53E	Bergs and pack-ice.	Pack-ice and berg to S.
15	57 00S	25 45E	Bergs, growlers and pack-ice.	Bergs, growlers and pack-ice.
15	57 00S	27 24E	Bergs, growlers and pack-ice.	Bergs, growlers and pack-ice.
16	57 00S	28 40E	Bergs and growlers.	Occasional bergs and growlers.
16	57 00S	30 21E	Bergs and growlers.	Occasional bergs and growlers.
16	57 05S	32 20E	Bergs and growlers.	Occasional bergs and growlers.
16	57 05S	34 01E	Bergs and growlers.	Occasional bergs and growlers.
17	57 05S	35 40E	Bergs, growlers and pack-ice.	Scattered pack-ice, bergs and growlers.
17	57 05S	37 20E	Bergs, growlers and pack-ice.	Scattered pack-ice, bergs and growlers.
17	57 05S	39 05E	Bergs and growlers.	Occasional bergs and growlers.
17	57 05S	40 40E	Bergs and growlers.	Occasional bergs and growlers.
18	57 05S	42 30E	Bergs and growlers.	Occasional bergs and growlers.
18	57 05S	43 50E	Bergs and growlers.	Occasional bergs and growlers.
18	57 12S	46 00E	Bergs and growlers.	Occasional bergs and growlers.
18	57 19S	47 30E	Bergs and growlers.	Occasional bergs and growlers.
19	57 39S	49 00E	Bergs and growlers.	Occasional bergs and growlers.
19	57 45S	50 24E	Bergs.	Occasional small low flat bergs.
19	57 48S	52 07E	Bergs.	Occasional small low flat bergs.
23	59 30S	74 20E	Bergs.	Frequent bergs.
23	59 30S	75 24E	Bergs.	Frequent bergs.
23	59 30S	75 35E	Bergs and growlers.	Frequent bergs and growlers.
24	59 30S	77 38E	Bergs and growlers.	Frequent icebergs and growlers.
24	59 35S	78 50E	Bergs and growlers.	Frequent icebergs and growlers.
24	59 23S	79 48E	Bergs.	Numerous icebergs.
24	59 23S	80 20E	Bergs.	Numerous icebergs.
25	59 23S	83 25E	Bergs and growlers.	Numerous icebergs and growlers.
25	59 05S	83 00E	Bergs and growlers.	Numerous icebergs and growlers.
25	58 58S	83 46E	Bergs and growlers.	Numerous icebergs and growlers.
26	58 58S	83 46E	Bergs and growlers.	Numerous icebergs and growlers.
26	58 57S	84 52E	Bergs and growlers.	Numerous icebergs and growlers.
26	58 58S	86 45E	Bergs and growlers.	Numerous icebergs and growlers.
26	58 58S	88 10E	Bergs and growlers.	Numerous icebergs and growlers.
27	58 58S	90 07E	Bergs.	Numerous large tabular bergs.
27	58 58S	91 50E	Bergs.	Numerous large tabular bergs.
27	59 02S	93 04E	Bergs.	Numerous large tabular bergs.
27	60 12S	93 04E	Bergs.	Numerous large tabular bergs.
28	60 22S	93 04E	Bergs.	Numerous large tabular bergs.
28	61 08S	92 38E	Bergs.	Numerous large tabular bergs.

Reported by *M.V. Napier Star*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
1-31			Nil reported.	Proceeded from Brisbane to London via the Cape, traversing the South Indian Ocean on a parallel of latitude of 30° 30' S. between the meridians of longitude of 98° E. and 30° E. and then following the normal trade route from the Cape to the United Kingdom.

Reports of ice for October, November and December previous to 1948 will be found in *The Marine Observer*, Vol. XVIII, No. 142, page 230

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FLEET LIST (Great Britain)

VOLUNTARY OBSERVING SHIPS

The following is a list of British ships, voluntarily co-operating with the Marine Branch of the Meteorological Office. The names of the Captains, Observing Officers, and Senior Radio Officers are given as ascertained from the last written return received. The date of receipt of the last return received is given in the last column.

All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent.

The Port Meteorological Officers and Merchant Navy Agents at the ports will make personal calls on the Captains and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired. (See under Notices to Marine Observers.)

Excellent awards are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published in a special list in the *Marine Observer*.

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

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

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Accra</i> ..	GJSW	A. Smith ..	J. R. Smith, L. Austin, C. Morrison, T. A. Hobson ..	J. A. Stuart ..	Elder Dempster Lines, Ltd. ..	18.1.49
<i>Afghanistan</i> ..	GNYP	W. A. Chappell ..	R. L. Cain, J. Linton, K. J. Evans ..	I. D. Sullivan ..	F. C. Strick & Co., Ltd. ..	3.1.49
<i>Ajax</i> ..	GJXM	W. T. Spencer ..	E. B. Bertelsen, C. M. Best, A. S. Curry ..	C. Calvey ..	A. Holt & Co. ..	20.5.49
<i>Akaroa</i> ..	GMLP	J. Steele ..	P. S. Yeoman, R. Munro, T. de M. Ogier ..	J. W. Soulsby ..	Shaw, Savill & Albion Co., Ltd. ..	22.3.49
<i>Alcantara</i> ..	GLOR	B. K. Berry, R.D., R.N.R.	T. Frazer, G. Wright, P. Driver ..	R. E. Hammond ..	Royal Mail Lines, Ltd. ..	8.3.49
<i>Amastira</i> ..	GYDD	M. A. Neeves ..	D. G. Roberts, C. Eastwood, D. Martin ..	P. Coghlan ..	Anglo-Saxon Petroleum Co., Ltd. ..	8.3.49
<i>Amersham</i> ..	GNTQ	A. Spencer ..	W. B. Avison, F. M. Dickenson, K. R. Jones, D. B. Cairns ..	W. Smith ..	Thompson S.S. Co., Ltd. ..	4.1.48
<i>Andes</i> ..	GQCV	D. A. Casey, C.B.E., D.S.O., D.S.C., R.D., R.N.R.	J. Jackson, F. P. Garbutt, T. A. Nicholson ..	R. F. Barrett ..	Royal Mail Lines, Ltd. ..	24.2.49
<i>Apapa</i> ..	MACE	I. J. Smith ..	E. E. Willis, J. Springall, D. Scott ..	S. W. Brown ..	Cunard White Star, Ltd. ..	28.10.48
<i>Aquitania</i> ..	GLRZ	R. B. G. Woollatt, R.D., R.N.R.	D. H. Shimmmin, R. Jones, E. E. Willis ..	B. H. Long ..	Cunard White Star, Ltd. ..	6.1.49
<i>Arabia</i> ..	GLKF	G. H. Morris ..	R. W. Ruddock, R. P. Aske, J. Curtis ..	A. Hitchen ..	F. C. Strick & Co., Ltd. ..	10.3.49
<i>Arabistan</i> ..	GCKK	J. H. Metcalfe ..	K. M. Cutler, P. J. Robinson, W. Mortimer ..	P. Corbishley ..	Royal Mail Lines, Ltd. ..	24.5.49
<i>Araby</i> ..	GMZL	G. H. Taggart ..	S. Armitage, W. Boyle, E. G. Price ..	T. McBride ..	Booker Bros. McConnell & Co., Ltd. ..	10.11.48
<i>Arakaka</i> ..	GDVN	J. A. Carter ..	K. White, D. G. Hastie, J. Reeve ..	C. Hastie ..	Blue Star Line, Ltd. ..	7.9.48
<i>Argentina Star</i> ..	GTKF	D. R. Macfarlane, O.B.E., D.S.O.	A. Fielding, T. R. Rowe, V. J. Johnsen ..	J. Downey ..	B. J. Sutherland & Co. ..	7.6.49
<i>Argyll</i> ..	GBWB	J. Dodds ..	R. D. Philipotts, E. Thompson, R. Bone ..	A. N. Taylor ..	Elders & Fyffes, Ltd. ..	4.1.49
<i>Arguani</i> ..	GMBL	G. Gracie ..	C. A. V. Dalyn, J. Cubbin, P. O. Donnell, N. Acon ..	A. O'Connor ..	T. & J. Harrison ..	20.4.49
<i>Arifan</i> ..	MAFK	H. Coates ..	B. G. Evans, K. McNish, J. Walden ..	E. H. Pitt ..	Union Castle Mail S.S. Co., Ltd. ..	24.5.49
<i>Arundel Castle</i> ..	GCZL	H. A. Deller ..	G. H. Griffiths, G. H. Drinkwater, J. B. Clemenson ..	M. A. Kempe ..	Cunard White Star, Ltd. ..	17.10.47
<i>Ascania</i> ..	GKNJ	J. Chapman, R.D., R.N.R.				

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Ashburton</i> ..	GNJN	F. W. Mould	C. F. Woodcock, D. A. Keats, J. Browne	J. S. Buchanan	Trinder Anderson & Co. ..	..
<i>Asia</i> ..	GLJV	J. L. Croasdale	C. A. Roy, D. S. Lomax, D. J. Staff ..	W. J. Rainey	Cunard White Star, Ltd. ..	..
<i>Aturias</i> ..	GLQS	G. A. Banister	F. Williams, C. Cowley, P. Sykes ..	..	Royal Mail Lines, Ltd. ..	18.3.48
<i>Athelchief</i> ..	GCRG	A. W. Pegg ..	J. P. Coffey, J. W. Carruthers, T. C. Bennett, R. V. Parkiss, N. Jones, A. Green	..	..	..
<i>Athelregent</i> ..	GQWL	C. Ray ..	D. Waite, A. Sugden, E. Peers, C. J. E. Mayers	W. Bradbury	Tankers, Ltd. ..	27.6.49
<i>Athenic</i> ..	GBLS	D. Aitchison	J. N. Carroll, J. W. Webster, J. W. Wood, R. F. Abbey	G. H. McClelland	Athel Line, Ltd. ..	24.2.49
<i>Athlone Castle</i> ..	GYTK	R. Wren, D.S.O. ..	W. B. Fletcher, J. Toogood, M. W. Williams, R. C. Neal	D. Haggart ..	Shaw, Savill & Albion Co., Ltd. ..	20.4.49
<i>Atlantis</i> ..	GLTM	D. R. Lee ..	R. Phillips, D. R. Moody, D. Guinness ..	J. H. Summers	Union Castle Mail S.S. Co., Ltd.	27.6.49
<i>Auricula</i> ..	GKPV	H. Sangster	C. K. Powell, R. R. Stonehouse, J. A. Hall, D. B. Davies	L. G. Hoskins	Royal Mail Lines, Ltd. ..	28.3.49
<i>Australind</i> ..	GJKF	J. F. Wood	J. Stevenson, J. B. McCowan, R. Mattingley	J. Sanderson	Anglo-Saxon Petroleum Co., Ltd.	7.2.49
<i>Avondene</i> ..	..	W. R. Jones	J. R. Dixon	H. J. Griffiths	Trinder, Anderson & Co. ..	26.4.49
<i>Balanitia</i> ..	GBNM	F. A. C. Thacker	J. Mitchell, W. Sturrock, G. L. Fraser ..	P. E. Coggin	Dene Shipping Co., Ltd. ..	4.1.49
<i>Baltara</i> ..	GTXM	G. E. Thomas	E. E. R. Roberts, R. E. G. Simmonds, —, Davies	C. James	United Baltic Corporation, Ltd. ..	4.1.49
<i>Banff Park</i> ..	GPYZ	E. Bursby ..	T. Burke, G. Dunn, R. Rutherford	J. Spicer	Ohlson S.S. Co., Ltd. ..	23.2.49
<i>Barjama</i> ..	MNCS	M. Fraser	J. H. Jones, T. L. Harcus	J. Freel	C. R. Mauritzen ..	7.6.49
<i>Baron MacLay</i> ..	GKXW	A. Campbell	R. Pollock, J. Baxter, R. Gunn ..	..	H. Hogarth & Sons	..
<i>Baron Yarborough</i> ..	GNJD	J. Pearson	J. Lungley, J. F. Thompson, P. T. Dennison	..	..	..
<i>Baskerville</i> ..	GPYF	E. Pugh, O.B.E.	F. Smith, J. Peck, E. J. Beaumont	W. Maclaren	Runciman (London), Ltd.	12.1.49
<i>Bassano</i> ..	GNXK	G. Hodgson	J. W. Gardener, D. Dickson, M. King ..	J. Williamson	Ellerman's Wilson Line, Ltd.	23.2.49
<i>Beaconsfield</i> ..	GNNQ	G. Grist	S. Fieldhouse, T. F. Hercus, A. Aikman ..	A. Garden	Watts, Watts & Co., Ltd. ..	23.2.49
<i>Beaverburn</i> ..	MAGB	J. B. Smith, O.B.E.	P. F. Williams, R. D. P. Gillett, R. A. Jones	T. Ainsworth	Canadian Pacific S.S. Ltd. ..	14.1.49
<i>Beavercoe</i> ..	GNLX	C. E. Duggan, R.D., R.N.R.	R. W. Savage, W. Williams, J. Jaling ..	J. A. McAskill	Canadian Pacific S.S. Ltd.	26.1.49
<i>Beaverdell</i> ..	GBBS	S. W. Keay, O.B.E., L.W.M.	E. R. Connerton, E. R. Shaw, D. Wallace	L. Norton	Canadian Pacific S.S. Ltd.	5.1.49
<i>Beaverford</i> ..	MOJG	R. A. Leicester, O.B.E.	L. Kinns, D. Bryce, J. Mackey ..	W. Poingdestre	Canadian Pacific S.S. Ltd.	11.1.49
<i>Beaverghen</i> ..	GBCP	J. Soam	G. W. Bateman, G. Palmer, J. Waling ..	R. Burch	Canadian Pacific S.S. Ltd.	11.1.49
<i>Beaverlake</i> ..	GBCQ	W. H. Stanley	J. W. Gardner, E. Perce, J. L. Kirby ..	A. P. Humphries	Canadian Pacific S.S. Ltd.	21.9.48
<i>Beckenham</i> ..	GCGK	D. G. Martin	R. Winn	J. Brennan	Watts, Watts & Co., Ltd. ..	7.12.48
<i>Benarty</i> ..	GCZZ	D. S. Sinclair	R. M. Drummond, T. P. Barr, J. Scott ..	R. Dixon	W. Thomson & Co. ..	19.1.49
<i>Bendorian</i> ..	MYSF	J. Cringle	L. C. Finn, R. M. Snowie, N. Mackie ..	J. E. Kemp	W. Thomson & Co. ..	22.3.49
<i>Benledi</i> ..	GDBI	A. P. Paterson	W. O. Atkinson, M. J. Peyton-Bruhl, A. Wallace, A. King	B. J. Saltwell	W. Thomson & Co. ..	6.8.47
<i>Benloch</i> ..	GDJT	J. B. Hastie	E. N. Stone, J. F. Robertson, G. K. Harrison	I. M. Fraser	W. Thomson & Co. ..	13.5.49
<i>Benwraiche</i> ..	GBTZ	W. C. Wilson	E. F. Cole, C. H. Long ..	..	..	..
<i>Benwyvis</i> ..	MYPW	J. Thompson	L. J. Thompson, D. S. Gilmour, D. McPhail	J. L. Wells	W. Thomson & Co. ..	13.10.48
<i>Bibury</i> ..	..	..	C. Everingham, J. McAndrew, J. H. Spandler	J. Whyman	W. Thomson & Co. ..	26.1.49
<i>Boynton Wyke</i> ..	GIFC	J. R. Faulkner	..	R. G. Thomson	Houlder Bros. & Co., Ltd.	9.3.49
<i>Brasil Star</i> ..	GTLF	G. Clxby	..	..	E. W. Robins	..
<i>Bravo</i> ..	GLDZ	G. Duff, G.M.	..	J. Waddell ..	Blue Star Line, Ltd. ..	12.1.49
..	..	E. Tyler ..	..	F. E. Smith ..	Ellerman's Wilson Line, Ltd.	..

