M.O. 489

# The Marine Observer

Volume XVI. No. 137

JULY, 1947

FOUR SHILLINGS NET
ANNUAL SUBSCRIPTION 16s. 0d. NET

M.O. 489 AIR MINISTRY

# THE MARINE OBSERVER

## A Quarterly Journal of Maritime Meteorology

prepared by the

## Marine Branch of the Meteorological Office

VOL. XVII. No. 137. JULY 1947

---

### TABLE OF PRINCIPAL CONTENTS



---

Published for the Meteorological Office by
HIS MAJESTY'S STATIONERY OFFICE



LONDON: PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
To be purchased directly from H.M. Stationery Office at the following addresses:
York House, Kingsway, London, W.C.2; 13a Castle Street, Edinburgh, 2;
39-41 King Street, Manchester, 2; 1 St. Andrew's Crescent, Cardiff;
Tower Lane, Bristol, 1; 80 Chichester Street, Belfast;
OR THROUGH ANY BOOKSELLER
1947

Printed by The Campfield Press, St. Albans, Herts
S.O. Code No. 40-38. 7-47

PRICE 4s. NET. Annual Subscription 16s. net incl. postage

## FOREWORD

BY SIR NELSON JOHNSON, K.C.B.

DIRECTOR OF THE METEOROLOGICAL OFFICE

*The Marine Observer* had been in circulation 16 years when war caused its publication to cease in October, 1939. With its disappearance and the cessation of wireless weather reports from ships, we felt that an important link with the Merchant Navy had parted. We therefore welcome its re-appearance as a symbol that the full co-operation of pre-war days has been resumed.

Since 1939, however, much has changed. Many of the ships and their gallant crews which we then knew are no longer with us. Those who remain have been reinforced by others who have stepped into the breach, and the spirit of service is as strongly in evidence as ever.

There have, of course, been many developments on the technical side in meteorology, largely to meet the demands of long distance flying which made such enormous strides in the war years. As a result there has arisen a need for more precise observations from merchant ships. The instruments and other means by which this object is to be achieved are being worked out, and will be communicated to you as soon as they are ready. In this the *Marine Observer* will play an important part.

With the general raising of the technical horizon, it is intended to make the *Marine Observer* rather more technical than it used to be. We are confident that observing officers will welcome articles which explain the use that is made of ships' observations, and show in simple terms the scientific results which are derived from them. Similarly, it is proposed from time to time to give short accounts of the world-wide organisation of meteorological services, so that ships' officers will be able to see just where their work fits into the general pattern.

In the past, the *Marine Observer* has served a number of useful purposes. In particular, the Meteorological Office has liked to regard the *Marine Observer* as a token of its appreciation of the invaluable service rendered by the Merchant Navy, and it is from this point of view that its reappearance after 7 years is most welcome to us. We hope that our friends afloat will be equally glad to see it again.

## MARINE SUPERINTENDENT'S NOTES

In introducing this first post-war edition of the *Marine Observer*, it is perhaps not inappropriate, for the benefit of new readers, to speak a little of the past. The *Marine Observer* was founded in 1924, at the suggestion of the late Marine Superintendent, Captain Brooke Smith, when Sir George Simpson was Director of the Meteorological Office. Its purpose was to provide an interesting, instructive, scientific journal as a tangible link between the Meteorological Office and the Corps of Voluntary Observers in British ships. Although a Government publication, it was to be essentially an intimate journal for seamen to which not only men of science, interested in meteorology and allied subjects, would contribute, but also the seaman himself. It was also a medium for the Meteorological Office to convey information to observers at sea.

It was issued free to all ships whose Masters and Officers voluntarily made observations at sea, and to the Marine Superintendents of their shipping companies, and to certain scientific bodies ; copies were also on sale to the general public, at home and abroad. In addition, bound copies were presented annually to those ships which were judged as having contributed the best meteorological records during the year. It commenced as a monthly journal but in 1933 it became a quarterly publication. At the time of its first edition the number of Voluntary Observing Ships totalled 500 and by 1939 their number had grown to 360 Selected and 635 Supplementary Ships.

In September, 1939, however, " that wicked man " plunged the world into a blood bath from which we were not to emerge until 1945. Immediately on the outbreak of war, for reasons of security, all meteorological reports from merchant ships ceased and consequently the publication of the *Marine Observer* came to an end, the last edition being the October number, 1939.

It is perhaps interesting to recall, at this stage, the great efforts which both sides made, throughout the war, to obtain their badly-needed meteorological information from the oceans, previously supplied by merchant ships. U-boats, warships of every type, aircraft and automatic buoys were all used in an endeavour to obtain information. Past records and climatological atlases assumed immense importance in an endeavour to increase our scientific meteorological knowledge and to probe the mysteries of the future weather—an all important subject for all Naval, Military and Air Force operations.

The war dragged on with its toll of death, destruction and sorrow. In 1945, however, thanks to the courage and endurance of the Allied armed forces and their merchant seamen, to the workers at home, and to the unspectacular housewife, and aided, we presume to think, by some Divine Providence, the evil thing that had sprung up in Germany and Japan was beaten to its knees. Peace—although somewhat troubled and uncertain—was with us again and normal activities were resumed.

One pauses a moment to remember those who laid down their lives in the struggle—particularly those members of the pre-war Corps of Voluntary Observers. We have no record of their names. " Greater love hath no man . . . "

During the war, the Meteorological Office, through its Port Meteorological Officer at Liverpool and the Merchant Navy Agents at other ports, kept in touch as far as possible, with the Voluntary Observing Fleet—depleted by enemy action from 360 Selected and 635 Supplementary Ships in 1939 to 272 Selected and 208 Supplementary Ships in 1945, and it was thus possible, very soon after the termination of hostilities, for these ships to resume voluntary meteorological work at sea.

The first radio reports under the new scheme were received on 1st November, 1945, and during that month a total of 600 reports were received from the Eastern Atlantic area, a very gratifying achievement after such a long interval.

Owing to the necessity of economy in paper and printing, it was not possible to resume publication of the *Marine Observer* as early as would have been desired, but Treasury authority has now been obtained and it is with much pleasure that we introduce our first post-war edition. It is to be hoped that this magazine will be as popular as it was before the war, and that it will

be a medium of contact between voluntary observers at sea and all those interested in marine meteorology, and the Meteorological Office.

For reasons of economy, it has been found necessary to reduce the size of the *Marine Observer*, compared with its pre-war edition, but it is felt that this handier size may perhaps not be disadvantageous to the reader. The general layout has not been changed to any extent. Suggestions as to possible improvements in the magazine will be welcome, and the editor will be very glad if voluntary observers, and other readers, will submit articles or letters for publication. A section of the magazine, called the " Marine Observer's Log ", is especially reserved for general items of interest, submitted by meteorological observers, including extracts from records, photographs and diagrams.

At a Conference of Empire Meteorologists, held in London in March, 1946, it was decided that the organisation of meteorological work in merchant ships should be on an Empire basis—thus ensuring uniformity of procedure and co-ordination and economy of effort. It was agreed that the British Meteorological Office would be responsible for the preparation, printing and issue, to all Empire Meteorological Services, of instructions, logbooks and other publications necessary for the carrying out of meteorological work in merchant ships. It was also agreed that the *Marine Observer* would be issued free to all voluntary observing ships throughout the Empire.

We have pleasure in introducing ourselves to this widening circle of readers and, we hope, of friends. It should be emphasised that the British Meteorological Office's function in this matter is merely that of a co-ordinating body for the benefit of the British Commonwealth of Nations ; the Empire Meteorological Services will be consulted and their wishes met. It is to be hoped, for example, that articles, photographs, drawings and other features of interest, by members of Empire Meteorological Services and by voluntary observers in Empire ships, in general, will become a regular feature of the *Marine Observer*.

It is now desirable to talk a little about the meteorological work that has been done by voluntary observers in British ships since November, 1945. A report on the general activities of the Marine Branch of the British Meteorological Office, from the outbreak of war to the present day, will be given in our next edition. It is hoped that later editions of the *Marine Observer* will contain similar reports on the activities of other Empire Services.

Since November, 1945, the Port Meteorological Officers and Merchant Navy Agents in British ports have been busily engaged in recruiting voluntary observing ships, supplying instruments and generally endeavouring to build up the Fleet. A target figure of 500 Selected and 500 Supplementary Ships has been envisaged as a desirable number of British ships to provide a reasonable network of observations from over the oceans. The table below shows the growth of the Observing Fleet up to February, 1947 ; an extremely creditable performance. It will be noted that 3 types of vessels are referred to :—

(*a*) Selected Ships which are loaned full sets of tested instruments, and transmit their observations by radio whenever possible at International hours.

(*b*) Supplementary Ships which are loaned modified sets of instru-

ments and are asked to transmit observations by radio in areas where shipping is relatively sparse.

(*c*) " Marid " Ships which transmit, by radio, observations of sea temperatures in Home Waters.