Brisbane Star	..	GZCJ	F. N. Riley, D.S.O.	..	R. H. Stark, M. R. Bremberg, G. Munro	D. J. Eastwood	..	Blue Star Line, Ltd.	19.5.48
Britannic	..	GDXF	H. Dixon ..	..	M. J. Dodds, R. McDougall, J. Rawlinson	— Kidson ..	..	Cunard White Star, Ltd.	4.9.48
British Colonel	..	GFDB	E. L. Miller	..	W. S. Jaeger ..	R. A. MacLeod	..	British Tanker Co., Ltd.	16.4.47
British Endurance	..	MLZM	W. Watkin Thomas, O.B.E., D.S.C.	..	A. D. Millar, S. H. Falconer, P. C. Coyne.	A. E. Adams	..	British Tanker Co., Ltd.	29.12.47
British Energy	..	GLBK	J. G. Hill ..	..	D. Mackay, D. MacKinnon, N. J. Price ..	O. G. Winship	..	British Tanker Co., Ltd.	27.6.49
British Escort	..	GCRB	H. G. Jeary ..	..	J. A. G. Millar, R. Weston, I. McKay ..	A. Murray ..	..	British Tanker Co., Ltd.	15.6.49
British Hussar	..	GJVR	T. J. Picken	..	W. R. Symon, J. A. Picken, D. H. Ferrett	C. O'Mahony	..	British Tanker Co., Ltd.	18.12.47
British Lancer	..	MAGS	W. S. Vittle	..	E. L. Mitchinson, S. E. Banyard, G. Lawrence	H. Davies ..	..	British Tanker Co., Ltd.	26.4.49
British Marquis	..	GWVL	G. W. Kemp	..	J. Hutchinson, C. D. Bishop-Laggett, J. Macdonald	F. P. Bellamy	..	British Tanker Co., Ltd.	4.3.49
British Patience	..	GUFF	F. S. Hall ..	..	L. McRitchie, H. Haigh, W. Johnston	M. Dunne ..	..	British Tanker Co., Ltd.	31.3.49
British Pilot	..	GCQT	R. O. Cash	..	A. F. Bowan, B. H. Moor, D. J. Woodfield	M. A. H. Kenneison	..	British Tanker Co., Ltd.	13.7.49
British Piper	..	GDNN	I. P. M. Samson	..	A. Fraser, P. F. Mason, E. C. Ford ..	F. G. Rimmington	..	British Tanker Co., Ltd.	15.10.48
British Power	..	GZGG	K. M. Mitchell	..	J. A. Macleod, T. Horne, G. A. Gee ..	F. Guiller ..	..	British Tanker Co., Ltd.	24.2.49
British Prestige	..	GMBF	J. H. Wilson	..	T. Gifford, D. Battel ..	K. Morris ..	..	British Tanker Co., Ltd.	2.10.47
British Resolution	..	GZPF	I. Bolger ..	..	R. Maybourn	G. W. Baylis	..	British Tanker Co., Ltd.	29.12.47
British Respect	..	MAGU	C. W. G. Stook	..	C. V. Harrison, J. B. Hunter, F. A. Lapper	G. Mitchell	..	British Tanker Co., Ltd.	23.2.49
British Statesman	..	GJNR	W. P. Booth	..	I. Fox, J. Kavanagh, A. N. Brook	N. W. Hodgson	..	Runciman Shipping Co., Ltd.	13.5.49
British Swordfish	..	GCQV	H. A. Wright	..	F. W. Gant, J. H. Looker	T. J. Kelly ..	..	Lampart & Holt Line, Ltd.	18.9.48
Brittany	..	GMZS	D. J. Jones	..	L. A. Savers, Lt.-Cmdr., W. T. Pitcher, B. E. Cole	T. Scambler	..	Henrikson & Co., Ltd.	7.3.49
Brockleymoor	..	GDWP	J. Whayman, D.S.C. and Bar, R.D., R.N.R.	..	F. Gribben, J. Roberts, R. Garcia	E. Johnston ..	..	Lampart & Holt Line, Ltd.	11.1.49
Brontie	..	GSKW	E. Drinkall	..	C. Sutherland, C. Percy, J. Holland	E. Johnston ..	..	Cairns, Noble & Co., Ltd.	21.3.49
Brontes	..	GWPS	J. Byrne ..	..	J. Hogg, W. Errington, J. Baxter	R. Young ..	..	Cairns, Noble & Co., Ltd.	16.12.48
Byron	..	GNFL	J. Scott ..	..	T. L. Langlands, J. W. L. Garrie, C. Milne	S. J. D. Taylor	..	Anchor Line, Ltd.	19.1.49
Cairnaron	..	GPIN	I. G. Foster	..	G. S. Gordon-Christian, J. M. Donkin, F. T. Jones	J. R. C. Johnson	..	P. & O. Steam Navigation Co.	14.12.48
Cairnesk	..	GMKR	N. E. Forth	..	R. N. Dixon	R. N. Dixon	..	Hudson Bros., Ltd.	13.2.47
Cairnvalona	..	GQKM	J. H. Brown	..	L. MacEwan, A. George, R. J. King	J. Gilbert ..	..	Union Castle Mail S.S. Co., Ltd.	20.4.49
Caledonia	..	GCKR	G. Stable ..	..	D. E. Cormack, G. O. Lambert, I. Thomson	S. Gracie	..	Lyle Shipping Co.	14.6.48
Canton	..	GDDT	W. I. Jonsen	..	H. Butler ..	H. Butler ..	..	J. Marr & Son, Ltd.	20.4.49
Cape Mariato	..	GZFV	W. D. Roach	..	A. Dodd, W. A. Morris, A. A. Abdullah	J. Park ..	..	R. Chapman & Son	..
Capetown Castle	..	GKGM	H. S. Todd	..	I. C. Borland, P. F. Drake, R. Ibbertson, J. A. Matthews	J. Parsons ..	..	Cunard White Star, Ltd.	4.1.49
Cape York	..	GCZS	— Mallon ..	..	D. Parsons, P. J. Passmore, D. T. Bolas ..	W. H. Chick	..	Runciman's (London), Ltd.	21.1.49
Caralla	..	GRRV	K. Wardale ..	..	T. C. Crane, C. D. Abbott, N. Knott	A. E. Morton	..	Elders & Fyffes, Ltd.	19.1.49
Carlton	..	GIFE	D. W. Sorrell	..	F. Hamilton, R. Crawford, J. G. Wilson	A. Austin ..	..	Runciman's (London), Ltd.	22.11.47
Caronia	..	GYKS	S. H. French	..	E. A. Muir	M. Ward ..	..	Raeburn & Verel, Ltd.	6.1.49
Carthage	..	GRNX	J. M. Cherry	..	W. Slater, B. P. Payling ..	T. Bailey ..	..	Shaw, Savill & Albion Co., Ltd.	11.2.48
Caslon	..	MCJR	S. A. Sapsworth	..	M. Musson, H. Jennings, H. Bragg	A. R. Porter	..	Hadley Shipping Co., Ltd.	15.9.47
Cavina	..	GKFF	R. E. Richardson	..	D. Parsons, I. Newlands, J. Stephenson, B. B. Jones	R. C. Whiting	..	Prince Line, Ltd.	13.10.48
Caxton	..	GCDX	J. H. Keir ..	..	C. W. Allerton, H. S. F. Strawbridge, W. L. Hillcoat	J. Malcoln ..	..	Anchor Line, Ltd.	14.12.48
Celtic Monarch	..	GSRF	A. V. Richards	..	J. Henderson, W. Hallum, D. Russell ..	..	..	..	..
Ceramic	..	GFLM	J. F. Auld ..	..	..	..	..	..	..
Cerithus	..	GCRM	F. S. Thornton, O.B.E.	..	..	..	..	..	..
Chinese Prince	..	GDJC	D. G. H. O. Baillie	..	..	..	..	..	..
Chitral	..	GLKN	J. D. Woods	..	..	..	..	..	..
Chupra	..	GDZV	A. C. Johnston	..	..	..	..	..	..
Cilicia	..	GDGL	..	..	..	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>City of Barcelona</i> ..	GTKR	E. M. Jenkins ..	A. M. Bowman, R. J. Binnie, E. V. Williams, P. Seiffert ..	J. O'Brian ..	Ellerman Lines, Ltd.	5.1.49
<i>City of Bristol</i> ..	GCPN	E. Garner ..	W. E. James, N. A. C. Smith, R. A. Reid, V. Y. Dymock ..	K. P. Grocock ..	Ellerman Lines, Ltd.	17.5.49
<i>City of Calcutta</i> ..	GLYX	H. A. Hazeel ..	D. J. Inglis, I. McDermid, N. Dalziel, A. J. Bickerton ..	J. Green ..	Ellerman Lines, Ltd.	12.7.49
<i>City of Capetown</i> ..	GBBQ	W. S. Coughlan, O.B.E. ..	W. E. Fletcher, P. Redhead, A. Ramsden ..	D. R. Crombie ..	Ellerman Lines, Ltd.	13.8.48
<i>City of Carlisle</i> ..	GBJK	L. E. Smith, M.B.E. ..	J. Irvin, W. Taggart, B. Pickering ..	P. J. McKeon ..	Ellerman Lines, Ltd.	19.12.47
<i>City of Chester</i> ..	MAHN	W. A. Rogerson, O.B.E. ..	R. Frame, R. M. Faulds, P. G. Thomas ..	J. A. Vallance ..	Ellerman Lines, Ltd.	24.2.49
<i>City of Delhi</i> ..	GLBW	A. M. Hamilton ..	G. Stewart, J. Wharry, J. Potter ..	A. E. Adams ..	Ellerman Lines, Ltd.	25.2.49
<i>City of Derby</i> ..	GFWC	A. G. Melville, O.B.E. ..	R. Tyrrel, J. Waddleton, R. Huntingdon ..	R. Macdonald ..	Ellerman Lines, Ltd.	18.1.49
<i>City of Dieppe</i> ..	GSVQ	H. S. Field ..	A. J. Tyrrell, J. Hughes, H. G. M. Lloyd ..	R. M. Jones ..	Ellerman Lines, Ltd.	1.7.49
<i>City of Dundee</i> ..	GDPY	F. M. Womersley ..	R. Jones, I. A. Whieldon, L. G. Powell ..	H. M. O'Gorman ..	Ellerman Lines, Ltd.	26.1.49
<i>City of Durham</i> ..	GBJM	T. H. Speakman ..	H. McL. Farquhar, D. S. Taylor, J. W. Terris ..	W. B. Roonan ..	Ellerman Lines, Ltd.	21.3.49
<i>City of Evansville</i> ..	GJNF	F. W. Woods ..	A. Fry, J. Tattershall, J. Checkley ..	I. Ellison ..	Ellerman Lines, Ltd.	11.11.48
<i>City of Exeter</i> ..	GQZW	J. I. Andrew ..	N. Groundwater, D. H. Wardlaw, R. Miller, K. Matheson ..	G. S. Creighton ..	Ellerman Lines, Ltd.	16.12.48
<i>City of Hereford</i> ..	GMXC	G. A. Ring ..	T. Rigg, J. F. Mason ..	S. C. Ambler ..	Ellerman Lines, Ltd.	25.1.49
<i>City of Johannesburg</i> ..	GBKW	A. G. Freeman ..	H. Routledge, H. Lewis, C. Craddock ..	A. R. Henderson ..	Ellerman Lines, Ltd.	4.1.49
<i>City of Khartoum</i> ..	GBZC	J. A. Beynon ..	D. L. Cox, W. Folder, D. A. Appleton ..	J. Dolan ..	Ellerman Lines, Ltd.	5.11.48
<i>City of Lille</i> ..	GSLN	E. Scrymgeour ..	R. B. May, H. M. Steele, G. S. Garner ..	A. Julius ..	Ellerman Lines, Ltd.	29.3.49
<i>City of Lyons</i> ..	GMCN	H. Johnson ..	A. R. Horam, R. Clark, J. Morrison ..	W. Anderson ..	Ellerman Lines, Ltd.	24.2.49
<i>City of Paris</i> ..	GFQM	H. Percival, O.B.E., R.D., Cdr., R.N.R. ..	G. G. Francis, M. A. Perry, R. N. Caldwell ..	W. Rouffinac ..	Ellerman Lines, Ltd.	25.5.48
<i>City of Pretoria</i> ..	GBLN	T. F. Labey ..	T. C. Dickinson, P. Seiffert, K. Haslam ..	W. Lupton ..	Ellerman Lines, Ltd.	18.3.49
<i>City of Swansea</i> ..	GBZT	G. Vickers ..	B. Walker, J. L. Blanch, E. E. Cooper ..	M. Prior ..	Ellerman Lines, Ltd.	5.11.48
<i>City of Sydney</i> ..	GSFM	J. B. MacLaren ..	E. Bonfield, R. H. Bellhouse, E. Redshaw ..	A. C. Macaulay ..	Ellerman Lines, Ltd.	4.1.49
<i>City of Tokyo</i> ..	GFMW	R. L. Stewart ..	T. Rigg, M. Graham, E. F. Brick ..	W. M. Morrison ..	Cayzer, Irvine & Co., Ltd.	11.2.49
<i>City of Windsor</i> ..	GJYR	W. S. Doidge ..	W. Kendal, S. F. Nicholson, E. J. E. Owen ..	W. Harper ..	Cayzer, Irvine & Co., Ltd.	4.1.49
<i>Clan Brodie</i> ..	GKPD	B. Vernon-Browne ..	J. H. Wright, F. King, L. G. Woolger ..	R. F. Cole ..	Cayzer, Irvine & Co., Ltd.	5.3.49
<i>Clan Buchanan</i> ..	GKNM	T. W. Inman, O.B.E. ..	D. S. Tosh, E. M. Crawley, J. Beynon, J. Hay ..	J. Shillabeer ..	Cayzer, Irvine & Co., Ltd.	26.4.49
<i>Clan Campbell</i> ..	GDZK	J. A. Forster ..	F. Turton, J. W. Ward, D. R. Godfrey ..	J. A. Gray ..	Cayzer, Irvine & Co., Ltd.	4.1.49
<i>Clan Chattan</i> ..	GF BX	H. C. Simpson, O.B.E. ..	R. S. Russell, A. G. Allison ..	W. H. Saville ..	Cayzer, Irvine & Co., Ltd.	12.7.49
<i>Clan Chisholm</i> ..	GF BY	J. H. Crellin ..	F. C. Doyle, A. T. Campbell, C. J. Abbott ..	J. Ormerod ..	Cayzer, Irvine & Co., Ltd.	7.12.48
<i>Clan Davidson</i> ..	MAWU	H. J. Anchor, O.B.E., R.D., R.N.R. ..	T. R. Halliday, M. P. R. Turner, D. S. Clark ..	G. Martyn ..	Cayzer, Irvine & Co., Ltd.	5.11.48
<i>Clan Forbes</i> ..	GPG B	H. S. Pengelly ..	J. P. Dunphy, F. Lionnet, D. Milner ..	C. E. C. Crew ..	Cayzer, Irvine & Co., Ltd.	18.1.49
<i>Clan Macaulay</i> ..	GZCS	A. G. Storkey ..	G. Bagnall, J. C. Montgomery, R. C. Pearce ..	R. W. Moore ..	Cayzer, Irvine & Co., Ltd.	4.1.49
<i>Clan MacDonald</i> ..	GCPG	H. Cater ..	R. Harris, J. A. Baxter, D. Richards ..	J. Lamb ..	Cayzer, Irvine & Co., Ltd.	5.5.49
<i>Clan Macdougall</i> ..	GF BQ	R. P. Galer, C.B.E., R.D., R.N.R. ..	L. W. Gibbins, A. Graham, P. L. Leslie ..			
<i>Clan MacLaren</i> ..	GSSC	E. H. O. Stone ..	J. C. Matheson, J. S. Catterall, J. L. Easton, G. H. Lewis ..			
<i>Clan MacNair</i> ..	GF NK	E. W. Jenkin ..				
<i>Clan Macneil</i> ..	GF WP	T. N. Soane ..				