Included in the Selected Ships are 31 Trawlers, whose reports are particularly valuable in view of the fact that they can send in reports from areas of great meteorological importance not generally frequented by merchant ships.

| | 1945 | | | | | 1946 | | | | | | | | | | | | 1947 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | J'ne | J'y | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
| Number of Selected Ships | 310 | 324 | 321 | 316 | 317 | 319 | 320 | 325 | 326 | 339 | 342 | 346 | 352 | 374 | 383 | 390 | 408 | 420 | 422 |
| Number of Supplementary Ships | 203 | 201 | 201 | 202 | 202 | 202 | 207 | 207 | 202 | 206 | 204 | 203 | 203 | 201 | 201 | 202 | 200 | 198 | 197 |
| Number of " Marid " Ships | — | | 25 | 52 | 63 | 62 | 64 | 67 | 68 | 68 | 72 | 74 | 75 | 77 | 78 | 79 | 79 | 79 | 79 |
| Number of Forms 911 received | — | — | — | — | 9 | 45 | 37 | 59 | 69 | 88 | 98 | 88 | 117 | 120 | 105 | 114 | 99 | 132 | 104 |

The map shows the distribution of British Selected Ships on 18th February, 1947.

Two Lighthouses abroad, and 6 Lightvessels or Coast Stations in Home Waters, which continued to return observations during the war, have maintained this service during the period under review. Observations from a number of Lightvessels in Home Waters were discontinued when these vessels were withdrawn from their stations, but arrangements are in hand to restart these observations.

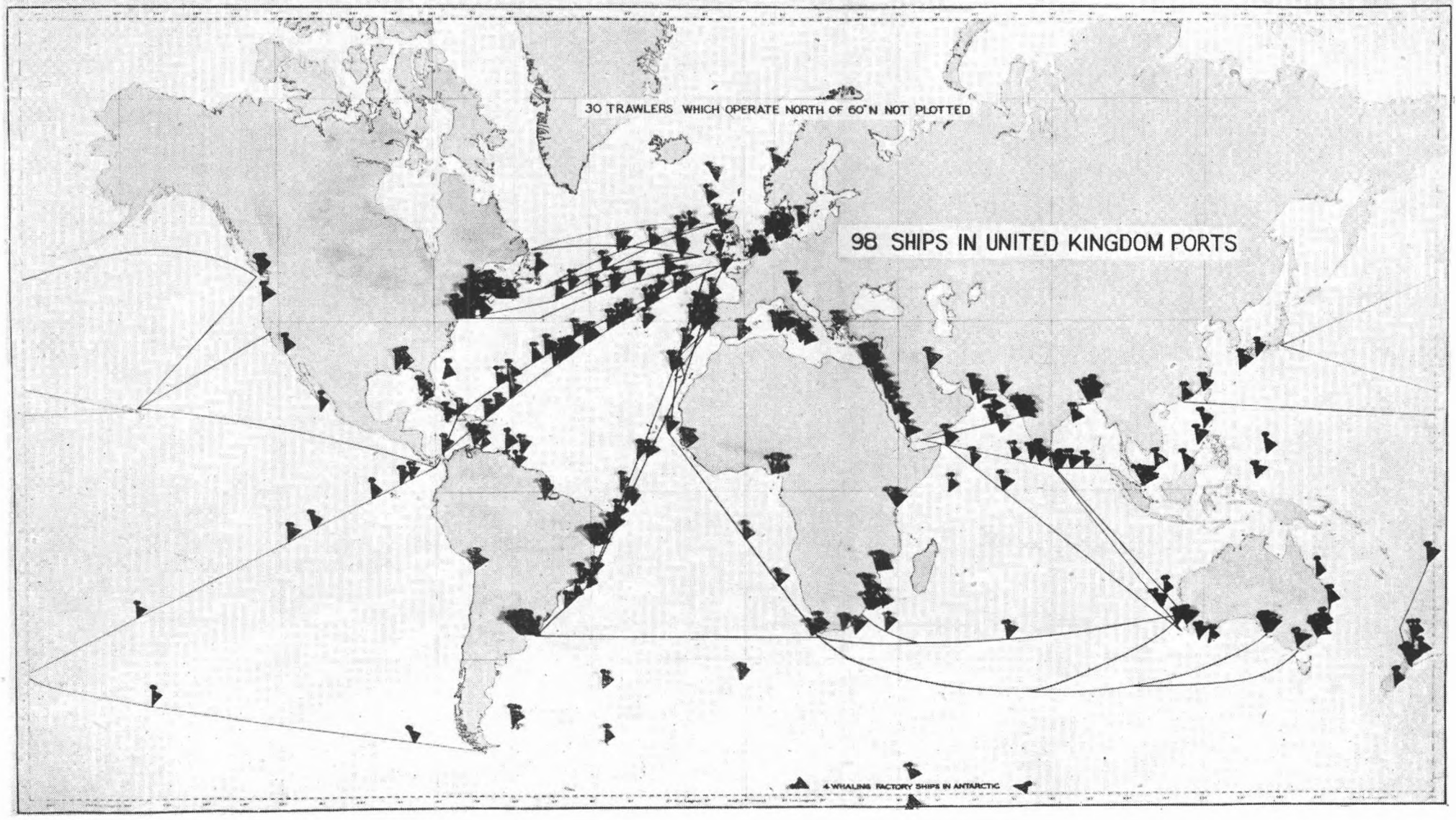
The observations of surface currents by ships reporting to the Meteorological Office was resumed in March, 1946. Since July, a monthly average of 28 surface current report forms has been received by the Marine Branch.

Miscellaneous observations received by the Marine Branch from British ships included special reports of surface sea temperature in Home Waters, regular measurements of rainfall on a ship in the Irish Sea, and comparisons of simultaneous sea temperatures taken by the bucket method and by the engine intake method.

During the early part of the period under review, owing to lack of information as to the wishes of other Meteorological Services, it was only practicable to arrange for ships to transmit their messages by radio to the British Meteorological Office when in the Eastern Atlantic, and, when outside that area, to broadcast their messages on 600 metres. The wishes of other Services were requested, however, and by degrees, the oceans were divided up into areas in which ships were requested to transmit their observations direct to other Meteorological Services, and by now, a large part of the world is thus covered.

It is not practicable, at present, to issue any general summary of the results throughout the world, but the table below gives figures as to the number of reports that are received by the British Forecast Service at Dunstable from ships in the area North of 35° N. and East of 40° W. These results are extremely gratifying and reflect great credit upon the voluntary observers in British ships. The observations are used, not only for forecasting in the

# ESTIMATED POSITIONS OF BRITISH SELECTED SHIPS 18TH FEBRUARY 1947



British Isles, but are re-transmitted in collective messages for the benefit of European and North American Services. A study of records received shows that similar results are being achieved in other parts of the world where observations have been formally requested.

| | 1945 | | 1946 | | | | | | | | | | | | 1947 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov | Dec | Jan | Feb | Mar | Apr | May | J'ne | July | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
| No. of ships which sent in W/T reports .. .. | 60 | 64 | 67 | 86 | 110 | 109 | 149 | 136 | 166 | 175 | 176 | 174 | 179 | 193 | 185 | 180 |
| Messages received during the month .. .. | 601 | 670 | 688 | 925 | 1208 | 1190 | 1684 | 1558 | 1910 | 2115 | 2013 | 2157 | 2272 | 2213 | 2374 | 2101 |
| Daily average of messages received .. .. | 20 | 21 | 22 | 33 | 39 | 40 | 54 | 52 | 61 | 68 | 67 | 70 | 76 | 71 | 77 | 75 |

All reports from ships of the British Empire are, at present, reported in Code Form F*233. This is a fairly comprehensive code, but to satisfy modern requirements some modifications are desirable.

At a Conference of the International Meteorological Organisation held in Paris in July, 1946, an entirely new universal code was drawn up. The new code embodies some rather drastic changes from former codes but is relatively simple to use. Its chief asset is in the fact that it will be a universal code for use throughout the world. This new code has not yet been accepted by all nations and the date of its introduction is, as yet, uncertain.


## JULY, AUGUST AND SEPTEMBER

It is hoped that these pages will be filled each quarter with a selection of the contributions of Mariners in manuscript, or remarks from the Logs and Records of regular Marine Observers. Photographs or sketches illustrating. observed phenomena are particularly desirable.

Responsibility for statements rests with the Contributor.

## CURRENT RIP

### West Australian Waters

The following is an extract from the Meteorological Record of M.V. *Waipawa*. Captain W. G. West. Colombo to Fremantle, Australia. Observer, Mr. D. MacCallum, 3rd Officer.

4th July, 1946, 0735 G.M.T. Definite current line observed running in SE × E/NW × W direction. No change in sea temperature was recorded while crossing current line. Weather partly cloudy, stratocumulus 3/10. Barometer 1017 mb. Temperature : air 71° F, sea 73° F.

Position of Ship : Latitude 20°30′S., Longitude 103°47′E.

## TIDAL STREAMS AND TIDE RIPS

### Malacca Straits

The following observations were made by the S.S. *Recorder*.

3rd–5th September, 1946. North of One Fathom Bank the predominating set was to the WNW about ½ to 1 knot. Little or no set was experienced during the period of Flood Tide, except off Diamond Point, where the WNW set continued at a rate of 1 to 1½ knots during this period.

About 15′ WNW of Diamond Point numerous heavy overfalls and tide rips were seen, the heaviest was close to the position of the 100-fathom line and stretched in a continuous line as far as the eye could see, roughly in the same direction as the contour line, that is SW to NE. It had the appearance of a stationary breaking wave about 2 ft. high.

The WNW set was reduced to only about ¼ knot soon after crossing the 100-fathom line in Latitude 5° 23′N.

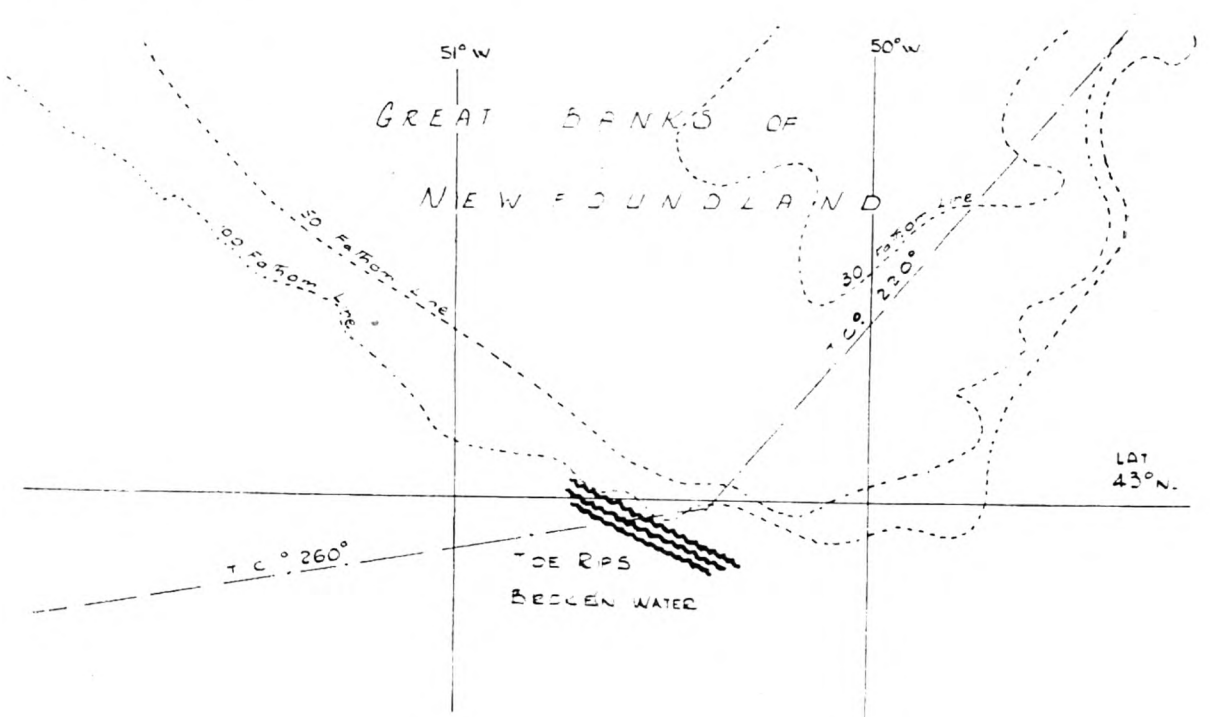
## TIDE RIPS

### Newfoundland Waters

The following is an extract from the Meteorological Record of S.S. *Consuelo*. Captain F. Ellison. Hull to New York. Observer, Mr. J. Salvidge, 2nd Officer.

25th August, 1946, 1600 G.M.T. Three distinct tide rips were observed running NW–SE, extending approximately for a distance of 4 to 5 miles and 1 mile in width, apparently taking the trend of the SW edge of the Newfoundland Bank. The echometer, which had been showing 38 fathoms, deepened to 62 fathoms just before the ship entered the rips, but the soundings faded out very quickly after passing through the rips. The disturbance of the water was very similar to the conditions experienced in the Pentland Firth. Weather conditions at the time : Wind SSW, force 3, slight sea and swell.

Position of Ship : Latitude 42° 58′N., Longitude 50° 25′W. Course 261°. Speed 14 knots.



## CHANGE OF TEMPERATURE
### Gulf of Aden

The following is an extract from the Meteorological Record of M.V. *Empire MacColl.* Captain F. J. Goodchild. Abadan to Port Said. Observer, Mr. T. B. Halvonsen, 2nd Officer.

1st September, 1946, 2100 G.M.T. (approx.). Between Aden and Perim, the sea temperature, as reported by the engineers, suddenly dropped to 64° F., at approximately 2100 G.M.T. The temperature then gradually rose, until when off Perim it was back to 86° F. at 0100 G.M.T. on the 2nd. The air temperature also fell, but approaching Perim, a warm NW breeze developed. The injection pipe for the engine room is about 24 ft. below sea level.

Approximate position of Ship : Latitude 12° 45'N., Longitude 44° 18'E.

The following is an extract from the Meteorological Record of S.S. *Ormonde.* Captain A. C. G. Hawker, C.B.E. London to Colombo. Observer, Mr. A. M. L. Murray, supny. 2nd Officer.

3rd September, 1946, 0700 G.M.T. The air temperature was observed to have dropped from 90° F. to 80° F. while the sea temperature dropped from 82° F. to 66° F. The wind which had been moderate from the NW × W backed to WSW and increased to fresh. Corrected barometer 1004·2 mb. At 1100 G.M.T. the sea temperature rose to 77° F. ; air temperature 82° F., wind SW force 4, barometer (corrected) 1002·1 mb.

Position of Ship : Latitude 12° 30'N., Longitude 43° 53'E. Course 101° True. Speed 15·7 knots.

*Note.*—On 6th August, 1946, S.S. *Strathmore* reported a drop in sea temperature of 13° F. when rounding Perim Island. On 10th August, 1946, S.S. *Queen of Bermuda* observed a drop of 23° F. in about two hours, immediately after passing this island. On 30th August, 1946, M.V. *Telemachus* reported a drop of 19° F. in sea temperature and 13·5° F. in air temperature on passing Perim, which lasted for 100 miles eastwards into the Gulf of Aden.

Considerable changes of sea temperature are frequently observed in the neighbourhood of the Straits of Bab el Mandeb during the south-west monsoon season and these may be very great in the period July to September. The probable explanation is that the monsoon wind draws away some of the surface water of the Gulf of Aden, which has to be replaced by the upwelling of cooler water from the depths. From Perim to east of Aden, the water shoals gradually over a wide area to the coast. The upwelling water would pass up this slope and come to the surface in soundings.

## LINE SQUALL
### Mozambique Channel

The following is an extract from the Meteorological Record of S.S. *Deebank.* Captain B. Rivett. Durban to Mombasa. Observer, Mr. S. M. Allan, 3rd Officer.

1st September, 1946, 1050 G.M.T. (0130 A.T.S.). A line squall was observed, stretching as a continuous band of cumulonimbus cloud, from horizon to horizon, in an otherwise clear sky. Lying in a direction roughly WNW–ESE, the base of the cloud was estimated to be at about 800 ft.

A rise in barometric pressure and air temperature was noticed when passing directly below the cloud ; the readings were as follows :—

| Time (A.T.S.) | Barometer (mb.) | Air temperature (°F.) |
|---|---|---|
| 01·30 | 1017·6 | 74 |
| 01·35 | 1018·1 | 75 |
| 01·40 | 1018·2 | 75 |

The sea temperature remained constant at 74° F.

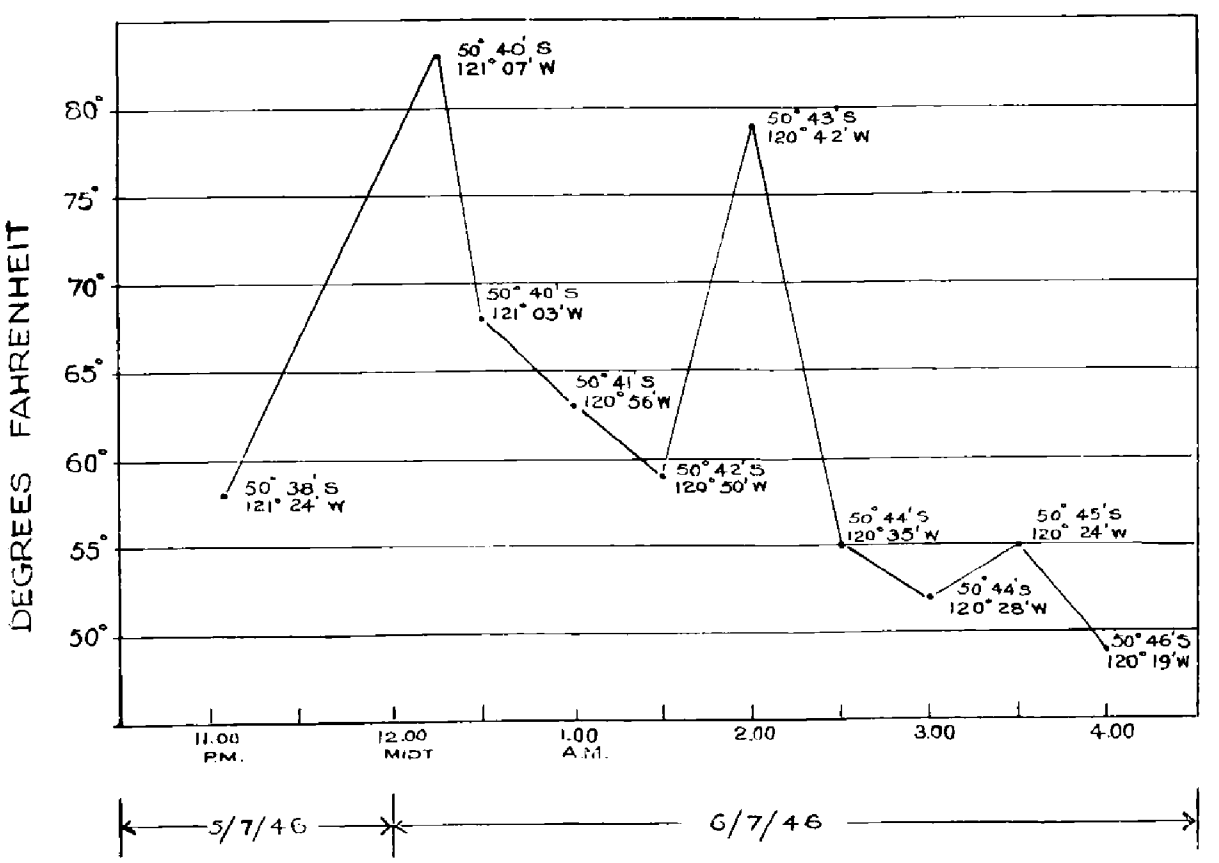
Position of Ship : Latitude 20° 24'S., Longitude 39° 30'E.