<i>Clan Macrae</i> ..	MAHP	T. W. Ellis, O.B.E.	J. D. W. Chapple, R. E. Heywood, J. Nichols	W. Bryce ..	..	Cayzer, Irvine & Co., Ltd.	8.3.48
<i>Clan Urquhart</i> ..	GFBK	C. C. Parfitt	W. Graham, M. N. Ure, T. N. Geesin	A. F. MacIntyre ..	..	Cayzer, Irvine & Co., Ltd.	8.3.49
<i>Clearpool</i> ..	MAHQ	J. Whamond	G. Radcliffe, I. Isak, A. Pringle	R. R. Bromham ..	..	Sir R. Ropner & Co., Ltd.	
<i>Clydebank</i> ..	GKLM	J. W. Greig	G. A. Gregory, A. R. Howson, E. A. D. Vargas	A. G. Roberts ..	..	Andrew Weir & Co.	25.2.49
<i>Clydefield</i> ..	GSNK	H. Vaughan-Jones	W. C. Muir, A. L. Dixon	P. Dwyer ..	..	Hunting & Son, Ltd.	25.1.49
<i>Columbia Star</i> ..	GQGT	C. I. W. Jones	L. Tessier, A. G. Smith, B. Edgington	J. Lovelock ..	..	Blue Star Line, Ltd.	16.7.48
<i>Comanche</i> ..	GYRX	T. Potts	A. E. Hughes, A. Bovill, F. P. Barber	J. Mongey ..	..	Anglo-American Oil Co., Ltd.	11.2.49
<i>Comedian</i> ..	GPTJ	H. T. Wells	J. Bean, L. Broadbent, A. Waring	J. Pye ..	..	T. & J. Harrison, Ltd.	13.10.48
<i>Comliebank</i> ..	GKLI	J. Robertson	A. J. Whiston, A. Brown, E. J. Stoddart	R. Holding ..	..	Andrew Weir & Co.	1.6.49
<i>Condesa</i> ..	MAHU	H. Heal	R. Tinnmouth, S. Edgington, D. Parkin	J. Bishop ..	..	Furness-Houlder Argentine Lines, Ltd.	20.4.49
<i>Consuelo</i> ..	GCGQ	F. Barnard, M.B.E.	C. Everingham, G. Saltmarsh, R. C. Neesham	K. K. Klosser ..	..	Ellerman's Wilson Line, Ltd.	12.1.49
<i>Corfu</i> ..	GRNW	C. S. Parker	G. V. Conolly, J. W. Woodbridge, D. Wright	B. O. Baxter ..	..	Shaw, Savill & Albion Co., Ltd.	5.5.49
<i>Corinthic</i> ..	GZYL	G. M. Robertson, D.S.C.	R. Allen, C. Martin, R. Aitken, J. H. Stark	J. Couchman ..	..	Donaldson Bros. & Black, Ltd.	13.7.49
<i>Corrientes</i> ..	GFPT	W. Anderson	W. F. Kelly, T. F. Tuomey, J. Ridley	R. Andrews ..	..	Dornoch Shipping Co., Ltd.	16.12.48
<i>Coulgorm</i> ..	MAHZ	G. Robison	W. Tressider, V. A. Sutton, J. C. Derby	A. Broadbent ..	..	Royal Mail Lines, Ltd.	24.2.49
<i>Craftsman</i> ..	GPZT	W. F. O'Neill	G. T. Clarke, R. Clark, D. C. Broome,	A. A. Macpherson ..	..	Andrew Weir & Co.	28.3.49
<i>Cumberland</i> ..	GPY	H. E. Reilly, D.S.C., R.D., R.N.R.	A. H. Pickles	J. Stowers ..	..	Lampport & Holt Line, Ltd.	14.10.48
<i>Dallas City</i> ..	GCLS	D. W. Boutcher	J. Crowe, P. Leighton, H. Smith	J. Care ..	..	Lampport & Holt Line, Ltd.	11.1.49
<i>Darro</i> ..	MAID	W. H. Grimshaw	B. M. Metcalfe, L. J. Roberts, C. T. Skrastin	A. Read ..	..	Donaldson Line, Ltd.	23.6.49
<i>Debrett</i> ..	GRPR	J. King	D. Stewart, J. S. Rodger, J. Wainwright	R. Pryer ..	..	Lampport & Holt Line, Ltd.	7.2.49
<i>Deebank</i> ..	GTDB	B. Rivett	W. Jones, A. Bennett, D. Bottomley	G. Heapy ..	..	Glen Line, Ltd.	2.6.49
<i>Defoe</i> ..	GNWF	W. C. Blake	E. G. Painter, L. Henshall, M. Webb	G. Williams ..	..	McCowen & Gross, Ltd.	13.6.49
<i>Delane</i> ..	MMNW	H. Pratt	E. T. Paddon, D. Kingsland	M. Doran ..	..	Royal Mail Lines, Ltd.	21.3.49
<i>Delilian</i> ..	GJSQ	R. McNie	W. B. Avison, J. H. Napper, J. Holt, F. C. Allwoon	L. Brazil ..	..	Lampport & Holt Line, Ltd.	9.7.48
<i>Delius</i> ..	GZSY	H. W. Underhill	D. H. Cordova, G. Shackleton	A. Williams ..	..	Federal Steam Navigation Co., Ltd.	23.5.49
<i>Denbighshire</i> ..	GQGW	W. F. Dark	J. Bryant, H. Cubitt, M. Shaw, W. Smith	J. Fletcher ..	..	Bibby Line, Ltd.	12.2.49
<i>Derryclare</i> ..	GCKN	G. Smith	J. Farrow, R. Driver, F. Hughes	S. J. Taylor ..	..	British India Steam Nav. Co., Ltd.	11.3.49
<i>Decado</i> ..	MAIH	S. J. Hill	H. B. Cray, D. P. Hancock, P. S. Gardner	J. Murphy ..	..	Shaw, Savill & Albion Co., Ltd.	18.7.47
<i>Devis</i> ..	GFKT	T. J. Sweeny	A. H. B. Anderson, A. H. N. Pugh, R. D. Fox	J. Cooper ..	..	Donaldson Bros. & Black, Ltd.	3.1.49
<i>Devon</i> ..	GDRF	A. Hocken	A. Dougal, J. Hendry, E. H. Knox	G. M. Hargreaves ..	..	Doris Steamship Co., Ltd.	4.11.48
<i>Devonshire</i> ..	GTTV	J. E. Cullen, O.B.E.	J. B. Whyte, K. M. Hamilton, W. D. Blingow	A. Allen ..	..	Royal Mail Lines, Ltd.	11.2.48
<i>Ditwara</i> ..	GYQV	F. L. Sampson, D.S.C.	C. A. Miller, M. Mortimer, P. C. T. Davies	G. A. Sutherland ..	..	Furness Withy & Co., Ltd.	31.7.49
<i>Dominion Monarch</i> ..	GRGG	Sir Henry Gordon, K.B., D.S.C.	J. McCool, W. Thomas, R. Douglas	S. J. Hardman ..	..	Lampport & Holt Line, Ltd.	17.7.47
<i>Dorelian</i> ..	GTL	D. MacQueen	K. Quirk, J. S. Peterkin, J. L. Radcliffe	D. R. Uglow ..	..	Trent Maritime Co., Ltd.	24.2.49
<i>Doris Clunies</i> ..	MSLB	J. G. Stevenson	T. Watson, L. Labistour, J. G. Perrin	A. McCartney ..	..	British India Steam Nav. Co., Ltd.	
<i>Drina</i> ..	MAIL	A. N. Anderson	G. Pugh, C. R. S. Monk, A. Ford	I. S. Humphrey ..	..	Crawford Shipping Co.	8.3.49
<i>Dromore</i> ..	GDSF	C. Fryer	J. D. B. Wylie	A. S. J. Broadbent ..	..	Houlder Bros. & Co., Ltd.	5.1.49
<i>Dryden</i> ..	MQFT	C. L. Legg	H. Neal, A. Gibbs, T. C. Mullings				
<i>Duke of Athens</i> ..	GMYS	J. G. Lomas, A.I.N.A.	M. W. M. Weekes, J. G. Brennand, M. J. Dean, J. M. Cree				
<i>Dunera</i> ..	GBBR	A. A. Kay					
<i>Dunkery Beacon</i> ..	GUF5	A. C. E. Green					
<i>Dunster Grange</i> ..	GCSO	R. S. Grigg, O.B.E.					
<i>Durango</i> ..	MAIM	W. H. Roberts					

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Durban Castle</i>	GP GP	J. B. McReynolds, D.S.C.	— Freer, — Hutchings, R. G. Patterson	H. A. Liggins	Union Castle Mail S.S. Co., Ltd.	18.1.49
<i>Durham</i>	GW WK	R. J. Dunning	J. Thomas, J. van der Straaten, G. Dunsford	C. Robinson	Federal Steam Nav. Co., Ltd.	11.2.49
<i>Eastern</i>	GFTV	H. C. G. Stratford	D. Simon, D. Elkington, D. Grant	E. C. Bonel	Eastern & Australian S.S. Co., Ltd.	28.3.49
<i>Edinburgh Castle</i>	GOHN	T. W. McAllen	R. J. Taylor, P. S. G. Eckford, J. W. Rogers	J. Hodgson	Union Castle Mail S.S. Co., Ltd.	26.1.49
<i>Edward East</i>	GXXZ				H. Croft Baker & Sons, Ltd.	
<i>El Gallo</i>	MAIP	E. H. Richardson	W. Swan, A. C. Bramble, T. M. Webber	L. Sutton	C. T. Bowring & Co., Ltd.	7.12.48
<i>Empire Brent</i>	GLBX	J. Cook	J. Short, A. McCallum, S. Ewing	L. Hooper	Donaldson Bros. & Black, Ltd.	13.1.49
<i>Empire Halladale</i>	GPVQ	E. Stormont, M.B.E.	G. Ramage, W. A. Brownlie, W. Marshall	D. Thompson, M.B.E.	Anchor Line, Ltd.	7.2.49
<i>Empire Martaban</i>	GBSV	E. Longster	McGowan, D. B. Butler	T. M. Keddie	Bolton S.S. Co., Ltd.	19.6.47
<i>Empire Pride</i>	MAJB	E. D. Bland	A. F. Cameron, A. Moore, R. V. Perkin	T. Prenton	Bibby Line, Ltd.	18.1.49
<i>Empire Star</i>	GCDP	S. J. C. Phillips, C.B.E.	N. R. Bremberg, F. P. McGuckin, J. D. Brewster	J. Hynes	Blue Star Line, Ltd.	28.10.48
<i>Empire Towy</i>	GDKL	J. Andrews	A. C. Cable, A. Purvis, D. L. Jardine	R. Porter	Fenton S.S. Co., Ltd.	4.11.47
<i>Empire Viceroy</i>	MAJN	J. B. S. Bland	B. Snell, A. G. Ingram	W. Campbell	Canadian Pacific S.S., Ltd.	15.12.48
<i>Empress of Australia</i>	GFSB	J. P. Dobson, D.S.C., R.D., Cmde., R.N.R.	A. F. Miller, B. Snell, J. H. Fraser	J. M. Butterworth	Canadian Pacific S.S., Ltd.	4.1.49
<i>Empress of Canada</i>	GSTR	E. A. Shergold	R. A. Jones, R. D. Williams	T. Murphy	Canadian Pacific S.S., Ltd.	19.1.49
<i>Empress of France</i>	GNTV	B. B. Grant	G. T. Sharpe, R. M. King, E. Thomson	R. T. Jones	Watts, Watts & Co., Ltd.	13.10.48
<i>Epsom</i>	GCYD	R. D. Griffiths, O.B.E.	V. Irving, C. P. Turquand, S. Langsford,	H. Lammas	Elders & Fyffes, Ltd.	16.6.49
<i>Eros</i>	GYSB	R. C. Vigurs	H. Beyer			
<i>Esperance Bay</i>	GSMP	T. V. Roberts, R.D. Capt., R.N.R.	D. T. Mouldy, K. Murray-Brown, D. Wright	P. Moloney	Shaw, Savill & Albion Co., Ltd.	16.12.48
<i>Essex Trader</i>	GCMS	C. Arundell	W. Kemp, F. Stamps, D. Harris	A. B. Pilkington	Trader Navigation Co., Ltd.	27.6.49
<i>Eso Glasgow</i>	GTXC	H. C. Fellingham	R. Davies, H. Wheatley, D. Harris	P. J. Everett	Anglo-American Oil Co., Ltd.	12.7.49
<i>Explorer</i>	GYIX	W. F. O'Neill	J. L. Williams, G. Cubbin, R. H. Soar	G. A. Bart	T. & J. Harrison	6.1.49
<i>Famad Head</i>	GNQQ	W. A. Haddock	A. Fee, T. S. McMaster, R. G. Pass, R. Coffey	A. L. Thomson	G. Heyn & Sons, Ltd.	20.4.49
<i>Fantee</i>	GTBD	J. W. Andrew	P. M. Ralston, G. H. Griffiths, S. Burley	W. A. Johnston	Elder Dempster Lines, Ltd.	2.3.48
<i>Finland</i>	MIYZ	A. Wilson, O.B.E.	I. S. Dryman, J. W. Phimister		Currie Line, Ltd.	18.3.48
<i>Fordale</i>	GSMW	T. Oliver	M. Harries-Beadnell, R. Welch, A. O. Griffith, B. Clarke-Lens	J. Knight	Shaw, Savill & Albion Co., Ltd.	5.11.48
<i>Fort Cadotte</i>	MAKS	F. E. Patchett	K. D. A. Lamb, N. MacAlister, H. Parry-Williams	G. K. Ramsey	Cunard White Star, Ltd.	11.2.49
<i>Fort Musquarro</i>	MXLF	J. D. Armstrong	M. Hehir, J. D. Smythe, D. R. Button	J. Sheahan	Cunard White Star, Ltd.	24.2.49
<i>Fort Nakasley</i>	MAMM	A. Johnson	A. M. Allan, R. F. Leithhead, A. S. Kelly	J. K. McCormack	I. & J. Denholme, Ltd.	16.8.48
<i>Fort Spokane</i>	MXLY	A. B. Fastang, R.D., R.N.R.	I. Farrow, M. V. Mearden, R. J. Ogilvy	V. P. Manahan	Cunard White Star, Ltd.	18.1.49
<i>Franconia</i>	GBRQ	C. S. Williams	P. T. Drake, A. M. Thomson, J. Millington	G. M. Parsons	Cunard White Star, Ltd.	24.6.48
<i>Fresno City</i>	GBYD	H. Fisher	S. S. Jones, W. P. Davies, M. Keewill	T. H. Owen Foulkes	Sir W. Reardon Smith & Sons, Ltd.	24.2.49
<i>Geologist</i>	GIMR	A. E. Jackson	L. Richardson, M. Wardle, W. Owen	M. H. Whitehead	T. & J. Harrison	6.1.49
<i>Georgic</i>	GRJI	H. Dixon	I. O. Springall, K. T. Jones, H. P. Williams	A. G. Hill	Cunard White Star, Ltd.	19.7.48
<i>Geo. W. McKnight</i>	GCQM	R. A. Swan, O.B.E.	D. Aubrey, F. Eastman, S. M. Garside	J. Everitt	Anglo-American Oil Co., Ltd.	28.3.49
<i>Glaucus</i>	GDYZ	J. Macarthur	R. G. Edwards, F. A. S. Millar, H. Bell	E. Roberts	A. Holt & Co.	31.12.47
<i>Glenartney</i>	GBLG	W. E. Coates	C. Lorimer, J. B. Mothersill	F. Wilson	Glen Line, Ltd.	11.2.49
<i>Glenbank</i>	GKLC	T. Fraser	W. Murphy, D. V. Hoskins	W. Lingbottom	Andrew Weir & Co.	7.12.48
<i>Glenorchy</i>	GBLL	C. Houghton	C. C. J. Neaves, C. J. Sawle, J. F. Parry	E. F. Power	A. Holt & Co.	25.1.49

<i>Gloucester</i>	..	MANK	H. D. Horwood, R.D., R.N.R.	L. James, P. Slocombe, P. D. Moran .. D. M. Allan, G. B. Manson, I. Barbour .. J. Donovan .. J. R. Ramsay, H. P. Lurin, J. T. Peattie, E. B. Mallett ..	R. J. Devlin .. M. Grant ..	Federal Steam Nav. Co., Ltd. .. Donaldson Line, Ltd. .. Goulandris Bros., Ltd. ..	20.4.49 25.4.49
<i>Gracia</i>	..	MANN	I. McInnes ..	G. S. Robinson, J. B. Steele ..	J. Matthews ..	New Zealand Shipping Co., Ltd.	8.1.49
<i>Grainford</i>	..	MOGC	E. C. J. Morgan ..	W. P. Abiey, M. B. Mactavish ..	D. J. O'Brien ..	J. and C. Harrison, Ltd.	24.2.49
<i>Haparangi</i>	..	GJYX	C. R. Pilcher, O.B.E.	J. W. Embleton, K. Cobb .. H. Knapper, J. W. MacKinlay, J. F. Whiteside ..	A. W. Hutchinson .. I. Donald ..	Anglo-Saxon Petroleum Co., Ltd. T. & J. Harrison ..	24.2.49
<i>Harmatris</i>	..	GTWP	A. R. Phelps ..	D. Buckle, J. Perkins, C. Wightman ..	F. Greaves ..	Bibby Line, Ltd. ..	12.7.49
<i>Helictna</i>	..	GKBC	F. T. Vine ..	L. W. Green, J. P. Martin, G. W. T.	W. Gay ..	Royal Mail Lines, Ltd. ..	4.3.49
<i>Herdsmen</i>	..	GPZX	W. A. Short ..	G. Griffiths, H. R. Wright ..	T. Desborough ..	Royal Mail Lines, Ltd. ..	8.1.49
<i>Herefordshire</i>	..	GOFG	H. Davis ..	Lillie ..	L. Cooper ..	Royal Mail Lines, Ltd. ..	26.1.49
<i>Highland Brigade</i>	..	GIKN	H. D. Hooper, O.B.E.	M. Wardle, R. Mawley, H. Nixon ..	F. Goodall ..	Booth S.S. Co., Ltd.	19.5.47
<i>Highland Chieftain</i>	..	GCTY	G. A. Bannister ..	H. G. Strickland, D. Barfoot, J. D. Todd ..	P. Probert ..	Stott, Mann & Fleming, Ltd.	14.12.48
<i>Highland Monarch</i>	..	GMZF	B. K. Berry, R.D., R.N.R.	W. Thompson, A. Turner, L. Leech .. W. D. Tullock, G. I. Outen, G. R. Ballard ..	J. Maudsley .. C. J. Rees ..	Stott, Mann & Fleming, Ltd.	7.2.49 26.5.48
<i>Highland Princess</i>	..	GEMN	P. Cooper ..	R. Sims, P. Jeannes, M. Wright ..	C. L. Lambe ..	New Zealand Shipping Co., Ltd.	20.4.49
<i>Hilary</i>	..	GQVM	J. Binns ..	T. J. M. Robertson ..		Currie Line, Ltd. ..	7.7.48
<i>Hopecrown</i>	..	GZZG	S. Wilson, O.B.E.	T. E. Williams, D.S.C., R.D., Lt. Cdr. R.N.R., L. A. Savers, R.D., Lt. Cdr.			
<i>Hopepeak</i>	..	GKGJ	G. Grindrod ..	R.N.R., P. J. Wahlberg, J. Mawhinney ..	F. N. Baskerville ..	Booth S.S. Co., Ltd.	23.6.49
<i>Hororata</i>	..	GYRL	F. H. Dufton ..	J. Anderson, N. I. Collett, P. Moulton ..	C. Littleboy ..	New Zealand Shipping Co., Ltd.	15.12.48
<i>Horsa</i>	..	MANZ	A. E. Taylor, R.D., Cdr. R.N.R.	A. Farrell, C. O'Connor, I. Pigott ..	F. Murray ..	G. Keyn & Sons, Ltd.	5.1.49
<i>Hubert</i>	..	MPFJ	D. Dickson ..	S. Duncan, H. E. Hoyle ..	W. Chalmers ..	Andrew Weir & Co. ..	28.9.48
	..	GFNW	J. Whayman, D.S.C., R.D., Capt. R.N.R.	E. G. J. Roberts, F. Saunders, P. R. K. Davis ..	R. Hartley ..	Kaye Son & Co., Ltd.	11.3.49
<i>Hurunui</i>	..	GIZF	F. Loughheed ..	D. L. Beynon, J. H. J. Frost, T. Thomas ..	C. Codling ..	Sir W. Reardon Smith & Sons, Ltd.	19.5.48
<i>Inishowen Head</i>	..	MAOC	G. A. Moore ..	P. V. McCullough, B. A. Gouldstone, E. B. Pratt ..	J. J. Sheridan ..	Furness Withy & Co., Ltd.	28.3.49
<i>Inverbank</i>	..	GKML	A. M. Williamson ..	Lt.-Cdr. C. Minchin, R.N., Lieut. G. R. Slaughter, R.N., Lieut. F. R. Brooke, R.N. ..	P/O Bonner ..	Falkland Islands Dependencies Govt. ..	
<i>Jamaica Producer</i>	..	VPLM	P. D. Allen, O.B.E.	P. Bathurst, W. L. Harrison, R. E. Griffiths, A. J. Ellis ..	P. A. Senior ..	John Holt & Co. (Liverpool), Ltd.	5.5.49
<i>Jersey City</i>	..	GIGA	I. M. Cox ..	D. M. Steven, J. R. Suffren, F. Le Messurier ..	F. Matthews ..	Trinder, Anderson & Co. Trinder, Anderson & Co.	21.8.48
<i>Jessmore</i>	..	MAOF	R. E. Holland ..	C. F. Turner, J. Milne, J. Newing ..	T. Herbert ..	Trinder, Anderson & Co.	4.1.49
<i>John Biscoe</i>	..	GFLF	Cdr. H. Kirkwood, D.S.C., R.N.	J. K. Mumford, J. H. Drummond, I. Bigham ..	C. Robinson ..	Union Castle Mail S.S. Co., Ltd.	24.2.49
<i>John Holt</i>	..	GNFD	A. Kennedy ..	B. Linklater, A. Stalker, R. Herbert ..	L. Roberts ..	Federal Steam Nav. Co., Ltd.	29.6.49
<i>Kaipaki</i>	..	GQJG	T. Fenwick ..	W. Keith, G. Griffiths, P. Kidd ..	W. Fielding ..	Dodd, Thomson & Co., Ltd.	10.10.47
<i>Kaipara</i>	..	GZPY	G. P. Parkinson ..	J. C. Davies, G. F. Hogg, A. J. Moore ..	P. Kelly ..	Dodd, Thomson & Co., Ltd.	7.12.48
<i>Kaituna</i>	..	GQGG	R. F. Hellings ..	W. G. Smith, J. E. Belt, P. H. Alexander ..	P. Goss ..	F. G. Strick & Co., Ltd.	12.1.49
<i>Kenilworth Castle</i>	..	MQLP	J. E. R. Willford ..	J. N. Bridges, D. B. Owen, A. R. Norton, N. J. Blair ..	D. Robins ..	Vacuum Oil Co., Ltd.	28.3.49
<i>Kent</i>	..	GPDC	N. A. Thomas ..				
<i>King Robert</i>	..	MAON	G. Craze ..				
<i>King William</i>	..	GNVF	A. B. Drever ..				
<i>Kohistan</i>	..	GSFZ	A. N. Henderson ..				
<i>Lacklan</i>	..	GNBB	A. McCausland ..				

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Laguna</i>	GJKC	S. E. Ayland	T. Hiatt, W. P. Goldie, P. McMenamin	T. Dunshire	Pacific Steam Navigation Co.	20.4.49
<i>Lambrook</i>	MAOS	H. F. McInnes	J. Orr, A. Sillars, R. F. Arnold	J. W. Fulton	Galbraith, Pembroke & Co., Ltd.	1.6.49
<i>Lanarkshire</i>	GCTC	C. E. O'Byrne	A. Mair, M. T. Morton, W. W. S. Arnott	J. B. Allan	Turnbull, Martin & Co., Ltd.	12.7.49
<i>Lancashire</i>	GLZC	A. Beharrel	W. H. Malley, J. C. Priest, B. MacKinnon	A. Jones	Bibby Line, Ltd.	25.4.49
<i>Lassell</i>	GFND	D. Roberts	S. Dickenson, J. Bicknell, P. V. des Landes	N. Moore	Lampart & Holt Line, Ltd.	1.6.49
<i>Latia</i>	GLCF	R. S. Walker	W. J. Erskine, R. W. Lumsden, G. A. Hubbard	W. E. Delamere	Anglo-Saxon Petroleum Co., Ltd.	2.11.48
<i>Leicester</i>	GBTG	H. M. Lawson, R.D., R.N.R.	C. R. Eaddy, C. G. Watterson, J. M. Whitridge, L. Anderson	W. C. Doyle	Federal Steam Nav. Co., Ltd.	12.7.49
<i>Leverbank</i>	GLPZ	D. Gillies	F. E. Barnes, F. Methan, G. Dineley	L. Bradshaw	Ellerman's Wilson Line, Ltd.	1.6.48
<i>Linguist</i>	GOBC	A. H. Frew	H. D. Lawton	J. Eager	Union Castle Mail S.S. Co., Ltd.	4.11.48
<i>Livorno</i>	GPWF	E. S. Green	H. L. Halcrow, D. W. Verniers, A. H. Benson	M. Riley	Junecrest Shipping Co., Ltd.	25.2.49
<i>Llangibby Castle</i>	GPLV	C. C. Page	J. H. Allenby, J. H. Kelly, G. E. Mitchell	J. J. Glynn	Pacific Steam Navigation Co.	18.3.48
<i>Lloydcrest</i>	MAOY	T. Walker	G. E. Leech, D.S.C. W. M. Morton, J. V. Bradbury, J. M. Ashworth	M. R. Littlejohn	Royal Mail Lines, Ltd.	12.7.49
<i>Lobos</i>	GDXL	A. J. Litherland	E. A. E. Littlewood, J. W. Kavanagh, J. M. Barber, P. Campbell	D. Morgan	Royal Mail Lines, Ltd.	12.2.49
<i>Loch Avon</i>	GMZT	W. W. Lowe	D. R. Bryden, R. C. Hunnisett, V. Charles	D. Douglas	Ships Finance & Management Co., Ltd.	4.3.49
<i>Loch Garth</i>	GMZY	D. R. Miller	A. H. Treikelder, J. Janczak, J. S. Armstrong	J. Saidler	G. Heyn & Sons, Ltd.	12.3.48
<i>Loch Ryan</i>	MAOZ	A. R. Osburn	W. R. Nelson, A. F. James, D. Philpotts	D. O'Callaghan	G. Heyn & Sons, Ltd.	20.4.49
<i>Lord Gladstone</i>	MAPA	P. J. Kenny	R. M. Hall, R. Harper, C. R. Wilson	C. A. Murphy	Pacific Steam Navigation Co.	18.3.49
<i>Lord Glentoran</i>	GRMK	W. J. Lenister	R. J. B. Lewis, D. T. Beamish, J. V. Hatfield	G. Surtees	Pacific Steam Navigation Co.	4.1.49
<i>Lord O'Neill</i>	GRLZ	R. A. Ferguson	F. Leicester, G. E. Turner, J. Galston	S. Money	H. E. Moss & Co.	20.6.49
<i>Loriga</i>	GCLM	J. E. Evans, D.S.C., R.D., Capt., R.N.R.	A. W. Banks, R. M. Chalmers	D. Whiting	A. Holt & Co.	28.3.49
<i>Losada</i>	GDXM	P. L. Hockey	J. Anderson, J. Cook, E. Hill	W. Ogilvie	T. & J. Brocklebank, Ltd.	14.12.48
<i>Luminous</i>	MAPB	S. Weatherston	— Jackson, L. J. S. Saxty, — Kirkham, — Ralli	— Fisher	T. & J. Brocklebank, Ltd.	10.3.49
<i>Machaoan</i>	GDPB	J. L. W. Johnston	N. H. Embleton, J. Robertson, R. J. Ryding	E. Halton	T. & J. Brocklebank, Ltd.	4.1.49
<i>Macharda</i>	GKKF	R. A. Penston	J. Brand, J. C. Long, P. Greenall, G. P. Hurns	T. Williams	T. & J. Brocklebank, Ltd.	4.3.49
<i>Magdapor</i>	GBJX	A. Hill, O.B.E.	D. L. Campbell, E. G. Anderson, L. Burn	C. W. Jacobs	T. & J. Brocklebank, Ltd.	16.12.48
<i>Mahanada</i>	GOFM	J. W. B. Robertson, R.D., R.N.R.	J. W. Ross, D. Evans, A. P. Briggs	P. Kinderman	T. & J. Brocklebank, Ltd.	5.5.49
<i>Mahout</i>	GDZN	H. F. Scoins	J. P. Pembroke, M. H. Taylor, D. L. des Landes	A. G. Lea	T. & J. Brocklebank, Ltd.	12.7.49
<i>Mahseer</i>	GZSV	L. T. Owen, O.B.E.	C. S. W. Gray, E. Watkins, R. F. Holland	G. Caddy	T. & J. Brocklebank, Ltd.	12.3.49
<i>Mahsud</i>	GSCP	R. Humble	R. M. Lucas, J. P. Hackworth, D. Hay	J. Caddy	T. & J. Brocklebank, Ltd.	21.7.48
<i>Maihar</i>	GSCL	S. Broughton	W. Gibson, D. S. Carter, J. Kemp	R. Burton	T. & J. Brocklebank, Ltd.	18.1.49
<i>Makalla</i>	GOFN	T. A. Eddy	E. Roberts, J. R. Stephens, N. A. Hill	G. Close	Prince Line, Ltd.	25.4.49
<i>Malakand</i>	GOFB	J. Owen	P. J. Leech, A. Jewers	W. Humphries	Houlder Bros. & Co., Ltd.	13.6.49
<i>Malancha</i>	GZRD	H. MacGregor	R. M. Sinclair, G. E. Howe, J. C. Jenkins	A. Macbeth	Ellerman's Wilson Line, Ltd.	
<i>Malayan Prince</i>	GFVW	J. D. Fraser			P. & O. Steam Navigation Co.	
<i>Malmesbury</i>	MAQE	W. McMellin				
<i>Malmo</i>	GQCN	J. W. Calvert				
<i>Maloja</i>	GFBD	E. J. Parry				

Manchester City	GBBP	F. L. Osborne	W. Hine, G. R. Thompson, S. Hinchcliff	H. J. Coates	Manchester Liners, Ltd.	9.6.47
Manchester Commerce	GKMY	H. Hancock	W. E. Quick, J. E. Askew, R. Wadsworth	A. R. Evans	Manchester Liners, Ltd.	8.6.48
Manchester Division	GBYR	E. W. Espley	M. F. Robinson, C. Cuid, T. H. Lynn	P. Cummins	Manchester Liners, Ltd.	2.2.48
Manchester Port	GYNF	F. Downing	F. Lewis, L. Taylor, C. Marchant	W. C. Critchley	Manchester Liners, Ltd.	5.1.49
Manchester Progress	GPGD	W. H. Downing	W. R. McLaren, D. Thomas, A. C. Caird	J. Reid	Manchester Liners, Ltd.	5.1.49
Manchester Regiment	GBRD	F. D. Struss, O.B.E., D.S.C.	F. Lewis, D. Heaton, T. H. Lynn	E. Ambler	Manchester Liners, Ltd.	14.1.47
Manchester Shipper	MAPC	J. Barclay	W. E. Oliver, P. N. Fielding, A. C. Caird,			
Manchester Trader	GMWG	E. W. Raper	N. Cockshoot	A. C. Gavin	Manchester Liners, Ltd.	12.1.49
Mandasor	GBNY	L. E. Jeans	D. A. Morris, A. W. Wiltshire, F. P.	G. W. Hazel	T. & J. Brocklebank, Ltd.	11.1.49
Maplebank	GBSD	N. P. McLeod	Atwood	J. B. Anderson	Ellerman's Wilson Line, Ltd.	21.8.48
Marengo	GLFW	F. Ellison	A. Hillerby, R. Turty, J. Leach	G. Camm	Kaye, Son & Co., Ltd.	24.2.49
Margay	GFYQ	E. A. Prentice	C. H. Forster, H. Leadbetter, F. G. Hardy	J. McFarlane	Dalhousie S.S. Co.	24.2.49
Marietta Dal	GBQJ	J. G. F. Brighty	L. D. Forster, R. H. Jenkins, C. Jacob	A. Hadden	T. & J. Brocklebank, Ltd.	7.2.49
Markhor	GTFZ	W. Hill, O.B.E.	I. A. MacLaren, J. Ritchie, R. N. Bonny	D. Owen	Chr. Salvesen & Co.	27.8.48
Marna	MLPK	J. Nelson	R. J. Sinclair, W. Allen	K. C. Wright	Kaye, Son & Co., Ltd.	4.1.49
Marquita	GQVY	F. C. Jennings	J. Cush, T. Liddle, D. Parker		T. & J. Brocklebank, Ltd.	
Marsdale	GBKB	M. Ferguson	H. Jones, J. Tiers, L. Marsell		T. & J. Brocklebank, Ltd.	
Martand	GTGG	T. Fox-Lloyd	E. L. Jones, P. A. Litherland, W. H.			
Martita	GNQT	H. Bunn	Clifford Hicks	D. H. Butterworth		
Mataroa	GCSV	S. Oswald	M. G. Stevens, P. A. Kelly, D. Johnstone	P. McDonnell		13.5.49
Matheran	GOFQ	A. B. Bannatyne, O.B.E.	P. M. Williams, J. G. Beck, D. S.	L. Boyce	Shaw, Savill & Albion Co., Ltd.	7.3.49
Matina	GSZX	H. Roberts	Aberdeen	P. Neeson	T. & J. Brocklebank, Ltd.	13.5.49
Mauretania	GTIM	R. C. Thelwell, O.B.E.	G. Roberts, E. Whitehouse, J. Mayo	A. C. Knight	Elders & Fyffes, Ltd.	9.6.49
Media	GSWR	A. D. C., R.D., R.N.R.	N. Carter, J. Ward, J. Mitchell	F. Clarke	Cunard White Star, Ltd.	10.11.48
Melbourne Star	GDFZ	C. S. Williams	J. A. B. Munro, R. A. Elder, C. H. Cooke	J. MacArdle, M.B.E.	Cunard White Star, Ltd.	20.7.48
Millais	MAPH	F. N. Riley, D.S.O.	J. Edgar, D. S. Leicester, A. B. Baines	G. Norton	Blue Star Line, Ltd.	12.1.49
Mirror	GDFL	A. R. Bibby, O.B.E.	R. E. Small, P. B. Henderson, C. E. Burrill	J. Crouch	Lampart & Holt Line, Ltd.	5.12.47
Monarch	GBDF	S. A. Gammon	K. H. Joy, A. Hoar, — Black-Tuckwell	E. Robinson	Cable & Wireless, Ltd.	18.7.47
Mooltan	GFBC	J. P. F. Betson	A. E. Clay, T. A. Sergeant, P. G.	F. Ash	Postmaster General	28.3.49
Moveria	GKYW	C. H. Baxter	Pattinson, J. A. Clifford	R. H. Hallum	P. & O. Steam Navigation Co.	12.2.49
Murillo	MAPM	J. McMillan	A. T. Jorston, R. S. Hopkins	R. Diamond	Donaldson Line, Ltd.	5.5.49
Myrtlebank	GLQB	W. Gillespie	I. Owen, W. J. Neill, D. Halzall		Lampart & Holt Line, Ltd.	
Napier Star	MAPN	F. Hale	G. G. Hodgson, J. T. Duncan, F. J.	N. Kehoe	Andrew Weir & Co.	12.7.49
Naticina	GIGH	E. N. Rhodes	Adamson	T. W. Murray	Blue Star Line, Ltd.	7.2.49
Nestor	GPYX	F. Mansfield	E. W. Jenkins, J. B. Kennedy, J. Bain	J. E. Conway	Anglo-Saxon Petroleum Co., Ltd.	4.1.49
Newfoundland	GNYC	A. W. Powell, M.B.E.	P. Kendall, M. Goddard, L. Stephens	J. D. Florio	A. Holt & Co.	20.9.48
New Zealand Star	GYCR	E. T. Church, O.B.E.	J. Lloyd-Jones, E. H. Davies, B. C. Pays	T. Cahill	Furness, Withy & Co., Ltd.	5.5.49
Norfolk	GJLV	G. Owen, O.B.E., R.D.,	J. B. Stewart, J. Sheffield, L. Pooney	C. J. Carter	Blue Star Line, Ltd.	15.12.48
Norlumberland	GBSJ	A. T. Robertson, R.D.,	R. Stewart, G. Munro, F. Wood	J. Heath	Federal Steam Nav. Co., Ltd.	12.2.49
Norwegian	GDMC	Capt., R.N.R.	J. G. Robinson, A. B. Moss, J. S. Glover	J. Charter	Federal Steam Nav. Co., Ltd.	7.12.48
Nova Scotia	GNNK	A. E. Williams	H. Cubitt, C. Masson, J. Witchell		Donaldson Bros. & Black, Ltd.	
Novelist	GMLG	J. Pollock	J. D. P. Williams, E. Cunningham, K.	W. C. Brock	Furness, Withy & Co., Ltd.	5.1.49
Orari	GJKX	J. E. Wilson, O.B.E.	Rowland	J. Mathieson	T. & J. Harrison	21.9.48
Orbita	GLTQ	T. E. Steel	D. O. Percy, G. A. Cain, K. G. Watson	F. Wilman	New Zealand Shipping Co., Ltd.	3.1.49
Orcades	MABA	E. A. J. Williams	A. Mackenzie, W. Pelt, J. Edmondson	W. McCormick	Pacific Steam Navigation Co.	3.1.49
		J. Sutherland	E. G. Shephard, G. E. Mitchell, P. Whel-		Orient Steam Nav. Co., Ltd.	
		C. Fox, C.B.E.	bourn			