## ABNORMAL SEA TEMPERATURE

### South Pacific Ocean

The following is an extract from the Meteorological Record of M.V. *Australia Star*. Captain O. C. Roberts. New Zealand to United Kingdom via Cape Horn. Observer, Mr. A. K. White, 3rd Officer.

2nd July, 1946, 1100 A.T.S. The barometer commenced falling and by 4 a.m. on July 3rd it stood at 29·50 in. Wind ESE, force 7. At noon the barometer was reading 29·25 in. For the rest of the day, winds of fresh gale force prevailed and the barometer continued falling. By 5 a.m., 4th July, the wind had moderated to a fresh breeze and backed to North. Barometer 28·63 in. (the lowest reading experienced). Fresh and strong breezes prevailed throughout the day and until 9 a.m., 5th July, when the wind veered to NNE and increased to force 9. By midnight the barometer had risen to 29·13 in. and then began to fall slowly. The mean air temperature stood at 45° F. throughout this period whilst the sea temperature ranged between 48° F. and 50° F. The above data has been given in order to give a general outline of the following phenomenon. At 1105 p.m., 5th July, the sea temperature was 58° F. and by 1215 a.m. July 6th it had risen to 83° F.



Readings were then obtained at 1230 a.m. and at every half-hour until 4 a.m. and are represented by the graph, together with the positions. The positions are only approximate as no observations were obtained after noon sights on 4th July owing to weather conditions. No undue disturbance of the water was noticed during the night, but this would have been difficult to see on account of the heavy sea running at the time. The sea temperatures were obtained from the engine room and we have been assured that the thermometer used is a reliable instrument.

## MONSOON SQUALLS

### Arabian Sea

The following is an extract from the Meteorological Record of S.S. *Ranchi*. Captain R. E. T. Tunbridge. Bombay to Aden. Observer, Mr. C. T. Page, 4th Officer.

4th August, 1946, 0500 G.M.T. approximately. Wind had been experienced at force 9. At this time squalls passed at intervals of 15 minutes in a NE'ly direction. During these squalls, wind backed to South, decreased to force 3, then veered to WSW and increased to force 11. Upper cloud (As.) was moving against the wind in a SW'ly direction and lower cloud (Nb.) with the wind in a NE'ly direction.

Position of Ship : Latitude 15° 51'N., Longitude 58° 45'E.

## DISCOLOURED WATER

### Arabian Sea

The following is an extract from the Meteorological Record of S.S. *Franconia*. Captain R. B. G. Woollatt, R.D., R.N.R. Suez to Bombay.

21st September, 1946, 1100 G.M.T. The vessel passed through numerous large patches of discoloured water. These patches were in lanes about 1 mile wide and running in a WSW to ENE direction, the colour was dull greenish yellow and had every appearance of fresh river water. Weather during the period was : Wind W, force 1. Smooth sea. Barometer 1012·0 mb. Temperature : air 80° F., sea 74° F. and remained unchanged throughout.

Position of Ship : Latitude 15° 00'N., Longitude 54° 10'E.

## PHOSPHORESCENCE

### Arabian Sea

The following is an extract from the Meteorological Record of S.S. *Empire Bounty*. Captain J. C. Nettleship. Singapore to Abadan. Observer, Mr. G. H. Taylor, R.D., 2nd Officer.

28th to 29th August, 1946, 2040 to 0150 G.M.T. At about 2020 G.M.T. it was very dark with sky cloudy to overcast. The horizon from NW through W to South became illuminated as if from the looms of numerous powerful shore lights. After a few minutes a white line appeared on the horizon and spread rapidly until the white water surrounded the ship. The sea was a light grey with considerable luminosity, although not phosphorescent, similar to its appearance during full moon, although the moon, only 3 days old, had already set. The sea also appeared quite calm and no " white horses " visible, but this was obviously not the true state of affairs as the motion of the vessel and relative wind force was the same as previously, when in a moderate SW'ly swell, light sea, and wind SW force 4–5. The cloud

formation disappeared during the first half-hour but made no difference to the appearance of the sea. The first occurrence of "white water" disappeared at 2120 G.M.T., further occurrences were observed from 2150 to 2215 G.M.T. and lastly from 2235 G.M.T. on the 28th to 0150 G.M.T. on the 29th. The last two occurrences, however, were not so bright as the first. During the last occurrence there appeared to be a complete formation of altostratus or cirrostratus veiling the whole sky and no stars were visible. Estimation of cloud height was not possible. During the phenomenon the horizon was well-defined, except to the SE, being especially so to the N and NE, where the line of white sea and black cloud showed up well.

Estimation of visibility was impossible throughout and could have been anything between 2 and 20 miles.

Position of Ship: Latitude 14° 27'N. to 15° 14'N., Longitude 67° 22'E. to 66° 45'E. Course 320°. Speed 12 knots.

## WATERSPOUTS

### North Sea

The following is an extract from the Meteorological Record of S.S. *Empire Halberd*. Captain W. F. Swann, Cuxhaven to Hull. Observer, Mr. G. W. Whitby, 1st Officer.

16th July, 1946, 1603 G.M.T. A small waterspout was observed, visible for a period of approximately 2 minutes and travelling westward at an estimated speed of 12–15 knots. Estimated size: diameter, 10–15 ft., height, 300–400 ft.

Position of Ship: Latitude 54° 05'N., Longitude 3° 40'E.

The following is an extract from the Meteorological Record of S.S. *Tasso*. Captain H. Scarborough. Hull to Scandinavia and back. Observer, Mr. S. H. Bennett, Chief Officer.

14th July, 1946, 0610 G.M.T. Just after picking up the Humber Pilot off Spurn Lightvessel, a small waterspout was observed close on our starboard bow. We had no option but to pass it very close and when doing so, the wind reached about force 10 with very heavy rain, which lasted for about 1 minute only.

Approximate position of Ship: Latitude 54° 24'N., Longitude 0° 20'E.

## MIRAGE

### Spanish Coast

The following is an extract from the Meteorological Record of M.V. *Richmond Castle*. Captain J. A. Sowden. London to Cape Town. Observer, Mr. R. Leeds, 3rd Officer.

11th July, 1946, 1930 G.M.T. Approximately 12 miles NW of Finisterre, phenomenal refraction was observed to be distorting objects both on shore and at sea. An object of special interest was a vessel passing inside us, about 4 miles distant. The sketches will give some idea of this abnormality. The weather at the time was fine, though fog was anticipated, for there appeared to be a bank of fog lying round the entire horizon. Visibility shorewards was quite good, though objects on the near shore were obscured by haze.

There was little or no wind at the time and only a slight swell. Barometer read 1016·0 mb. and was falling. Temperature : air 69° F., sea 65° F.
*Note.*—The apparent bank of fog was probably an effect of mirage of the horizon.


## LUNAR HALO

### Arabian Sea

The following is an extract from the Meteorological Record of M.V. *Empire MacColl.* Captain F. J. Goodchild. Aden to Abadan. Observer, Mr. T. B. Halvonsen, 2nd Officer.

20th August, 1946, 0045 G.M.T. The sky which had been overcast with cumulus clouds cleared away and a lunar halo was visible. The radius of the halo was about 21° (by sextant). The sky was still cloudy, altostratus and altocumulus covering about 5/10 of sky, but at 0110 G.M.T. these middle clouds cleared away except below 45°. There was a certain amount of monsoon haze reducing visibility to 7 or 8 miles. The inside edge of the halo was firm and very distinct but the outer edge was not so firm. Cirrus clouds were around and some cirrus remained on lower edge of halo, but what appeared to be an arc of lower contact was faintly discernible. This arc extended from about 8° from the point of contact. The ring and arc were plain white. The halo was visible until the advent of daylight at 0130 G.M.T.

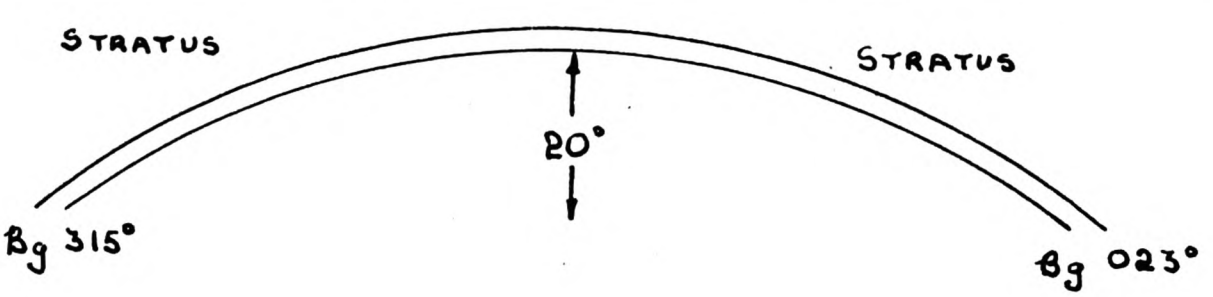
Position of Ship at 0130 G.M.T. : Latitude 17° 54′N., Longitude 57° 24′E. True course 041°, speed 12·5 knots.

## LUNAR RAINBOWS

### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Empire Tagalam.* Captain C. Broughton. New Orleans to Heysham. Observer, Mr. P. L. Hopkins, 3rd Officer.

11th August, 1946, 0115 G.M.T. The moon bearing 170° (T) a white rainbow was seen bearing directly opposite it about 20° high (by sextant). The rainbow bore 023° (T) and 315° (T) and lasted about 10 minutes. Moon nearly full with cumulus clouds around moon and stratus around the



rainbow. Wind WSW 4. Temperature: air 76·5° F., sea 77° F.
Position of Ship: Latitude 41° 37′N., Longitude 52° 08′W. True course 067°. Speed 11·7 knots.

The following is an extract from the Meteorological Record of S.S. *Custodian*. Captain W. Weatherall. Barbados to Liverpool. Observer, Mr. M. Rose, 2nd Officer.

11th September, 1946, 0700 G.M.T. Observed a lunar rainbow in a shower of rain ahead of the vessel, lasting approximately for 5 minutes. Wind ESE, force 1, air temperature 80° F., sea slight, cumulonimbus clouds with scattered showers. Moon bearing 245°, altitude 20°.

Position of Ship: Latitude 27° 13′N., Longitude 48° 05′W.

## SUNSET PHENOMENON

### Gulf of Aden

The following is an extract from the Meteorological Record of M.V. *Strathnaven*. Captain R. B. Beck. Bombay to Southampton. Observer, Mr. N. G. Jenner, 4th Officer.

26th September, 1946, 1454 G.M.T. (Sunset 1437 G.M.T.). A cobalt bow, 1° in width, appeared across the sky, emanating a little above the horizon on a bearing of 270°, and extending to an altitude of 68°, curved to the eastern horizon on a bearing of 90°. It appeared visible for about 30 minutes, slowly losing intensity with the fading light, but gaining richly in colour against the "earth shadow" to the eastward. The bow was transparent; $\alpha$ Lyrae was plainly visible and unimpaired in colour at an altitude of 65° in the centre of the bow.

Weather conditions: Cloud, stratus and cirrostratus, amount 4/10, wind ENE force 1, corrected barometer 29·875 in., air temperature 77° F.

Position of Ship: Latitude 13° 32′N., Longitude 49° 12′E.

*Note.*—This is a very interesting observation and the cause of the bow is not evident. It may have been the shadow of something below the horizon, a cumulus cloud or a hill on the Arabian coast, but in this case the bow should have changed its position in the sky to some extent, with the gradual change of the sun's azimuth below the horizon.

## AURORAE

### Australian Waters

The following are extracts from the Meteorological Record of M.V. *Port Lincoln*. Captain H. H. Smith, O.B.E. Cape Town to Adelaide. Observer, Mr. A. G. W. Miller, 3rd Officer.

22nd September, 1946, 1100 G.M.T. to 2030 G.M.T.

| | |
|---|---|
| 1100 G.M.T. | Aurora observed from 232° to 160° appearing as purple sheet extending to about 20° altitude and disappearing in bank of stratocumulus cloud. |
| 1130 G.M.T. (1900 A.T.S.) | Lower portion turned green, with purple portion developing into rays of light extending upwards as stratocumulus cloud moved to N. Purple portion gradually extending W, and greenish portion extending E. |
| 1145 G.M.T. | Purple rays becoming interspersed with white rays. |

| | |
|---|---|
| 1200 G.M.T. | Aurora appeared as an arc of greenish-white light extending from 090° to 240°, with a maximum altitude of 25° at bearing of 170°. At both ends there was diffused light of much greater intensity than the rest of the arc, the eastern end being white and the western end red. Fairly dark sky observed under the arc with several stars visible. |
| 1215 G.M.T. | Coloured portions gradually fading. |
| 1245 G.M.T. | Bright white glow extending over southern portion of sky. |
| 1300 G.M.T. | Brighter white rays rising vertically from southern horizon to about 7° to 10°. |
| 1330 G.M.T. | Aurora slightly fading, sinking into the southern horizon, with fractocumulus increasing over glow. |
| 1500 G.M.T. | Arc of light extending across sky, of a yellowish colour, rising at 110°, setting at 260°, reaching a height of approximately 50° and being about 5° to 10° wide. Sky quite dark above horizon to S, with patches of cumulus cloud. |
| 1545 G.M.T. | Rays of white light rising vertically from the horizon throughout southern portion of sky and reaching through arc with patches of red to the W, and between arc and lower portion of rays. |
| 1520 G.M.T. | Rays of white light with red glow covering the southern half of sky pointing toward the zenith, and in places reaching the zenith. Few patches of light cumulus bordering southern horizon. |
| 1530 G.M.T. | Rays of light converging at the zenith with scattered rays pointing from N, at a high altitude. Curtain of rays extending between 085° to 280°. |
| 1610 G.M.T. | Rays slowly fading, leaving white glow over southern portion of sky. |
| 1630–1640 G.M.T. | Yellowish-green diffused light on southern horizon from 120° to 230°. E of 170° changed to rays of light converging towards spot N of ship's zenith. These rays were of varying intensity and appeared to leap up from the horizon and gave the effect of shimmering in a vertical direction. |
| 1800 G.M.T. | Diffused light to S, now very dim. |
| 1910 G.M.T. | Minor display of rays, pale yellow and green, bearing 210°. |
| 2030 G.M.T. | Appeared only as a general lightening of the southern sky, persisting until twilight. |

Position of Ship : Latitude 39° 36′S., Longitude 114° 18′E. Course 081°. Speed 16 knots.

23rd September, 1946, 1200 G.M.T. (2000 A.T.S.). Aurora commenced as a white glow in the southern sky. At 1315 G.M.T. a white arc extended from bearing 135° to 225°, with a maximum altitude of 20°, and was about 5° wide. From 1345 G.M.T. until 1530 G.M.T. the aurora was visible as a diminishing glow to SW.

Position of Ship : Latitude 38° 26′S., Longitude 122° 14′E.

The following is an extract from the Meteorological Record of S.S. *Mulbera*. Captain K. G. Mace. Melbourne to Bombay. Observer, Mr. T. A. Robinson, 2nd Officer.

22nd September, 1946, 1400 G.M.T. Aurora Australis observed over a horizontal arc of the horizon of 60° to the southward. The following sequence was seen : (1) Pink glow over the horizon ; (2) Shafts of light like organ pipes to about 20° altitude ; (3) Same as (2) to 40° altitude ; (4) After about 20 minutes the display ceased and then repeated from the beginning. The strength was about the same as a dimmed anti-aircraft searchlight such as used for practice in wartime.

Position of Ship : Latitude 36° 30'S., Longitude 123° 20'E.

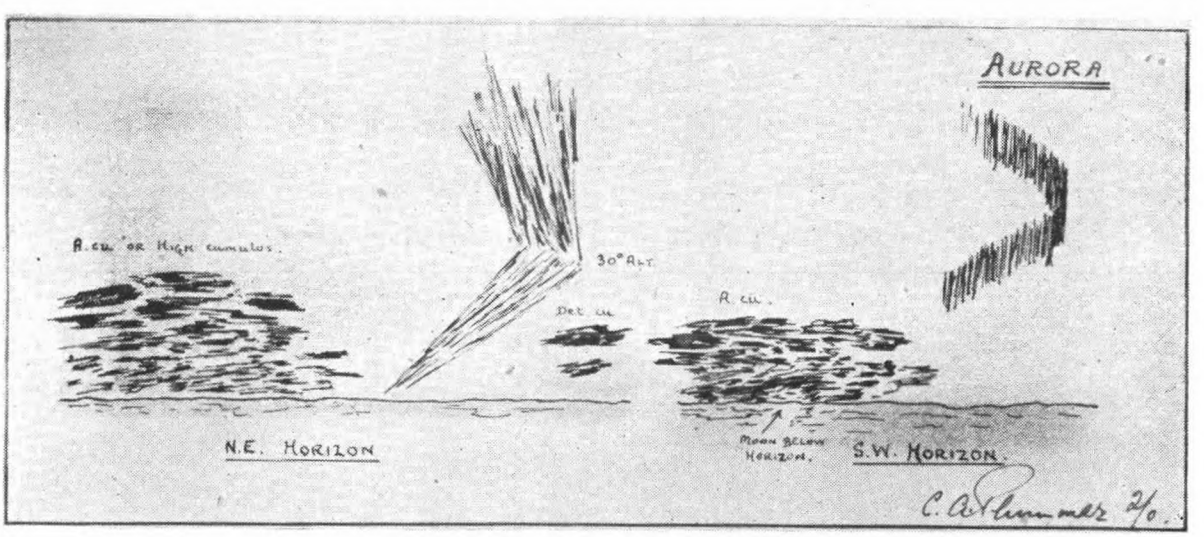
**Icelandic Waters**

The following is an extract from the Meteorological Record of S.S. *Horsa*. Captain D. Dickson. Leith to Reykjavik and back. Observer, Mr. C. A. Plummer, 2nd Officer.