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Orduna</i>	GLTS	J. Whitehouse	T. Wilcockson, W. Singleton, J. Owen	J. Clarke	Pacific Steam Navigation Co.	14.6.49
<i>Orion</i>	GYKL	Sir A. Baxter, K.B.E., D.S.C., R.D., Cmde., R.N.R.	M. R. Wilmshurst, A. Murray, D. K. Kinloch	T. Shannon	Orient Steam Nav. Co., Ltd.	11.1.49
<i>Ormonde</i>	GLYC	I. E. Goldsworthy, R.D., R.N.R.	C. S. Thomas, R.D. Lt.-Cdr., R.N.R., L. C. Kingswood, P. J. Collier	R. Oakley	Orient Steam Navigation Co., Ltd.	7.12.48
<i>Orontes</i>	GBXM	N. A. Whinfield	R. F. Underwood, F. W. Woolley, D. R. Ward	F. Murphy	Orient Steam Navigation Co., Ltd.	4.1.49
<i>Otranto</i>	GFKV	T. L. Shurrock, O.B.E.	E. V. Harris, — Thomas, F. B. Woolley	C. T. Seaton	Orient Steam Navigation Co., Ltd.	14.5.48
<i>Pacific Enterprise</i>	GBPY	M. E. Cogle, O.B.E.	J. Crosthwaite, M. J. Brown, J. T. Cameron	A. F. Cory	Furness Withy and Co., Ltd.	1.11.48
<i>Pacific Exporter</i>	GBJC	W. F. Swann	D. MacDonald, M. J. Brown, A. Pringle	A. Cary	Furness, Withy & Co., Ltd.	23.6.49
<i>Pacific Fortune</i>	GBFM	E. O. Evans	G. Cook, A. Linden, G. Williams	V. Ash	Furness, Withy & Co., Ltd.	8.12.48
<i>Pacific Importer</i>	GDKV	B. M. Collard	B. A. Newcomb, P. S. Taylor, E. H. Gregson	A. L. Cawley	Furness, Withy & Co., Ltd.	12.2.49
<i>Pacific Liberty</i>	GDFQ	N. Conbrough	J. Clarke, D. R. Gibson, — Keene	S. Vincent	Furness, Withy & Co., Ltd.	21.1.49
<i>Pacific Nomad</i>	GCRZ	E. A. Kemp	H. P. Last, A. H. N. Pugh, A. R. Stephenson	I. G. Lawrie	Shaw, Savill & Albion Co., Ltd.	5.1.49
<i>Pacific Shipper</i>	GKBV	E. V. Richards	— McKinley, W. H. Davis, R. Budson	R. McCarthy	MacAndrews & Co., Ltd.	14.12.48
<i>Pacific Stronghold</i>	GNSQ	F. H. Perry	M. A. Frenfield, G. T. Page, J. A. Lefevre	H. Olding	P. & O. Steam Navigation Co.	28.6.48
<i>Pacific Unity</i>	GBFN	H. S. Reveley	K. E. McChure, C. W. Williams, K. R. Towers	J. Stone	MacAndrews & Co., Ltd.	
<i>Pakeha</i>	GBMK	H. C. Smith	G. R. Naylor, E. White, T. Bennett	H. Booth	Royal Mail Lines, Ltd.	6.8.48
<i>Palacio</i>	GNJW	J. P. Harris	R. Luly, J. Hedley, W. Dan	A. R. Smith	New Zealand Shipping Co., Ltd.	13.9.48
<i>Palana</i>	MMBF	F. R. Spurr	G. A. Gibbons, D. Davies, M. Blackman	W. Sykes	New Zealand Shipping Co., Ltd.	27.6.49
<i>Palomares</i>	GJGN	D. L. Thomas, M.B.E.	C. G. M. Smith, M. Hawkins, J. M. Barber	P. Goulden	Royal Mail Lines, Ltd.	21.1.49
<i>Pampas</i>	GCDL	T. Powell	J. T. Jones, R. C. Hunnisett	R. H. Turner	Royal Mail Lines, Ltd.	20.4.49
<i>Papanui</i>	GDIW	B. Evans	P. C. Reed, R. Elenor, A. W. Dallas	N. H. Crocker	Royal Mail Lines, Ltd.	21.3.49
<i>Paparoa</i>	GBCZ	E. Hopkins	K. T. Jones, F. Watts, P. Walton	B. S. Magennis	P. & O. Steam Navigation Co.	12.2.49
<i>Paraguay</i>	MAQS	H. V. Todd	J. Walker Brown, I. S. MacColl, A. Crozier, T. A. Hood	A. O'Sullivan	Cunard White Star, Ltd.	2.12.48
<i>Pardo</i>	GMNZ	R. N. Fletcher	R. K. Pannell, P. Hewitt, R. T. Neve	R. Wilson	P. Henderson & Co.	23.6.49
<i>Parina</i>	GCLQ	J. Smith, R.D., Cmde.	J. Browne, C. Stonehouse, D. G. Geddes, M. J. Skillington	F. Groves	P. & O. Steam Navigation Co.	28.3.49
<i>Paringa</i>	MMBD	C. E. Pollitt	C. B. Davies, D. C. Diggins, P. Slater	F. Rayner	Turnbull, Martin & Co., Ltd.	8.6.49
<i>Parthia</i>	GSWQ	G. H. G. Morris	D. P. Warren, P. Anthony, J. Egan	P. Hampson	General Steam Nav. Co., Ltd.	
<i>Pegu</i>	GFGP	S. Thomson	P. M. Busby, D. G. Seward, A. W. Finch	L. P. Sayer	T. & J. Harrison	4.1.49
<i>Perim</i>	GCGB	J. M. Peter	G. W. Sigsworth, G. G. Robins	— Gagney	Royal Mail Lines, Ltd.	1.6.49
<i>Perthshire</i>	GYWK	A. J. Hogg	J. Gilman, E. Smith		New Zealand Shipping Co., Ltd.	23.2.49
<i>Philomel</i>	GYPV	H. M. Selmer	W. G. Enright, O.B.E., Cdr. R.N.R.		Chr. Salvesen & Co.	
<i>Philosopher</i>	MAQV	H. Coates			Port Line, Ltd.	
<i>Pilcomayo</i>	GBZX	T. Davies				
<i>Pipiriki</i>	GDRQ	R. G. Rees				
<i>Planter</i>	GZSS	I. Harnden				
<i>Polar Maid</i>	MAQX	H. Leask				
<i>Port Auckland</i>	GWRB					

Port Brisbane	GWRC	W. G. Higgs, O.B.E.	P. A. N. Thomas, I. H. Stewart, J. A. W. Ashburner	E. G. Gunner	Port Line, Ltd.	..	4.3.49
Port Chalmers	GWQR	E. T. W. Lawrey	..	..	Port Line, Ltd.	..	..
Port Hobart	GKGC	T. F. Kippins, O.B.E., D.S.C.	A. J. Braund, J. D. Aitchison, R. G. Gilling	B. Morley-Evans	Port Line, Ltd.	..	16.12.48
Port Jackson	GZKR	F. W. Bailey, M.B.E.	C. Guest, D. M. MacKeith, R. E. C. Harris	R. C. Crompton	Port Line, Ltd.	..	23.2.49
Port Lincoln	GFZK	L. Copeland	G. G. Carter, G. Manley, M. W. Raggitt	P. T. McKeon	Port Line, Ltd.	..	28.6.49
Port Macquarie	MAQY	E. E. Roswell	R. M. Liley, F. Lascelles, H. A. Sproul-Cran	R. Robertson	Port Line, Ltd.	..	23.2.49
Port Phillip	MAQZ	J. G. Lewis, O.B.E.	F. M. Barton, E. G. Gilling, H. R. Long	B. McGovern	Port Line, Ltd.	..	6.1.49
Port Pirie	GLVQ	W. J. Enright, O.B.E., R.D., Capt. R.N.R.	R. C. Matthews, A. W. Kensett, H. J. Haldrup	W. Miller	Port Line, Ltd.	..	25.1.49
Port Wellington	GDNI	E. I. Syvret	J. M. Bedwell, D. Sinclair, E. Newstead	J. S. Macpherson	Port Line, Ltd.	..	11.2.49
Port Wyndham	GYCW	H. W. Hazlewood	P. R. Lewis, P. G. Henneker, C. M. Watkins	J. N. Coutts	Port Line, Ltd.	..	20.4.49
Potaro	GNLI	D. R. Miller	R. D. Jones, R. R. Thompson, J. T. Price	T. J. Berry	Royal Mail Lines, Ltd.	..	11.5.48
Pretoria Castle	GOAE	J. C. Brown, C.B.E., R.D., Capt. R.N.R.	D. Kernick, A. Peers-Jones, C. J. Willis	H. Oliver	Union-Castle Mail S.S. Co., Ltd.	..	8.1.49
Rakaia	GFGW	J. Oxnard	J. Sladen, B. Crust, F. Christall	P. Holmes	New Zealand Shipping Co., Ltd.	..	3.1.49
Ranchi	GLKW	R. E. T. Tunbridge, D.S.C., R.D., A.D.C., R.N.R.	E. R. Rose, J. Clayton, C. E. Waller	R. V. Gregory	P. & O. Steam Navigation Co.	..	18.1.49
Rangitiki	GSXW	P. B. Clarke, M.V.O., O.B.E., D.S.C.	G. C. Simpson, R. E. Baker, J. E. Crewdson	S. Peeling	New Zealand Shipping Co., Ltd.	..	18.1.49
Recorder	GTPV	R. F. Longster	P. A. Leighton, P. B. Dilleigh	F. Foye	T. & J. Harrison	..	26.5.49
Red Charger	GCNF	R. Nash	C. Noble	..	Iago Steam Trawler Co., Ltd.	..	..
Red Crusader	GTBP	B. Rogerson	E. Arthur, W. Elliott, G. Friskney	R. Green	Iago Steam Trawler Co., Ltd.	..	..
Red Knight	MBQT	E. Littler	J. A. Greenwood, J. B. Olason, W. J. Campbell	R. W. Jones	Iago Steam Trawler Co., Ltd.	..	1.6.49
Red Lancer	MKTP	M. Wright	D. M. Muir, F. L. James, G. R. Watts	J. Moffat	Trinidad Leaseholds, Ltd.	..	18.10.48
Regent Hawk	GMND	J. Ward	R. H. Jones, P. J. Ellett, A. S. Frier, R. B. Escreet	..	West Dock Steam Fishing Co., Ltd.	..	..
Reighton Wyke	GZDM	G. Clixby	J. W. Lewin, W. Kilgour, W. Shaw	J. Butler	Pacific Steam Navigation Co., Ltd.	..	12.7.49
Retna del Pacifico	GMPS	W. A. Hearle	S. Sloan, K. D. William, L. Gellie	W. Keogh	Galbraith, Pembroke & Co., Ltd.	..	23.6.49
Repton	GPFL	D. Cowrie	J. A. Scott	R. C. Wilde	Blue Star Line, Ltd.	..	17.6.49
Rhodesia Star	GFKN	C. H. Watson	..	J. H. Burgess	Ellerman's Wilson Line, Ltd.	..	13.10.48
Rialto	GRLV	G. Hodgson	..	J. Scott	Union Castle Mail S.S. Co., Ltd.	..	6.12.48
Richmond Castle	GCSP	J. A. Sowden	..	S. Godfrey	Union Castle Mail S.S. Co., Ltd.	..	22.4.48
Richmond Hill	GМКJ	J. P. Allen	..	E. R. Saunders	P. & O. Steam Navigation Co.	..	20.4.49
Riebeck Castle	GNGL	M. S. Hodson	..	S. Marchant	Houlder Bros. & Co., Ltd.	..	22.4.48
Rimutaka	GFBJ	P. B. Clark, M.V.O., D.S.C., O.B.E.	D. L. Willmott, J. M. Heeley, T. Wadie	R. Munro	Anglo-American Oil Co., Ltd.	..	10.11.48
Ripplingham Grange	GIGP	R. Owen	H. Butler, D. Shaw, E. A. Prothero	..	Hewett Fishing Co., Ltd.	..	..
Robert F. Hand	GWML	E. J. Instone, O.B.E.	J. Ratray, J. J. Jones, —, Stoneman	G. Mein	Union Castle Mail S.S. Co., Ltd.	..	25.4.49
Robert Hewett	MDYS	G. Elliott	H. Wilcock	H. E. Robinson	Andros Shipping Co., Ltd.	..	7.3.49
Rochester Castle	GZQF	J. M. Rayner, R.D., Cdr. R.N.R.	G. D. Fowler, R.D., Lt. Cdr. R.N.R., J. V. H. Drummond, A. F. George	T. M. K. Knowles	Union Castle Mail S.S. Co., Ltd.	..	14.6.48
Rocksider	VGDN	H. L. Holland	F. Rossouw, N. E. Upham	..	..	..	..
Roslin Castle	GYJZ	R. A. D. Cambridge, D.S.C., R.D., Cdr. R.N.R.	K. M. Knight, J. V. H. Drummond, H. D. Lawton	..	..	..	..
Roswallan Castle	GDFT	..	..	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Roxburgh Castle</i>	GBGS	J. M. Rayner, R.D., Cdr. R.N.R.	H. N. Dryden, D.S.C., R. Fancourt, R. J. King T. G. Hughes, M. Rideout, M. Drummond	L. W. Bettinson M. Cahill	Union Castle Mail S.S. Co., Ltd. Blue Star Line, Ltd. Navigation & Coal Trade Co., Ltd.	18.3.49 11.1.49
<i>Royal Star</i>	MARI	G. Aldridge	J. A. Williamson	J. Macfarlane	Currie Line, Ltd.	8.1.47
<i>Rubystone</i>	MARK	E. J. Griffiths	A. Mathison, J. T. Hibbert	H. Holdridge	Bolton S.S. Co., Ltd.	
<i>Rutland</i>	GTCP	W. Thom	H. Edwards, C. W. Fox, J. Ryley	W. Parratt	Ellerman's Wilson Line, Ltd.	18.3.49
<i>Ruysdael</i>	MAQP	D. E. Norie			T. Hamling & Co., Ltd.	10.12.47
<i>Sacramento</i>	GKCN	J. Robinson, M.B.E.	D. L. Verity	D. L. Verity	St. Andrews Steam Fishing Co.	
<i>St. Apollo</i>	GBBZ	J. H. Ellis	H. Tock, W. R. Vickers, H. Harrison,	W. Hood	South American Saint Line, Ltd.	3.1.49
<i>St. Crispin</i>	MBSW	A. E. Hall	J. A. Woolven		T. Hamling & Co., Ltd.	
<i>St. Merriel</i>	GWDC	F. Menlight	P. C. Spink		Donaldson Bros. & Black, Ltd.	4.1.49
<i>St. Nectan</i>	GZJY		G. M. Clark, R. S. Macaulay, I. MacGregor	J. Wilson	Pacific Steam Navigation Co.	16.7.48
<i>Salacia</i>	GZRN	H. McLachlin	R. B. Bryant, W. P. Duguid, J. N. Owen	W. A. Steele	Pacific Steam Navigation Co.	18.1.49
<i>Salamanca</i>	GLSG	D. W. Hutchinson	P. D. O'Driscoll, J. Peters, A. Hudson	J. Slater	Pacific Steam Navigation Co.	27.6.49
<i>Salaverry</i>	GBLQ	J. D. Richards	A. Powell, R. Scaiff, R. R. Williams	F. J. Fitzgerald	W. Thomson & Co.	16.12.48
<i>Salinas</i>	GLLK	J. Williams	J. Brown, J. T. Fyffe, E. H. Booth	H. MacKay	Pacific Steam Navigation Co.	20.4.49
<i>Salmonier</i>	GDVV	J. D. Wilson	D. L. Jones, W. B. Holmes, G. D. Jeffery	A. Hatfield	Cunard White Star, Ltd.	3.1.49
<i>Samanco</i>	MARQ	A. Lyall	Lidgey, — Jones, — Clark	E. P. Bishop	Eagle Oil & Shipping Co., Ltd.	17.5.49
<i>Samaria</i>	GJCF	J. A. Myles, R.D., R.N.R.	T. Magee, R. Wilkinson, G. Davies	S. G. Whiteford	Eagle Oil & Shipping Co., Ltd.	28.3.49
<i>San Adolfo</i>	GYKK	L. Mays	T. B. Wright, R. G. Scarey, D. A. Ward	D. W. Powell	Eagle Oil & Shipping Co., Ltd.	20.10.48
<i>San Cirilo</i>	GZMR	M. A. Connell, M.B.E.	A. Walker, J. Dixon, B. S. Orange	W. L. Radcliffe	Pacific Steam Navigation Co.	4.1.49
<i>San Felix</i>	GFJZ	J. B. Macarthy, O.B.E.	J. Norman, W. J. Campbell	J. C. Tomlinson	Eagle Oil & Shipping Co., Ltd.	20.4.49
<i>Santander</i>	GBNR	T. J. Naylor	R. Munday, W. D. Hepworth, R. B. Taylor	S. H. Wilson	Eagle Oil & Shipping Co., Ltd.	28.10.48
<i>San Velino</i>	GCNY	H. C. Archer, O.B.E.	R. Aurie, J. J. Greener, R. Purvis	T. A. Henderson	Eagle Oil & Shipping Co., Ltd.	3.5.49
<i>San Veronica</i>	MASQ	R. M. Atkinson	W. F. Hunt, J. D. Nash, P. Johnson	B. Kimble	Pacific Steam Navigation Co.	5.3.49
<i>San Vulfrano</i>	MASR	J. Thomson, O.B.E.	T. Hiatt, F. Nuttall, T. A. Ireland	N. Roberts	Blue Star Line, Ltd.	11.2.49
<i>Sarmiento</i>	MARW	G. H. Rice	H. Tomsett, L. Evans, G. Irving	R. Watson	Cunard White Star, Ltd.	5.1.49
<i>Saxon Star</i>	MARX	J. D. W. Davies	D. T. English, R. E. Harvey, J. M. Doran	B. Netscher		
<i>Scholar</i>	GDCC	D. Wolstenholme	D. R. Rosling, A. R. Graham, D. G. Dalziel	W. Blanchard		
<i>Scythia</i>	GDYP	W. M. Stewart, O.B.E.	W. G. McGuiness, V. F. Harrison, R. J. Turnbull	J. Macdonald		
<i>Selector</i>	MARZ	W. H. Slaughter	W. Baker, W. D. Aitken, R. Crenall	A. Brett		
<i>Settler</i>	GTTX	R. F. Phillips	J. H. Tomlinson, M. Rawson Duke, D. Paget Clarke	T. Coughlan		
<i>Silverbriar</i>	GDWM	T. S. Morgan	N. W. Rothwell, D. M. Lamont, N. C. Jones	R. Burrow		
<i>Silberguava</i>	GMVK	W. G. Cole	F. E. Godley, K. A. Wise, P. R. Miller	D. Will		
<i>Silveroak</i>	GCOR	W. N. Tulloch	G. Armatage, A. R. Moore, M. Beaumont	A. B. King		
<i>Silverplane</i>	MABL	H. Woodrow	J. M. Evans, W. Cole, H. Rose, M. Bingham	J. Thomas		
<i>Silverstandard</i>	GSFQ	J. H. Leask	W. J. Ross, J. B. de Wet, F. A. Ferguson	J. Hands		
<i>Silvertreak</i>	GSFR	E. Palmer	W. Locker, N. Newton, E. Wilson	A. D. Carter		
<i>Silverwalnut</i>	GSFT	E. L. Tilmouth	F. W. M. Pearce, E. Owen, E. Snowden,	H. Camp		
<i>Sneaton</i>	GDBS	W. Armstrong	P. W. F. Holmes	L. Whittington		
<i>Socotra</i>	MASC	C. F. Halliday	D. Davies, W. Martin, A. Robinson			
<i>Somerset</i>	GJMN	P. S. Calcutt				