11th August, 1946, 0045 G.M.T. Aurora observed in NE sector of horizon, and became bright at 0100 G.M.T., when it took the form (see sketch) of a sheet of cirrus, curving acutely at about 30° altitude towards the Pole Star and fading at the zenith. It assumed the form of a single drapery in the SW and the whole phenomena was a pure white. At 0140 G.M.T. the aurora was obscured by cloud.

Wind N, force 3. Visibility 9. Barometer 1006·3 mb. Temperature : air 53·5° F., wet bulb 50° F., sea 55° F. No low clouds, middle cloud Ac. or high cumulus of fine weather.

Position of Ship : Latitude 62° 03'N., Longitude 17° 51'W.




**North Atlantic Ocean**

The following is an extract from the Meteorological Record of S.S. *Thamesfield*. Captain D. A. Law. Hamburg to Aruba. Observer, Mr H. Shaw, 2nd Mate.

27th July, 1946, 0300 G.M.T. Observed to the NW immense streaks of light, the extremities of which were of a reddish tint. The streaks were fixed like searchlights, not wavering.

Barometer 1024·4 mb., air temperature 60° F., sea temperature 63° F. Course 239° True. Speed 11·5 knots.

Position of Ship : Latitude 45° 30'N., Longitude 16° 15'W.

The following is an extract from the Meteorological Record of M.V. *Losada.* Captain E. Potter. Cristobal to Liverpool. Observer, Mr. G. E. Turner, 2nd Officer.

27th July, 1946, 0030 G.M.T. A deep red glow was observed stretching across the horizon from NNE to NNW to an altitude of about 25°. A low narrow belt of cumulus cloud partially obscured the glow at times and rays of yellowish light (like distant searchlight beams) were observed shooting fanwise from approximately the N point of the horizon. This phenomenon lasted until 0330 G.M.T.

Again at 0415 G.M.T. a yellowish glow was seen from NNE to NNW to an altitude of about 20°, together with the shooting rays, of blue-white light. This second appearance lasted 20 minutes.

The sky, apart from a low narrow belt of cumulus, was clear. Barometer 30·165 in. Air temperature 81° F. Wind SSE, force 2. Course 045 . Speed 9 knots.

Position of Ship : Latitude 29° 33'N., Longitude 64° 24'W.

The following is an extract from the Meteorological Record of M.V. *Athelprince.* Captain A. W. Pegg. Havana to United Kingdom. Observer, Mr. B. Platt, 2nd Officer.

26th to 27th July, 1946. Hours of darkness. Auroral arc, altitude 20° average, visible all night in various forms and of varying brilliancy. Early part of night of a red cast, latterly all white.

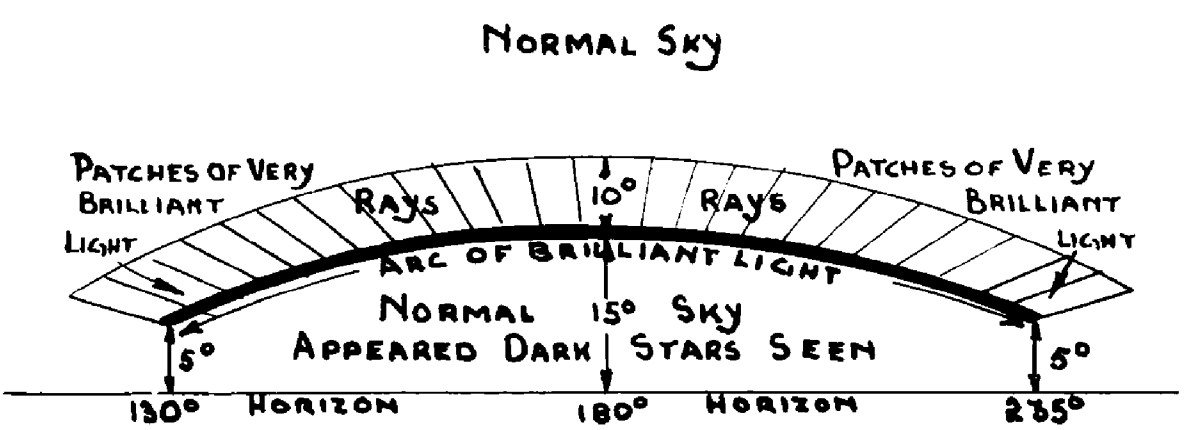
Position of Ship at midnight : Latitude 41° 06'N., Longitude 51° 02'W.

**South Australian Waters**

The following is an extract from the Meteorological Record of S.S. *Chitral.* Captain A. G. Jenkins. Sydney to Fremantle. Observer, Mr. H. L. Fisher, 3rd Officer.

28th September, 1946, 1300 G.M.T. An auroral display was observed from 1245 G.M.T. to 1315 G.M.T. and was at its greatest brilliance at 1300 G.M.T. The new moon had set at 1240 G.M.T. Cloudless sky, excellent visibility. WNW'ly wind, force 1.

Position of Ship : Latitude 36° 07'S., Longitude 121° 31'E. Course 282°.



## METEORS

### Approaching English Channel

The following is an extract from the Meteorological Record of S.S. *Scythia*. Captain O. Bateman. Bombay to Liverpool. Observer, Mr. I. V. Williams, Senr. 3rd Officer.

30th August, 1946, 0156 G.M.T. Large meteor observed bearing 050° about 30° altitude, traces visible for 10 minutes after disappearance.

Position of Ship : Latitude 48° 15'N., Longitude 07° 27'W.

### Arabian Sea

The following is an extract from the Meteorological Record of S.S. *Mahout*. Captain H. E. MacGregor. Calcutta to Aden. Observer, Mr. O. Pritchard, 2nd Officer.

6th July, 1946, 2330 G.M.T. Observed a brilliant white flash, lighting up the entire horizon. After the flash, there appeared directly overhead a white streak resembling a long thin white hot wire (shape see A) which remained in the same position for between 40 and 50 seconds, gradually diminishing in brightness till it finally disappeared.

Position of Ship : Latitude 10° 10'N., Longitude 65° 20'E.

A 

*Note.*—The actual passage of the meteor was not seen, owing to its high altitude. Trails persisting for some time occur with some meteors, but not all.

The following is an extract from the Meteorological Record of S.S. *Ormonde*. Captain A. C. G. Hawker, C.B.E. London to Colombo. Observer, Mr. A. M. L. Murray, Supny. 2nd Officer.

25th September, 1946, 2340 G.M.T. Exceptionally large meteor observed, the brilliancy of which was greater than Venus. It appeared on bearing approximately 240° at altitude 20°, travelled southward leaving a short trail and burst on bearing approximately 210° at altitude 15°. Weather at time, partly cloudy with light SW × S wind. Barometer (corrected) 1010 mb., dry bulb temperature 78° F., wet bulb 74° F.

Position of Ship : Latitude 16° 13'N., Longitude 61° 18'E.

### Indian Ocean

The following is an extract from the Meteorological Record of M.V. *Port Fairy*. Captain D. G. H. Bradley. London to Melbourne via Cape Town. Observer, Mr. O. N. Harries, Chief Officer.

28th August, 1946, 1515 G.M.T. A brilliant meteor was observed, appearing in the vicinity of $\alpha$ Pavonis and disappearing near Antares. The duration of flight was approximately 3 seconds, and the magnitude estimated at −10 or more. The brilliant light illuminated the whole ship as a star shell.

The colour was white, and it left a trail covering the entire path of flight, which remained visible for about 15 seconds. The sky was cloudless at the time, no moon, and with excellent visibility. In the course of its flight, the body passed directly over the ship. No more meteors were observed during the night.

Position of Ship : Latitude 41° 54'S., Longitude 78° 05'E.

### South African Waters

The following is an extract from the Meteorological Record of S.S. *Macharda*. Captain R. A. Penston. Calcutta to Cape Town. Observer, Mr. J. F. Baker, 3rd Officer.

26th July, 1946, 2400 G.M.T. A large meteor coloured green was seen bearing SW by W, altitude 40°, visible for 1½ seconds before disappearing over horizon. Visibility excellent.

Position of Ship : Latitude 30° 00'S., Longitude 36° 30'E.

### South Pacific Ocean

The following is an extract from the Meteorological Record of M.V. *Port Jackson*. Captain L. H. Swan, O.B.E. London to Auckland via Panama. Observer, Mr. R. R. Rowlinson, 3rd Officer.

28th August, 1946, 1025 G.M.T. A meteor of abnormal size and brilliancy moved at a moderate speed from the region of Altair in a NW to SE direction. Very little trail. Duration of flight, 3 to 4 seconds. Altitude 45°. Brightness similar to burning magnesium. Predominating colours, white and green. Observed in a clear sky.

Position of Ship : Latitude 13° 41'S., Longitude 107° 13'W.

1st September, 1946, 0750 G.M.T. A meteor of abnormal size and brilliancy moved at a moderate speed from the region of $\alpha$ Cygni in a northerly direction. Very little trail. Duration of flight, 3 seconds. Altitude 17°. Extremely bright. Predominating colour, green. Observed in a clear sky.

Position of Ship : Latitude 26° 15'S., Longitude 130° 50'W.

## OCEAN WEATHER SHIPS

BY COMMANDER C. FRANKCOM, O.B.E., R.D., R.N.R.

HISTORY.—Prior to the year 1936, synoptic observations from the sea were provided almost entirely by voluntary observers in merchant ships, apart from those obtained from the relatively small number of naval vessels. These observations, although extremely valuable to the forecaster, were necessarily restricted in nature, and more or less haphazard as regards position.

As transoceanic aircraft became a possibility, it became obvious that more detailed information was necessary than could be obtained from voluntary observers in moving ships in order to provide meteorologists and aircraft with accurate information about weather conditions at sea, both on the surface and in the upper atmosphere.

In 1936-7, the British Meteorological Office placed a meteorologist aboard a cargo steamer on the North Atlantic trade route during several voyages and obtained a regular series of special synoptic observations as an experiment. Visual observations of cloud heights and of upper winds were obtained in this ship by the use of pilot balloons.

In 1938–9, the French Government fitted up the merchant vessel *Carimare* as a stationary meteorological ship in the North Atlantic. Observations of conditions in the upper atmosphere by radio-sonde were successfully obtained in this ship as well as those of surface conditions, and the results transmitted by radio. At about the same time, the Germans had two special vessels performing similar functions in connection with their transoceanic airways—one operating in the North Atlantic and the other in the South Atlantic. The British Meteorological Office was exploring the possibility of fitting up a vessel specially for this type of work in the summer of 1939.

The war of 1939–45 put an end to all the above activities, and in the early part of that war, observations from the oceans were only obtainable from naval vessels and from aircraft. As the war progressed, both sides used various ingenious methods to obtain weather observations from the oceans for their own use. In the latter part of the war, owing to the large number of Allied aircraft regularly crossing the Atlantic, the United Kingdom and United States authorities employed a number of small naval vessels as stationary meteorological ships in that ocean.

When the war finished, the naval stationary vessels were gradually withdrawn, and observations were once more obtainable from merchant vessels. It was realised however, that such observations were not sufficient, and early in 1946 the Conference of Directors of the International Meteorological Organisation at a meeting in London passed a resolution urging the establishment of stationary meteorological ships in certain ocean areas. Shortly afterwards, the Provisional International Civil Air Organisation (PICAO) passed a similar resolution in Dublin. In the summer of 1946, at a meeting of the member states of PICAO in London, it was agreed that a total of 13 stationary meteorological ships would be established in the North Atlantic by July, 1947.

THE PICAO AGREEMENT.—The United States, Canada, France, Holland, Belgium, Norway, Sweden, Great Britain, Eire, Denmark, Iceland, Portugal and Spain were all signatories to the " Ocean Weather Ship " agreement. It was agreed that the allocation of stations would be as follows :—

| | |
|---|---|
| United States .. .. .. | 7 |
| Canada and United States, jointly | 1 |
| France .. .. .. .. | 1 |
| United Kingdom .. .. .. | 2 |
| Norway, Sweden and U.K. jointly | 1 |
| Holland and Belgium, jointly .. | 1 |

Eire agreed to provide an annual monetary contribution towards the scheme. It was decided that Portugal, Denmark and Iceland already contributed sufficiently to the safety of transoceanic aircraft by the establishment of meteorological stations in the Azores, Greenland and Iceland respectively.

It was decided that on an average it would need at least two ships to maintain one ocean weather station. The minimum size vessel which could satisfactorily perform the necessary duties was considered to be one of about

1,300 tons displacement, having a length of about 200 ft. and being of a suitable type for North Atlantic work.

THE DUTIES OF THE SHIP would include :

(*a*) *Meteorological observations.*—Surface observations every three hours.

Special observations, when necessary, of meteorological phenomena and of important changes in the weather.

Upper air wind observations by radar methods not less than four times daily.

Upper air temperature, pressure and humidity by radio-sonde not less than twice daily.

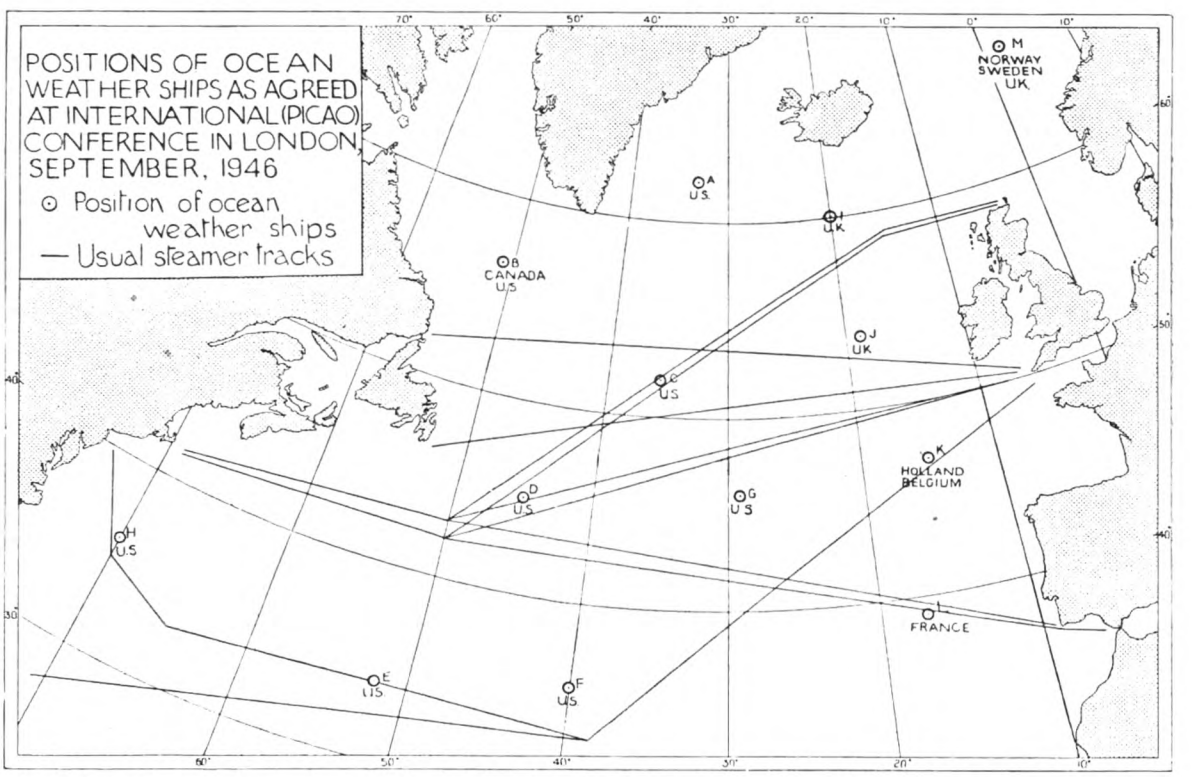
All the above observations would be reported by radio at the appropriate international hours. In addition, observations from certain merchant ships and other ocean weather ships would be collected and re-transmitted by radio.

(*b*) *Search and Rescue Services*—for aircraft and shipping in distress, as necessary, for which the requisite equipment will be provided aboard the ships. This implies the provision of special boats and other life-saving equipment, radar and special radio equipment, including beacons on which aircraft can " home ". The general scheme is that aircraft in distress can " home " on the ocean weather station and alight near enough for a rescue to be effected.