Southern Collins	MASE	D. Hunter	D. Falconer, D. Moar, G. Reid	G. Ballantine	Chr. Salvesen & Co.	31.3.49
Southern Garden	MASF	W. J. Swanson	W. Scott R. Marshall, E. G. Sutton	W. J. Tullock	Chr. Salvesen & Co.	2.6.49
Sovac	GDDV	H. Anthony	I. Miller, R. Jarrett, L. Ash	E. Hobson	Vacuum Oil Co.	24.2.49
Speaker	GCGT	C. C. Heaton	R. J. Abbott	J. Glover	T. & J. Harrison	10.11.48
Specialist	GQYF	L. F. Harriman	J. Beam, A. F. Perry	A. Gray	Springwell Shipping Co.	18.1.49
Springfield	GQKQ	T. R. Mackle	J. Reid	T. W. Bearman	Stanhope S.S. Co., Ltd.	10.11.47
Stancourt	GKCP	F. H. Wainford	J. A. Jones	O. R. Wilcox	Stanhope S.S. Co., Ltd.	5.5.49
Stanhall	GQOZ	R. G. Wightman	P. J. Macpherson, L. A. Bowen West	D. Macdonald	Stanhope S.S. Co., Ltd.	29.6.49
Stanthorpe	GCZC	H. V. Roberts	E. L. Davies, R. S. Drew, N. R. Brown,	F. P. Williams	Union Castle Mail S.S. Co., Ltd.	23.2.49
			— Davidson	N. J. Braddon	Turnbull, Martin & Co., Ltd.	20.6.49
Stirling Castle	GYPX	W. A. Pace, O.B.E.	R. Kerr, R. Hudson, M. Gray	F. E. Ash	P. & O. Steam Navigation Co.	10.11.48
Stirlingshire	GCQD	J. McCrone	A. S. Palethorpe-May, G. A. Winter, R. T. Escotne	H. S. Horn	P. & O. Steam Navigation Co.	19.1.48
Strathaird	GRSX	H. S. Allen, R.D., R.N.R.	M. H. D'ath, R. L. Pigeon, J. Owen	A. M. Preston	Chr. Salvesen & Co.	13.5.49
Stratheden	GDGT	S. W. S. Dickson	H. Toon, D. G. Daniel, B. S. Mordaunt	J. Turnham	Federal Steam Navigation Co., Ltd.	20.4.49
Struan	MASI	M. Polson	J. Raffan, A. M. Brown	J. McMahon	Junecrest Shipping Co., Ltd.	6.2.48
Suffolk	GQOS	F. Pover	J. Laidlow, N. A. Dennis, D. Nicholson	I. R. Lloyd	Currie Line, Ltd.	31.3.48
Suncrest	GNWV	T. G. Barwell	T. L. Ison, J. E. Collins, P. Yate	D. Ford	B. J. Sutherland & Co., Ltd.	27.6.49
Sutherland	MJWR	J. McClure	C. Dick, D. Hogben, J. Walker	J. Williamson	Sir R. Ropner & Co., Ltd.	24.2.49
Sutherland	GBYG	R. W. Nicolson	R. Thwaites, A. L. Glenmit, H. Juele-Dorf	I. McConnell	Blue Star Line, Ltd.	12.7.49
Sutherland	GPFS	I. E. Roddam	K. Jackson, A. C. Bolton, W. M. Fallon	N. Brewer	Pacific Steam Navigation Co.	6.8.48
Sutherland	MRSM	T. F. McDonald, O.B.E.	A. Kennedy, J. C. Davies, G. C. Jones, J. C. Mackintosh	D. MacRae	Shaw, Savill & Albion Co., Ltd.	7.6.49
Talca	GCDT	A. G. Litherland	D. I. Jones, J. Butterworth, W. R. Holmes	G. Gilling	Elder Dempster Lines, Ltd.	6.1.49
Tamara	GFWX	W. Thompson	S. P. Oliver, J. B. Cousins, A. H. Baber	J. Campbell Wilson	Ellerman's Wilson Line, Ltd.	11.2.49
Tamela	GCBF	W. Munt	P. I. Finan, D. Thompson, A. Lamber	A. Holt & Co.	Elders & Fyfe, Ltd.	6.12.48
Tarkwa	MASU	G. D. Simpson	R. Munro, G. Moore, A. Bird	L. W. Bell	Royal Mail Lines, Ltd.	16.12.48
Tasso	GLMR	H. Scarbrough	D. J. C. Martin, R. Cludbertson, R. Whittleton	T. Carter	Hunting & Sons, Ltd.	20.5.49
Telemachus	GBLB	G. Brown, M.B.E.	A. G. Reed, P. D. F. Cruickshank, E. Brown	G. Nicholls	Ellerman's Wilson Line, Ltd.	10.11.48
Tetela	GMPN	R. W. Lundy, O.B.E., R.D., Cdr. R.N.R.	T. A. Buckney, R. J. Kistler, G. F. I. Jamieson	W. F. Sykes	New Zealand Shipping Co., Ltd.	17.3.48
Teviot	MASX	H. E. Sang	J. P. Ross, R. L. Newcombe, P. B. Goldie	G. Penkreith	G. Heyn & Sons, Ltd.	21.3.49
Thamesfield	GDGK	R. Cunningham	A. Ledger, E. J. Agar	L. B. Priestley	Hain Steamship Co., Ltd.	12.2.49
Tinto	GBYT	S. H. Bennett, M.B.E.	E. W. Clubb, D. L. Parkin, S. W. Lambrick	P. J. Walsh	Hain Steamship Co., Ltd.	20.4.49
Tongarivo	GLFZ	E. E. Chadwick	D. Gault, A. J. Farrel, W. Greig	J. T. W. Nixon	T. & J. Harrison	10.11.48
Torr Head	GZPW	M. Kennedy	J. Milne, P. Westcote, R. B. Dawson	W. G. Fitzgerald	Anglo-Saxon Petroleum Co., Ltd.	31.8.48
Tower Grange	MQJL	G. Robson	W. Phillips, J. F. Males, E. L. Cussons	J. H. Parkes	Royal Mail Lines, Ltd.	23.2.49
Trasilian	GCKP	W. Venables	R. B. Oliver, H. Nicholls, D. R. Jenkins	S. Hewitt	Bullard, King & Co., Ltd.	25.5.48
Treygylor	GCKG	M. S. Sadler	W. Lawton, J. S. Jones, J. Adams	A. H. Coxhead	Bullard, King & Co., Ltd.	12.2.49
Tribesman	GBNZ	A. Smart	D. W. Falconer	J. S. Sprunt	Cunard White Star, Ltd.	11.3.49
Tribulus	GFJS	F. Leask	— Meldrum, J. Chester, D. S. Guinness	W. T. Parkinson	Sir W. Reardon Smith & Sons, Ltd.	21.3.49
Tynda	MMIX	I. W. Leask	M. Blair, D. A. Forrester, J. C. Howell			
Tweed	GBRP	D. R. Miller	J. A. Bensley, F. Evans, D. G. Jupp, D. McNeill			
Truckenham	GNDC	W. D. Shields, O.B.E.	B. J. McAree, H. K. Underwood, L. Farrer			
Umtali	GYWB	F. E. J. O'Hea	H. D. Nock, K. Carter, C. R. Dench			
Umtala	GDQF	J. W. Miles	N. Jones, J. D. Smythe, A. Hoyle			
Umsinto	GIFQ	F. Harris	H. L. Evans, F. English, H. Bailey			
Valacia	MATR	W. L. P. Cox				
Vancouver City	GIGT	B. Carnaffon				

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Varadulia</i>	GCFW	J. F. Drake, O.B.E., R.D., R.N.R.	J. M. Hughes, I. A. Stewart, A. Bull	F. Berry	Cunard White Star, Ltd.	14. 10. 48
<i>Vasconia</i>	MQJY	G. S. Evans	A. L. Davies, R. H. Arnott, A. R. Graham	W. J. Peat	Cunard White Star, Ltd.	31. 3. 49
<i>Vestra</i>	MNNB	D. S. Archibald	I. D. Mackenzie, I. Macalpine	D. S. Archibald	Henrikssen & Co., Ltd.	
<i>Victrix</i>	GZLL	E. Garnett	C. F. Lawrence		Railway Executive (Eastern Region)	
<i>Vienna</i>	GTBR	A. P. Sutton	J. A. Tully, R. Fergus, E. Atkinson	F. Howell	British Oil Shipping Co., Ltd.	28. 2. 47
<i>Vivien Louise</i>	MATV	G. McLeod	R. E. Garisch	G. Williams	Ellerman's Wilson Line, Ltd.	22. 4. 48
<i>Volo</i>	GPCJ	A. Morrill	T. Briggs, T. A. Firth, T. Johnson			
<i>Waimana</i>	MATW	L. J. Hopkins	A. S. D. Masters, J. W. Webster, K. C. Davis, M. Lock, R. H. Dennison	A. C. Elliott	Shaw, Savill & Albion Co., Ltd.	10. 5. 49
<i>Waipapa</i>	GWXQ	R. G. Ireland	A. E. Smith, W. A. Hutchison, J. F. Scott, O. M. Thomas	W. Charlton	Shaw, Savill & Albion Co., Ltd.	26. 4. 49
<i>Wairangi</i>	MATX	W. G. West	D. Hasson, G. Lodge, C. Brodie	H. Jardine	Shaw, Savill & Albion Co., Ltd.	4. 3. 49
<i>Wawera</i>	GBJB	B. Forbes-Moffatt	E. Snaith, J. H. Moore, B. Hammond	J. Downie	Shaw, Savill & Albion Co., Ltd.	23. 2. 49
<i>Warwick Castle</i>	GRRI	J. Trayner	S. K. Smith	G. Shaw	Union Castle Mail S.S. Co., Ltd.	23. 6. 49
<i>Yoma</i>	GLPN	A. Rowlands	J. Morgan, D. Wilson, J. Kenniborough	W. Allen	P. Henderson & Co.	
<i>Zealandic</i>	MAGJ	P. F. Owens	P. J. Brentnall, G. R. Sherlock, D. A. Atkinson	A. McLennan	Prince Line, Ltd.	7. 6. 49

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<i>Conway, H.M.S.</i>	—	E. Hewitt, R.D., Capt. R.N.R.	The Senior Cadets	—	—	6. 5. 49
<i>Pangbourne Nautical College</i>	—	H. C. Skinner, O.B.E., Cdr. R.N.	The Senior Cadets	—	—	3. 4. 48
<i>Worcester, H.M.S.</i>	—	G. C. Steele, V.C., Cdr.	The Senior Cadets	—	—	28. 3. 46

FLEET LIST (New Zealand) VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships, voluntarily co-operating with the Meteorological Service of New Zealand.

NAME OF VESSEL	CAPTAIN	OBSERVER	RADIO OFFICER	OWNERS
<i>Huia</i>	A. J. Matheson	B. R. Druce	G. M. Gormlie	Nobel (Australasia) Proprietary Ltd.
<i>Kaikorai</i>	G. S. Beaton	A. Mackay	B. G. Hart	Union S.S. Co. of New Zealand, Ltd.
<i>Kairanga</i>	T. S. McNicol	E. W. Robb	L. M. Harvey	Union S.S. Co. of New Zealand, Ltd.
<i>Karetu</i>	W. E. Jones	D. H. Turnbull	A. E. Whalley	Union S.S. Co. of New Zealand, Ltd.
<i>Karitane</i>	G. Evans	J. C. Young	G. M. Throp	Union S.S. Co. of New Zealand, Ltd.
<i>Kauri</i>	A. T. Adam	E. Clark	W. A. Hawkins	Union S.S. Co. of New Zealand, Ltd.
<i>Komata</i>	F. Chapman	B. E. Avery	E. H. Ward	Union S.S. Co. of New Zealand, Ltd.
<i>Kopua</i>	A. F. Inman	G. H. Edwards	W. A. Taylor	Capt. J. Holm and crew.
<i>Kuraw</i>	J. Holm	A. R. Russel		Union S.S. Co. of New Zealand, Ltd.
<i>Manuka</i>	A. R. Russel	L. C. Boulton		Government of New Zealand (Pacific Islands Admin.
<i>Maui Pomare</i>				

<i>Pamir</i> ..	..	..	..	..	..	A. F. Jenkins ..	..	..	..	A. J. Stanton ..	..	Government of New Zealand.
<i>Port Waikato</i> ..	..	..	..	..	..	E. Anderson ..	..	..	..	..	..	A. F. Watchlin.
<i>Ranui</i> ..	..	..	..	..	..	N. Worth ..	..	..	..	..	..	Public Works Department.
<i>Wahine</i> ..	..	..	..	..	..	W. Grey ..	..	..	..	I. G. Rea ..	..	Union S.S. Co. of New Zealand, Ltd.
<i>Waipori</i> ..	..	..	..	..	..	C. Burgess ..	..	..	..	S. J. Waters ..	..	Union S.S. Co. of New Zealand, Ltd.
<i>Waitaki</i> ..	..	..	..	..	..	F. W. Gibson ..	..	..	..	C. V. Hayes ..	..	Union S.S. Co. of New Zealand, Ltd.
<i>Waitemata</i> ..	..	..	..	..	..	W. Whitfield ..	..	..	..	E. L. Hulme ..	..	Union S.S. Co. of New Zealand, Ltd.
<i>Whakara</i> ..	..	..	..	..	..	F. A. Barrett ..	..	..	..	..	..	Tasman S.S. Co.

FLEET LIST (Hong Kong)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships, voluntarily co-operating with the Royal Observatory, Hong Kong.

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	SHIPPING COMPANY OR OPERATORS
<i>Anhui</i> ..	..	..	..	China Navigation Co., Ltd.
<i>Bris</i> ..	F. H. Histad ..	A. J. Keddle, H. M. Stanfield, P. H. Ward ..	Leung Man Sing ..	China Siam Line
<i>Caroline Moller</i> ..	S. Eldjord ..	S. Mathiasen, A. Reitan, A. Roselund ..	A. Reitan ..	Mollers' (Hong Kong), Ltd.
<i>Chak Sang</i> ..	I. Adam ..	I. Mathieson, T. J. Smith, F. McKay ..	..	..
<i>Choy Sang</i> ..	G. W. F. Edwards ..	B. D. Johnson, I. D. Markland, Yuan Tso Ying ..	Im Ki ..	Indo-China Steam Navigation Co.
<i>Eastern Saga</i> ..	A. G. Robbiant ..	I. E. Williams, E. Jones, A. Nelson ..	Chow Tong Wa ..	Indo-China Steam Navigation Co.
<i>E Sang</i> ..	S. Schofield ..	W. E. Reeve, G. P. Parish, C. M. Wilson, F. L. Rowden ..	G. MacDonald ..	Indo-China Steam Navigation Co.
<i>Fengtien</i> ..	I. Shiel ..	L. C. Cox, J. R. Findlay, A. O. Jakobsen ..	Ma Ping Leung ..	..
<i>Foochow</i> ..	F. Gibbs ..	C. N. Stewart, C. L. Phillips, W. T. Masters ..	Leung Tjeuk Shing ..	China Navigation Co., Ltd.
<i>Fuhsing</i> ..	E. G. Thomas ..	S. Fergusson, G. S. Ireland, J. S. Anderson ..	Lam Bun Leung ..	China Navigation Co., Ltd.
<i>Fukien</i> ..	M. H. Wallace ..	C. M. Tso ..	Y. S. King ..	Chinese Maritime Customs
<i>Greytaka Castle</i> ..	G. T. M. Ramsay ..	I. W. E. Warrior, L. Walker, A. Roddis ..	Chin Fook On ..	China Navigation Co., Ltd.
<i>Hai Jung</i> ..	S. W. Millwright ..	F. Kelly, E. Docherty, R. N. Frappell, S. A. Archibald ..	..	Mollers' (Hong Kong), Ltd.
<i>Hai Lee</i> ..	M. M. Stewart ..	P. F. Yee, P. S. Wang, M. S. Wang, H. S. Hau ..	..	Chinese Maritime Customs
<i>Hai Yang</i> ..	I. Hansen ..	R. Olsen, H. J. Mikkelsen, H. Andersen ..	K. S. Wang ..	China Siam Line.
<i>Hang Sang</i> ..	W. G. Erwin ..	J. R. Simpson, H. L. Jett ..	T. Y. Chan ..	Douglas S.S. Co.
<i>Han ang</i> ..	L. W. Harrison ..	L. H. Smith, L. Oussanikoff ..	..	Indo-China Steam Navigation Co.
<i>Heinrich Jessen</i> ..	O. Fox ..	L. King, S. H. Liu, J. R. Keddie ..	Young Shan ..	China Navigation Co., Ltd.
<i>Hermelin</i> ..	R. A. D. Neilsen ..	J. P. Johansen, C. S. Jensen, N. E. Christensen ..	Leung Cheuk Shing ..	..
<i>Hin Sang</i> ..	S. B. Eliassen ..	Th. Pedersen, H. Berge, K. Andersen ..	P. Johnke ..	China Navigation Co., Ltd.
<i>Hiran</i> ..	C. R. Harris ..	R. C. Traill, W. Graham, D. Dekker ..	Th. Pedersen ..	China Siam Line
<i>Hong Sang</i> ..	Stange Olsen ..	T. Torkildsen, J. Jacobsen ..	E. V. Thoresen ..	Indo-China Steam Navigation Co.
<i>Hunan</i> ..	R. E. Agar ..	G. Goss, J. Barrett, H. B. Vance ..	K. T. Chan ..	China Siam Line
<i>Huangshing</i> ..	I. McKinley ..	B. L. Miller, P. Flory, J. C. Cristal ..	E. A. West ..	Ho Hong S.S. Co.
..	P. L. W. Leguit ..	H. K. Fung, H. M. Chu, Y. C. Hu ..	Choi Pong Cheung ..	China Navigation Co., Ltd.
..	..	..	S. C. Wang ..	Chinese Maritime Customs

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	SHIPPING COMPANY OR OPERATORS
<i>Hutuh</i> ..	W. E. Awcock ..	R. G. W. Gorman, E. W. Woodcock, A. P. Sokoloff ..	Tsang Kau ..	China Navigation Co., Ltd.
<i>Jungshing</i> ..	C. C. Norman ..	P. Whitecross, E. C. C. M. Trestfall, L. Ku ..	S. F. Yu ..	Chinese Maritime Customs
<i>Kwetyang</i> ..	J. Taylor ..	D. W. R. Gaah, M. D. B. Sweeny, G. Young ..	Leung Gan ..	China Navigation Co., Ltd.
<i>Kut Sang</i> ..	D. G. Burleigh ..	F. H. Main, B. D. Houston, J. Jones ..	W. H. Carmichael ..	Indo-China Steam Navigation Co.
<i>Lok Sang</i> ..	R. I. Groundwater ..	R. B. Todd, J. Mck. Marshall, G. E. N. Tinley ..	E. J. Chew ..	Indo-China Steam Navigation Co.
<i>Mau Sang</i> ..	R. G. Gillespie ..	J. H. Thomas, D. R. McFadzie, P. Bock ..	A. G. Lum ..	Mollers' (Hong Kong), Ltd.
<i>Muncaster Castle</i> ..	A. G. Gorham ..	W. A. Findlay, L. L. Watson, P. Potts ..	Chau Wing ..	China Navigation Co., Ltd.
<i>Nanchang</i> ..	J. W. Evans ..	S. I. Yeandle, A. Harper, P. Baxter ..	Liu Yuck Kong ..	China Navigation Co., Ltd.
<i>Newchwang</i> ..	M. Deffy ..	E. I. Griffiths, C. Stark, T. M. J. Davies ..	Lo Kin Chek ..	China Navigation Co., Ltd.
<i>Ninghai</i> ..	D. M. Holmes ..	E. J. Bower, St. E. M. F. Haslett, P. Bulatoff ..	Tang Chung Fai ..	China Navigation Co., Ltd.
<i>Pakhoi</i> ..	D. Wilson ..	W. J. Bunney, S. Davidson, D. R. Mackenzie ..	Li San Kau ..	China Navigation Co., Ltd.
<i>Poyang</i> ..	A. Taylor ..	A. V. Harrison, W. Layfield, C. B. Skinner ..	J. E. Martien ..	British India S.N. Co.
<i>Sangola</i> ..	R. H. A. Bond, O.B.E. ..	G. A. Brignall, J. R. Melgrove, C. P. C. Gordon ..	E. J. Rozario ..	China Navigation Co., Ltd.
<i>Shansi</i> ..	A. H. Finnie ..	F. Bruce, J. F. O'dowd, J. Hunter ..	Tsang Phu Leung ..	British India S.N. Co.
<i>Shengking</i> ..	D. Brothie ..	N. McMullan, V. Walker, D. I. Robertson ..	Young Chow Yee ..	China Navigation Co., Ltd.
<i>Shirala</i> ..	H. McGwire ..	D. S. Hutton, T. L. Jones, C. G. Hirst ..	R. O. Smith ..	British India S.N. Co.
<i>Sinkiang</i> ..	D. D. Richards ..	A. Watson, G. A. Rankin, R. M. Cooper ..	F. Gallady ..	Australian Oriental Line
<i>Sirdhana</i> ..	H. E. Evans ..	D. M. Reid, G. Usher, E. R. Daniels ..	Yu Pak Pui ..	Standard-Vacuum Oil Co.
<i>Soochow</i> ..	F. Booth ..	D. Manthorpe, G. J. Gundersen, S. R. L. Tonkins ..	Yu In San ..	China Navigation Co., Ltd.
<i>Stannac 312</i> ..	L. A. Stirling ..	D. R. Williams ..	G. N. Williams ..	Indo-China Steam Navigation Co.
<i>Szechuen</i> ..	D. C. Sim ..	W. E. Hargrave, R. Tasker, P. T. Adams ..	P. K. Ma ..	Shun Cheong S.N. Co.
<i>Tak Sang</i> ..	E. J. Thomson ..	T. J. Ashcroft, K. P. Wilkinson, A. E. Ladbrooke ..	S. L. Pong ..	United Corporation of China, Ltd.
<i>Tai Chung Shan</i> ..	A. H. Bathurst ..	A. E. Lovegreen, K. Leung, K. K. Li ..	T. M. Cheng ..	Chinese Maritime Customs
<i>Tai Ping</i> ..	J. I. Young ..	I. W. Hurst, S. C. Chan ..	Wai Pun Un ..	Indo-China Steam Navigation Co.
<i>Tai Po Shan</i> ..	R. Durup ..	E. Johansen, I. H. Feng, K. K. Chu ..	F. G. Hayes ..	Indo-China Steam Navigation Co.
<i>Teh Hing</i> ..	C. I. van Es ..	F. Hindle, R. A. P. Spears, V. A. Boutskoi ..	A. W. J. Levack ..	Indo-China Steam Navigation Co.
<i>Tshan</i> ..	J. G. Smart ..	W. I. Bartlett, D. Knight, P. D. Coles ..	Cheung Shing Cheung ..	China Navigation Co., Ltd.
<i>Wing Sang</i> ..	H. G. Goddard ..	T. C. W. Marr, S. A. Sheridan, C. A. Bates ..	S. F. Lai ..	Chinese Maritime Customs
<i>Wo Sang</i> ..	N. H. King ..	K. McLeod, T. R. Young, W. J. Coburn ..	Lee Hor Chung ..	China Navigation Co., Ltd.
<i>Yachow</i> ..	W. B. B. Paul ..	D. Rea, D. T. Le, M. Lu ..		
<i>Yunhsing</i> ..	R. O. McKenzie ..	S. Duff, D. J. Mander, G. D. Rennie ..		
<i>Yunnan</i> ..	A. Naimith ..			

FLEET LIST (India)

The following is a list of observing ships, voluntarily co-operating with the India Meteorological Department

NAME OF VESSEL	OWNERS OR AGENTS
<i>Akbar</i>	Mogul Line, Ltd.
<i>Alavi</i>	Mogul Line, Ltd.
<i>Aurora Amra</i>	British India Steam Navigation Co., Ltd.
<i>Aronda</i>	British India Steam Navigation Co., Ltd.
<i>Badarpur</i>	Burma Oil Co.
<i>Bamora</i>	British India Steam Navigation Co., Ltd.
<i>Bandra</i>	British India Steam Navigation Co., Ltd.
<i>Barala</i>	British India Steam Navigation Co., Ltd.
<i>Barjora</i>	British India Steam Navigation Co., Ltd.
<i>Barpeta</i>	British India Steam Navigation Co., Ltd.
<i>Begum</i>	Asiatic Steam Navigation Co., Ltd.
<i>Binfield</i>	British India Steam Navigation Co., Ltd.
<i>Canara</i>	British India Steam Navigation Co., Ltd.
<i>Chanda</i>	British India Steam Navigation Co., Ltd.
<i>Dara</i>	British India Steam Navigation Co., Ltd.
<i>Dumra</i>	British India Steam Navigation Co., Ltd.
<i>Dwarka</i>	British India Steam Navigation Co., Ltd.
<i>Egra</i>	British India Steam Navigation Co., Ltd.
<i>Englestan</i>	Bengal Burma Steam Navigation Co., Ltd.
<i>Ethiopia</i>	British India Steam Navigation Co., Ltd.
<i>Havildar</i>	Asiatic Steam Navigation Co., Ltd.
<i>Ikauna</i>	British India Steam Navigation Co., Ltd.
<i>Islami</i>	Mogul Line, Ltd.
<i>Itaura</i>	British India Steam Navigation Co., Ltd.
<i>Itria</i>	British India Steam Navigation Co., Ltd.
<i>Jaladurga</i>	Scindia Steam Navigation Co., Ltd.
<i>Jaladuta</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaganga</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalagopal</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalajyoti</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalakrishna</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalamani</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalamohan</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalarakshini</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaratna</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalaveera</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalavihar</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalavijaya</i>	Scindia Steam Navigation Co., Ltd.
<i>Jalayamuna</i>	Scindia Steam Navigation Co., Ltd.
<i>Jehangir</i>	Mogul Line, Ltd.
<i>Kampala</i>	British India Steam Navigation Co., Ltd.
<i>Karanja</i>	British India Steam Navigation Co., Ltd.
<i>Karapara</i>	British India Steam Navigation Co., Ltd.
<i>Khandalla</i>	British India Steam Navigation Co., Ltd.
<i>Khosrou</i>	Mogul Line, Ltd.
<i>Mahadevi</i>	Asiatic Steam Navigation Co., Ltd.
<i>Maharaja</i>	Asiatic Steam Navigation Co., Ltd.
<i>Malika</i>	Asiatic Steam Navigation Co., Ltd.
<i>Masimpur</i>	Burma Oil Co. (Tankers), Ltd.
<i>Nadir</i>	Asiatic Steam Navigation Co., Ltd.
<i>Nawab</i>	Asiatic Steam Navigation Co., Ltd.
<i>Nizam</i>	Asiatic Steam Navigation Co., Ltd.
<i>Nurani</i>	Asiatic Steam Navigation Co., Ltd.
<i>Nurjehan</i>	Asiatic Steam Navigation Co., Ltd.
<i>Palancotta</i>	British India Steam Navigation Co., Ltd.
<i>Palikonda</i>	British India Steam Navigation Co., Ltd.
<i>Pasha</i>	Asiatic Steam Navigation Co., Ltd.
<i>Pundit</i>	Asiatic Steam Navigation Co., Ltd.
<i>Querimba</i>	British India Steam Navigation Co., Ltd.
<i>Rajput</i>	Asiatic Steam Navigation Co., Ltd.
<i>Ragula</i>	British India Steam Navigation Co., Ltd.
<i>Risaldar</i>	Asiatic Steam Navigation Co., Ltd.
<i>Rizrcani</i>	Mogul Line, Ltd.
<i>Shahjehan</i>	Asiatic Steam Navigation Co., Ltd.
<i>Shahzada</i>	Asiatic Steam Navigation Co., Ltd.
<i>Shirala</i>	British India Steam Navigation Co., Ltd.
<i>Singu</i>	Burma Oil Co. (Tankers), Ltd.
<i>Sirsa</i>	British India Steam Navigation Co., Ltd.
<i>Tairea</i>	British India Steam Navigation Co., Ltd.
<i>Varela</i>	British India Steam Navigation Co., Ltd.
<i>Varsova</i>	British India Steam Navigation Co., Ltd.
<i>Vasna</i>	British India Steam Navigation Co., Ltd.
<i>Yenangyaung</i>	Burma Oil Co. (Tankers), Ltd.

MARID SHIPS

The following is a list of ships voluntarily observing and reporting sea temperatures from coastal waters of Great Britain. Captains are requested to point out any errors or omissions in the list.

NAME OF VESSEL	CALL SIGN	CAPTAIN	OWNERS-MANAGERS
<i>Accrington</i>	GDMJ	R. Good	The Railway Executive (Eastern Region).
<i>Actuality</i>	GPPF	J. Lewis	F. T. Everard & Sons, Ltd.
<i>Allurity</i>	MOFS	A. Fisher	F. T. Everard & Sons, Ltd.
<i>Angelo</i>	GQFY	L. R. Stilwell	Ellerman's Wilson Line, Ltd.
<i>Antwerp</i>	GDFV	R. V. Adams	The Railway Executive (Eastern Region).
<i>Ariosto</i>	GKFW	W. Hill	Ellerman's Wilson Line, Ltd.
<i>Atlantic Coast</i>	GWSY	G. Goldman	Coast Lines, Ltd.
<i>Baltic</i>	GTXX	F. Waldron	United Baltic Corporation.
<i>Belhaven</i>	MNXZ	P. L. Irvine	London & Edinburgh Shipping Co., Ltd.
<i>Belvauch</i>	MKGV	T. Wallace	London & Edinburgh Shipping Co., Ltd.
<i>Belvina</i>	MLZF	J. Philip	London & Edinburgh Shipping Co., Ltd.
<i>Bury</i>	GRNM	R. G. Watts	The Railway Executive (Eastern Region).
<i>Cambria</i>	MOBB	W. H. Hughes, D.S.C.	The Railway Executive (L.M.R.).
<i>Clupea</i>	GOAJ	A. E. B. Brown	Scottish Home Department (Fishery Division).
<i>Corfen</i>	GDJX	E. Allen	Wm. Cory & Son, Ltd.
<i>Corfleet</i>	GWTD	R. J. Barrow	Wm. Cory & Son, Ltd.
<i>Corfoss</i>	MAHX	F. Farrant	Wm. Cory & Son, Ltd.
<i>Cormain</i>	MAHT	R. B. Armstrong	Wm. Cory & Son, Ltd.
<i>Cormead</i>	GDBX	T. Slack	Wm. Cory & Son, Ltd.
<i>Cormist</i>	GDVT	R. Burrow	Wm. Cory & Son, Ltd.
<i>Cormoat</i>	GLKV	J. V. Hansen	Wm. Cory & Son, Ltd.
<i>Cormull</i>	MAHS	E. Keen	Wm. Cory & Son, Ltd.
<i>Corncraze</i>	MJKL	W. Aplin	General Steam Nav. Co., Ltd.
<i>Crane</i>	MMCS	J. S. Lickis	General Steam Nav. Co., Ltd.
<i>Denbigh Coast</i>	MMDG	O. A. Drake	Coast Lines, Ltd.
<i>Drake</i>	MMYC	R. Langley	General Steam Nav. Co., Ltd.
<i>Duke of Argyll</i>	GNVX	F. Ardern, D.S.C.	The Railway Executive (L.M.R.).
<i>Duke of Lancaster</i>	GCPO	E. B. Serjeant	The Railway Executive (L.M.R.).
<i>Duke of Rothesay</i>	GNVL	H. Thompson	The Railway Executive (L.M.R.).
<i>Duke of York</i>	GKVL	M. Adern	The Railway Executive (L.M.R.).
<i>Eastern Coast</i>	GWNV	R. E. Holt	Coast Lines, Ltd.
<i>Eildon</i>	MLZL	J. Little	G. Gibson & Co., Ltd.
<i>Empire Cedric</i>	GRSC	W. N. Johnson	Frank Bustard & Sons, Ltd.
<i>Empire Doric</i>	MAVQ	H. T. Green	Frank Bustard & Sons, Ltd.
<i>Explorer</i>		D. C. Sandison	Scottish Home Department (Fishery Division).
<i>Falcon</i>	MNXL	S. W. Develin	General Steam Nav. Co., Ltd.
<i>Golden Dawn</i>		A. Adamson, M.B.E., Lt. R.N.R.	The Captain.
<i>Goldfinch</i>	MMCR	J. W. Howeggs	General Steam Nav. Co., Ltd.
<i>Granta</i>	GNJR	D. A. Hunter	Witherington & Everett.
<i>Grebe</i>	MAEY	E. C. Painter, D.S.C.	General Steam Nav. Co., Ltd.
<i>Guernsey Coast</i>	MAN5	H. G. Keilit	British Channel Islands S.S. Co., Ltd.
<i>Harrogate</i>	MNDB	C. H. Tully	Associated Humber Lines.
<i>Hebridean Coast</i>	GKGP	T. Stewart	Aberdeen Steam Nav. Co., Ltd.
<i>Hibernia</i>	GRPS	A. Marsh	The Railway Executive (L.M.R.).
<i>Highwood</i>	MLQQ	J. Coupland	E. R. Newbiggin, Ltd.
<i>Hindlea</i>	GWDO	A. G. Holder	Walliker & Hindmarsh.
<i>Isle of Guernsey</i>	GOYI	F. E. Trout	The Railway Executive (Southern Region).
<i>Isle of Jersey</i>	GRBQ	A. L. Light	The Railway Executive (Southern Region).
<i>Isle of Sark</i>	GTSR	C. E. Durley	The Railway Executive (Southern Region).
<i>Lairdsburn</i>	GTND	J. McCall	Burns & Laird Lines, Ltd.
<i>Lairdswood</i>	GYZO	H. Campbell	Burns & Laird Lines, Ltd.
<i>Lapwing</i>	GKBP	K. R. Lockhart	General Steam Nav. Co. Ltd.
<i>London Merchant</i>	MBRZ	C. A. Piper	London Scottish Lines.
<i>Melrose Abbey</i>	GSYW	J. Laverack	Associated Humber Lines.
<i>Minna</i>	GKPS	T. Mather	Scottish Home Department (Fishery Division).
<i>Ocean Coast</i>	GYMP	G. Mearns	Coast Lines, Ltd.
<i>Otterhound</i>	MNVZ	A. M. Kennedy	Coastal Tankers, Ltd.
<i>Persian Coast</i>	MJNL	T. Taylor	Tyne, Tees S.S. Co., Ltd.
<i>Petrel</i>	MBGV	G. W. Lawrey	General Steam Nav. Co., Ltd.
<i>Plover</i>	MLLV	W. J. Tait	General Steam Nav. Co., Ltd.
<i>St. Andrew</i>	GPQW	?	The Railway Executive (Western Region).
<i>St. Julien</i>	GLBV	L. J. Richardson	The Railway Executive (Western Region).
<i>Salerno</i>	GSPW	H. Greenhill	Ellerman's Wilson Line, Ltd.
<i>Scotia</i>		E. A. Bruce	Scottish Home Department (Fishery Division).
<i>Scottish Co-operator</i>	MMSW	T. Robertson	Scottish Co-operative Wholesale Society.
<i>Selby</i>	MLFT	A. W. Johnston	Associated Humber Lines.
<i>Sieve Bawn</i>	MQCC	R. E. Sherwood, D.S.O., R.D., Cdr. R.N.R.	The Railway Executive (L.M.R.).
<i>Sieve Bearnagh</i>	MLNL	W. N. Greenwood	The Railway Executive (L.M.R.).
<i>Sieve Bloom</i>	MQDD	N. Lloyd-Williams	The Railway Executive (L.M.R.).
<i>Sieve Donard</i>	MQCQ	A. C. Borthwick	The Railway Executive (L.M.R.).
<i>Sieve League</i>	MQCM	V. S. Phillips	The Railway Executive (L.M.R.).
<i>Sieve More</i>	MQBM	F. G. J. Manning, D.S.C.	The Railway Executive (L.M.R.).
<i>Southern Coast</i>	MASD	P. A. Johnson	Coast Lines, Ltd.
<i>Wandle</i>	MKBB	E. Clarke	Wandsworth & District Gas Co.

FLEET LIST (Canada)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of Canada

NAME OF VESSEL	OWNERS
Selected Ships:	
<i>Aorangi</i>	Canadian Australasian Line.
<i>Canadian Challenger</i>	"Canadian Challenger", Ltd. (Canadian National Steamships).
<i>Canadian Constructor</i>	"Canadian Constructor", Ltd. (Canadian National Steamships).
<i>Canadian Cruiser</i>	"Canadian Cruiser", Ltd. (Canadian National Steamships).
<i>Fort Amherst</i>	Furness, Withy & Co.
<i>Fort Townshend</i>	Furness, Withy & Co.
<i>Imperial Alberta</i>	Imperial Oil, Ltd.
<i>Imperial Quebec</i>	Imperial Oil, Ltd.
<i>Imperial Toronto</i>	Imperial Oil, Ltd.
<i>Imperial Winnipeg</i>	Imperial Oil, Ltd.
<i>Imperial Victoria</i>	Imperial Oil, Ltd.
<i>Lady Nelson</i>	"Lady Nelson", Ltd. (Canadian National Steamships).
<i>Lady Rodney</i>	"Lady Rodney", Ltd. (Canadian National Steamships).
<i>Victoria County</i>	Acadia Overseas Freighters.
<i>Waihemu</i>	Canadian Union Line, Ltd.
<i>Waikawa</i>	Canadian Union Line, Ltd.
<i>Wairuna</i>	Canadian Union Line, Ltd.
<i>Waitomo</i>	Canadian Union Line, Ltd.
Lightships:	
<i>Lurcher Lightship</i>	Minister of Transport.
<i>Sanbro Lightship</i>	Minister of Transport.
Supplementary Ships:	
<i>Lake Athabaska</i>	Western Canadian Steamship Co., Ltd.
<i>Lake Chilco</i>	Western Canadian Steamship Co., Ltd.
<i>Lake Kootenay</i>	Western Canadian Steamship Co., Ltd.
<i>Lake Minnewanka</i>	Western Canadian Steamship Co., Ltd.
<i>Rupert Island</i>	Hudson's Bay Co., Ltd.

LIGHT VESSELS

The following Light Vessels voluntarily observe and report from coastal waters of Great Britain.

NAME OF VESSEL	MASTER
<i>East Goodwin</i>	A. Giblin
<i>Humber</i>	F. I. Butcher
<i>Newarp</i>	R. Hadden
<i>Royal Sovereign</i>	W. J. Sheaf
<i>Shipwash</i>	H. L. Neale

Marine Observer's Guide, Part V

Owing to staff shortages and other difficulties and the large number of radio stations and areas concerned, and the number of amendments which occur, it has been found quite impracticable to keep Part V of this publication up to date. A new procedure will shortly be introduced whereby Part V will merely contain summarised information covering the whole world. This will take a little time to prepare, and in the meantime masters and officers are advised to consult the *Admiralty List of Radio Signals*, Vol. III, which contains full details of meteorological services for shipping all over the world.

NOTICES TO MARINE OBSERVERS

Postal Arrangements

The quarterly numbers of *The Marine Observer* are published on the last Wednesdays of December, March, June and September.

The Marine Observer is addressed to the Captain, S.S./M.V....., c/o the owners, and captains are requested to make their own arrangements for forwarding.

Shipowners, Marine Superintendents, and all concerned in the despatch of mails to ships are asked to kindly facilitate the despatch and delivery of mail received at their offices from the Meteorological Office and "Air Publications and Forms Stores", to their ships abroad.

Addressed to the captains of ships, this contains information required for the conduct of meteorological work at sea, and is most effective if received by the captains at the earliest possible date.

Ice Observation

Drifting ice, derelicts, and other floating dangers to navigation are reported by all means of communication at the disposal of the master.

See Appendix III, pages 106-108 of the *Marine Observer's Handbook*, Sixth Edition.

It is also desirable that more detailed information than can be given in a TTT wireless message should be available to the Meteorological Office for the purpose of research, and for Admiralty Charts and Sailing Directions.

Marine observers will greatly assist by noting the conditions of ice, either drifting or fast, in the pages provided at the end of the logbook (Form 911), or on Form 912, which may be supplied to the captain of any British ship on application to a Port Meteorological Officer or Merchant Navy Agent.

Observing ships using the Trans-North Atlantic tracks are requested to record not only when ice is encountered, but also when they have passed through the ice region during the ice season without encountering ice. In this case a "nil" report should be returned, since it is desirable as far as possible to determine when tracks have been clear of ice.

RETURN OF LOGBOOKS

Owing to the need for strict economy in the use of paper, observing officers should endeavour to fill up their logbooks (Forms 911), before returning them to the appropriate Meteorological Service, except when insufficient space remains for the recording of observations during a further complete passage.

Meteorological Services for Shipping

Captains of British ships are requested to notify the Marine Branch of the Meteorological Office of areas in which meteorological services for shipping appear inadequate. Suggestions for the improvement of these services are always welcome.

Fleet List Call Signs

The inclusion of the signal letters (call signs) of the British Selected Ships in the Fleet List is largely for the benefit of those meteorological services who might wish to identify the ships concerned in a "collective" message.

Aden Weather Forecasts for Shipping

Wave : (ZNR) 475 kcs.

Time : 0420, 1620 G.M.T.

Form of message : forecasts for areas A15, A20 and A25. (See chart in *Marine Observer's Guide* or *Admiralty List of Radio Signals*, Vol. III, Part A.)

Great Britain

Transmission of the 1800 G.M.T. Radio Weather Message from Single-Operator Observing Ships

In the eastern Atlantic, the 1800 G.M.T. radio weather message is a very important one from the viewpoint of shipping. The 2130 Atlantic bulletin for shipping, as issued from the United Kingdom, is normally based upon the weather map drawn from observations made at 1800. The 2030 coastal forecast issued by W/T and R/T may also be influenced by these observations. The 1800 weather map is at the same time of considerable general value, for if the messages both from ship and shore stations arrive punctually, the map is drawn in sufficient detail to influence the general forecast which is issued in the evening to the press for publication in the morning newspapers.

The attention of voluntary observers is, therefore, drawn to the fact that in single-operator ships, there is no objection to making out the 1800 weather message at, say, 1730, with the object of clearing it by radio before the radio officer goes off watch. In the coded message "GG" should then be coded to give the actual time of the observation to the nearest hour (G.M.T.).

TRANSMISSION OF WEATHER MESSAGES THROUGH DETAILED STATIONS

When transmitting routine weather messages to Meteorological Services, observing ships are specially requested to transmit only through the radio stations detailed in Part II of the *Marine Observer's Guide*.

When in a reporting area, messages should be transmitted *only through the radio stations appropriate to that area* (except when using Area Stations for short-wave transmissions).

In no circumstances must weather messages addressed to one country be transmitted through the radio stations of another country.

Transmission of reports through stations other than those detailed, or through stations outside the appropriate reporting area may involve complications in the payment of telegraphic charges.

Routine Radio Weather Messages—New Zealand

Marine Observers are asked to pay special attention to the transmission of their radio weather messages addressed to Weather Wellington through the detailed stations when navigating in the area allocated to New Zealand. (See Chartlet Part II of M.O. 477, *Marine Observers' Guide*.) If reports cannot be transmitted immediately they should be sent up to twelve hours after the time of observation, as owing to the relatively small number of ships within the area at any one time, the maximum number of reports are desired. All observing officers are invited to visit the Central Forecasting Office, when in Wellington, where they will be shown the use made of their reports by the forecasters.

ROYAL OBSERVATORY, HONG KONG

Contents of Storm Warning Bulletins

The following content and order of items will be adopted for all non-local storm warnings issued by the Royal Observatory, Hong Kong, with effect from 0000 G.M.T., 1st June, 1949 :

- (I) International call, TTT (for warnings transmitted in morse code).
- (II) Statement of type of warning :

Warning	Corresponding wind, up to Beaufort Force 7
Gale warning	Corresponding wind, Beaufort Force 8-9
Storm warning	Corresponding wind, Beaufort Force 10-11
Typhoon warning	Corresponding wind, Beaufort Force 12 and over.
- (III) Time of reference G.M.T. in the international six-figure date time group.
- (IV) Type of disturbance ; tropical cyclones to be classified as :
 - (a) Tropical depressions Winds up to 34 knots
 - (b) Tropical storms Winds from 35 to 64 knots
 - (c) Typhoons Winds 65 knots and over.
- (V) Position of storm centre in degrees (and tenths if possible) of latitude and longitude. Information will also be given as to the degree of certainty with which the centre is located.
- (VI) Direction and speed of movement of disturbance, in points of the compass and knots.
- (VII) Extent of affected area, and wind speed in different parts of the storm area if known.
- (VIII) Any expected changes in course or intensity.

It will be noted that the new warnings are very similar to those hitherto issued by the Royal Observatory, both in content and order. The only changes are in the statement of type of warning (Item II) and in the classification of tropical cyclones (Item IV). Attention is particularly drawn to the fact that in future the word " typhoon " will be used only when the storm is really destructive and dangerous with winds of 65 knots and over. Due regard should therefore be paid to " gale warnings " and " storm warnings " for disturbances classified as tropical storms with wind speeds from 35 to 64 knots.

Non-local storm warnings in the form specified above will be included when necessary in the shipping weather bulletins broadcast from Cape D'Aguilar (VPS) and in the Hong Kong meteorological broadcast (SCU). There will be no alteration in the scheduled times and frequencies of these transmissions.

Non-local warnings in the same form will also be transmitted to Naval Headquarters, Hong Kong, for distribution as fleet weather messages, and to the Meteorological Office, Hong Kong airport, for distribution by point-to-point channels to other air terminals.

GREAT BRITAIN—LOCAL WEATHER FORECASTS

Masters of ships and others interested in the movements of shipping and in the loading and discharging of cargo can obtain local weather forecasts from the forecast centre nearest to the port, free of charge.

The addresses and telephone numbers of the forecast centres nearest to the main ports of Great Britain are given below, corrected to September, 1949.

PORT	ADDRESS OF NEAREST FORECAST CENTRE	TELEPHONE NO.
Aberdeen	The Meteorological Officer, Dyce Airport, Aberdeenshire	Dyce 332. Ex. 70
Bristol	The Meteorological Officer, Bristol Airport, Whitchurch, Bristol	Bristol 26451. Ex. 22
Cardiff	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 4465/6/7. Ex. 110.
Dundee	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
Falmouth	The Senior Meteorological Officer, H.Q. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Glasgow	The Meteorological Officer, Renfrew Airport, Renfrewshire	Renfrew 2352. Ex. 21/3.
Hartlepool	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731/5. Ex. 230/1.
Hull	The Senior Meteorological Officer, H.Q. No. 1 Group, Royal Air Force, Bawtry, Doncaster, Yorkshire	Bawtry 363/7. Ex. 105
Inverness	The Senior Meteorological Officer, Royal Air Force, Raigmore, Inverness	Inverness 1853/8. Ex. 62/65.
Kirkwall	The Meteorological Officer, Hatston Airport, Orkneys	Kirkwall 421. Ex. 2.
Leith	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
London	The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2	Holborn 3434. Ex. 629.
Liverpool	The Senior Meteorological Officer, Speke Airport, Liverpool, 19	Garston 1240. Ex. 21/2.
Milford Haven	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Newcastle	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731. Ex. 230/1.
Plymouth	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Southampton	The Senior Meteorological Officer, Southampton Airport	Eastleigh 87228. Ex. 10.
Swansea	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 4465/6/7. Ex. 110.

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

Captains and observing officers of the Voluntary Corps of Marine Observers will always be welcomed at headquarters, where the Marine Superintendent will be pleased to show them how their observations are utilised in meteorological research and weather forecasting.

Headquarters

Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R., Marine Superintendent, Meteorological Office, Air-Ministry, Headstone Drive, Harrow, Middlesex. (Telephone: Harrow 4331, Ext. 324.)

Commander J. Hennessy, R.D., R.N.R., Deputy Marine Superintendent. (Telephone: Harrow 4331, Ext. 323.)

Mersey

Commander M. Cresswell, R.N.R., Port Meteorological Officer, Room 617, Royal Liver Building, Liverpool, 3. (Telephone: Central 6565.)

Thames

Commander C. H. Williams, R.D., R.N.R., Port Meteorological Officer, Room 4, Ibex House, Minorities, London, E.C.3. (Telephone: Royal 1721.)

Bristol Channel

Captain J. C. Matheson, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone: Cardiff 4474.)

Southampton

Captain J. R. Radley, Port Meteorological Officer, 19 Queen's Terrace, Southampton. (Telephone: Southampton 4295.)

AGENTS

Clyde

Captain W. W. Elliott, c/o Thomas Hastie & Son, 2-4 Tullis Street, Bridgeton, Glasgow. (Telephone: Bridgeton 3219.)

Forth

Captain G. More, "Craigneuk", Dechmont, West Lothian. (Telephone: Dechmont 19.)

Humber

Captain R. E. Dunn, c/o Principal Officer, Ministry of Transport, Trinity House Yard, Hull.

Tyne

Captain F. B. West, Custom House Chambers, Quayside, Newcastle-on-Tyne. (Telephone: Newcastle 23203.)

OFFICERS OF THE METEOROLOGICAL SERVICE OF CANADA

Headquarters

Controller, Meteorological Division, Department of Transport, 315 Bloor Street W., Toronto, 5.

Halifax

O.I.C. Dominion Public Weather Office, 728 Dominion Public Building, Halifax N.S. (Telephone: 3-8314.)

Saint John

Officer in Charge, The Observatory, Saint John, N.B. (Telephone: 3-3500.)

Vancouver

Mr. C. H. Bromley (acting), 815 Bower Building, 543 Granville Street, Vancouver, B.C. (Telephone: Pacific 3032.)

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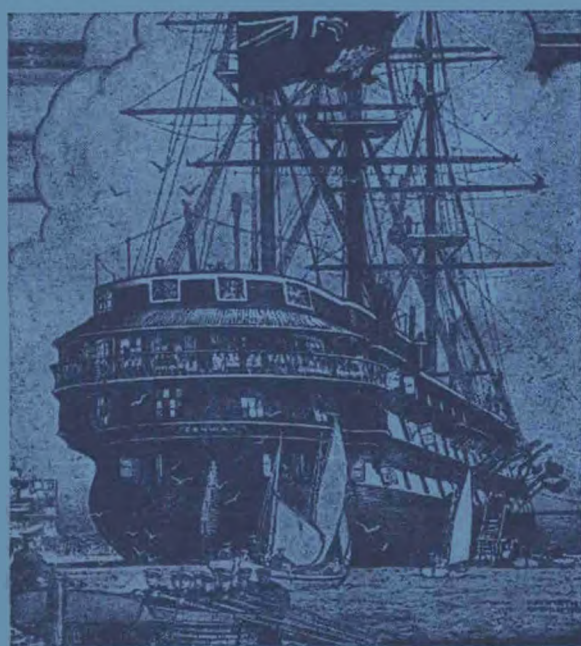
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the Offices, Nautilus House, 6 Rumford Place, Liverpool, 3. Secretary, Alfred Wilson.

ABRIDGED LIST OF PUBLICATIONS OF THE METEOROLOGICAL OFFICE

Publications may be ordered directly from the Sales Offices of His Majesty's Stationery Office at the Addresses shown overleaf or through any bookseller

Cloud Forms. Definitions and descriptions, with photographs of clouds. M.O. 233, 6th Edition, 1949. 8vo. 1s. 3d. Postage 1d.

Weather Map. An introduction to modern meteorology. M.O. 225 i, 3rd edition, 1939. 8vo. (see also Meteorological Glossary, in continuation of the "Weather Map") 3s. Postage 2d.

Meteorological Glossary (continuation of the "Weather Map", *q.v.*). M.O. 225, ii 3rd edition, 1939. 8vo. 7s. 6d. Postage 5d.

Handbook of Weather Messages, Codes and Specifications. M.O. 510. 8vo.

Part I. Transmission schedules and station index numbers 1949. 2s. 6d. Postage 2d.

Part II. Codes and specifications. 1948. 1s. 6d. Postage 2d.

Part III. Coding, decoding and plotting 1948. 2s. Postage 2d.

(Amendments issued as necessary and priced separately.)

Instructions for the preparation of weather maps with tables of the specifications and symbols. M.O. 515. 1949. 8vo. 9d. Postage 1d.

International Meteorological Code adopted by the International Meteorological Organisation, Washington, 1947. **Decode for the use of shipping**, incorporating the code for weather reports from and to ships and the analysis code for the use of shipping. M.O. 509. 1948. 9d. Postage 1d.

Meteorological Handbook for Pilots and Navigators. M.O. 448, 2nd edition, 1942. 8vo. 2s. 6d. Postage 2d.

A Short Course in Elementary Meteorology. By W. H. Pick, B.Sc., F.C.P., F.Inst.P. M.O. 247, 5th edition, 1938. 8vo. 2s. 6d. Postage 3d.

Meteorology for Aviators. By R. C. Sutcliffe, Ph.D. M.O. 432, 1940. 8vo. 7s. 6d. Postage 6d.

Meteorology of Airfields. By C. S. Durst, B.A. M.O. 507, 1949. 8vo. 2s. Postage 2d.

Meteorological Magazine. 8vo. Published monthly. New series commencing January, 1947. Each 1s. Postage 1d.

(Annual subscription, 13s. post free.)