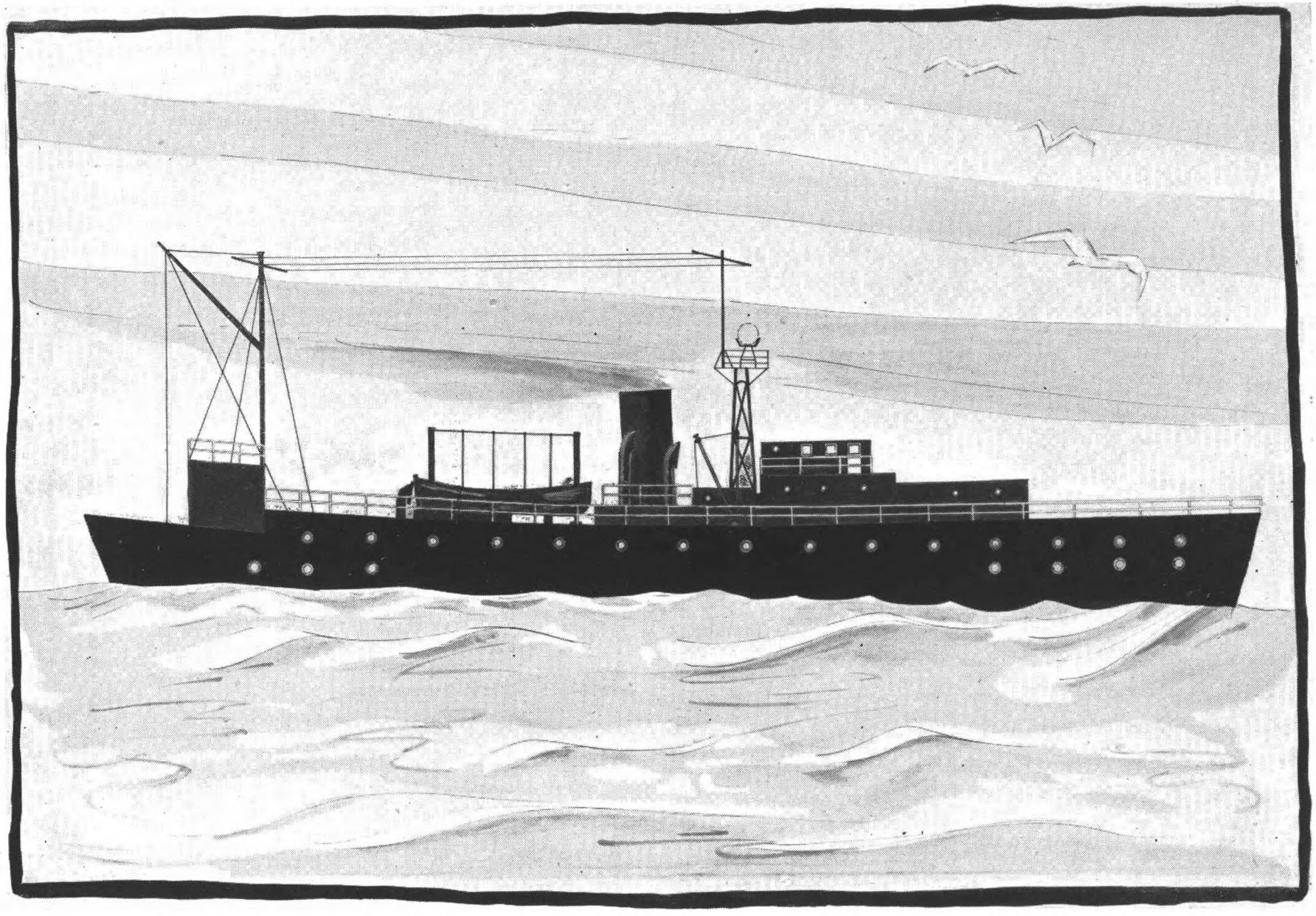
(*c*) *Navigational aids to aircraft in flight*, for which special radio beacons will be fitted aboard the ships.

(*d*) *Oceanographical and other scientific observations* as far as it is practicable.

The attached map shows the agreed distribution of the ocean weather stations, together with an approximation of the usual transatlantic steamer tracks. It should be emphasised that the establishment of these ocean weather




H.M. Corvette *Snowflake*



An artist's impression of a " Flower " class corvette converted to an Ocean Weather Ship

stations will not in any way lessen the importance of observations from merchant ships. The network of observations from the oceans can never approach the density obtainable from stations ashore, but the closer the density the more able is the meteorologist to forecast coming weather changes. The ocean weather ships will merely approximate to islands from which regular observations, both on the surface and in the upper air, are obtainable—the immense gaps being filled by in observations from merchant vessels. It is hoped that the establishment of these stations will not only further the safety of transoceanic aircraft and shipping, but that they will also be the means of greatly improving the accuracy in forecasts for the benefit of the whole community.

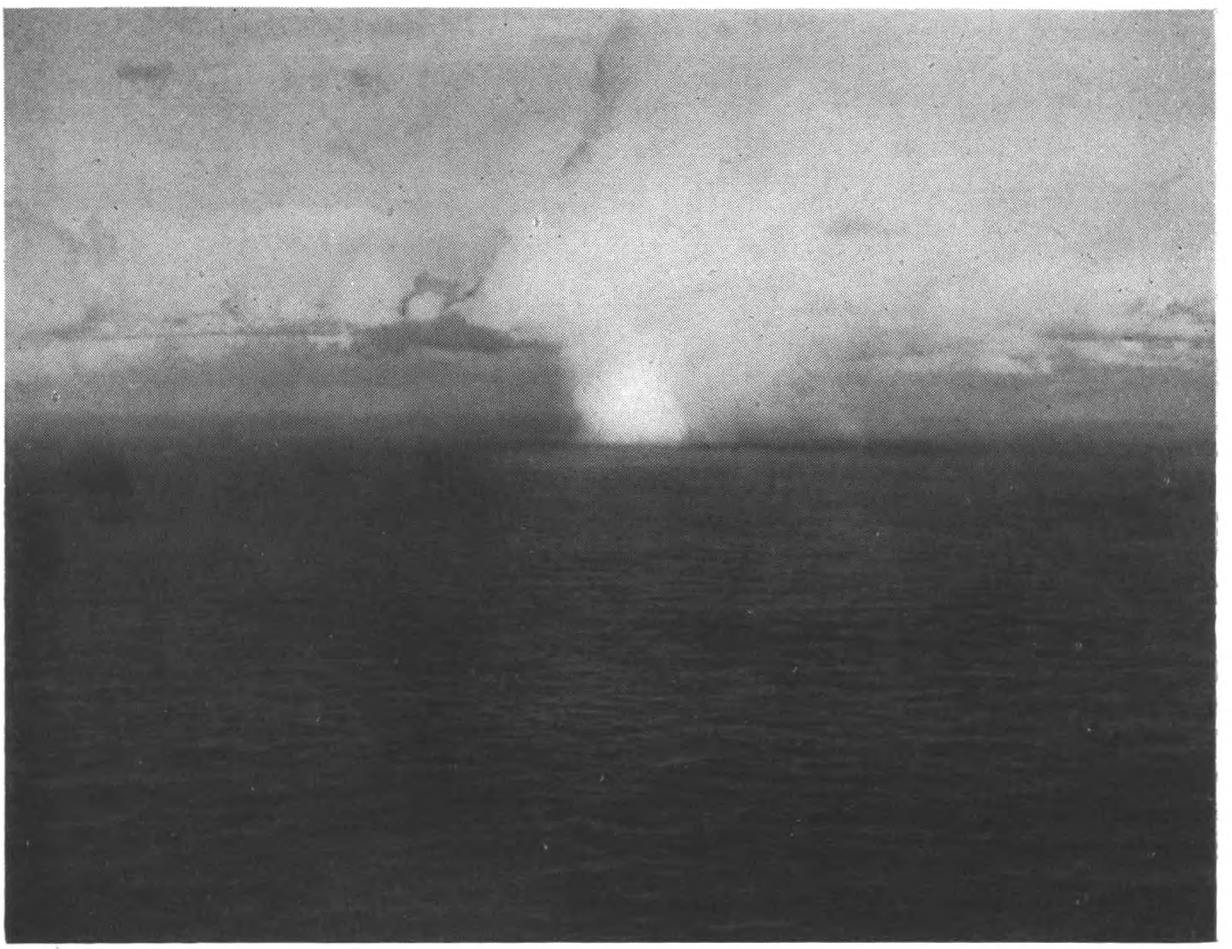
THE BRITISH PLAN for the operation of their 2 stations is to employ 4 ex-naval corvettes of the " Flower " class. These vessels are about 200 ft. in length, are built on whaler lines and have a loaded displacement of about 1,400 tons. They are oil-fired steam vessels, having reciprocating engines and a single screw, and a maximum speed of about 16 knots, economical speed 9 knots. They have established a reputation for being excellent sea boats, having been employed on convoy escort and other duties in the Atlantic, in all weathers, during the recent war.

The British ocean weather ships will carry civilian crews, and they will be administered by the Meteorological Office. Special accommodation will need to be fitted to house the crew of 12 officers, 20 petty officers and 22 ratings, to the modern standards laid down by the Ministry of Transport. A steel shelter will be erected on deck for the filling of radio-sonde balloons ; special radio equipment, radar and motor lifeboats will need to be fitted. The work of conversion of these vessels will be carried out in Admiralty dockyards. It is probable that the ships will be based in the River Clyde area.

The photograph shows H.M. corvette *Snowflake*, one of the vessels which has been allocated to the Meteorological Office. It will be appreciated that with the removal of her guns and the structural alterations necessary to convert her to an ocean weather ship her appearance will be considerably altered, as indicated by the artist's impression.

In addition to a normal complement of Deck and Engine Room officers and ratings, stewards and cooks, the ships will carry meteorologists and radio technicians. It is anticipated that each vessel will spend about 27 days at sea, followed by a spell of 15 days in port—which latter period is necessary for leave to be given to the ships' companies and for necessary repairs, storage and refuelling to be carried out. It is anticipated that the accommodation and food aboard the ships will be good and that generous leave will be given to the ships' companies.

When on station, in the Atlantic, the ships will, as far as possible, remain " hove to ", more or less head on to the wind and sea. Navigation will need to be accurate to ensure remaining in the vicinity of their station, as far as possible, within reasonable limits in all weathers, but the ships will, of course, make way through the water and vary their position from time to time. Life aboard these small ships at sea will be relatively exacting, at times monotonous, at times exciting—but for the man who likes ships and the sea and the study of the weather, it will, in general, always be interesting. The work will undoubtedly be unusual and apart from its importance for scientific and practical meteorological purposes, its potential value for the safety of human life is without question. Those who go down to the sea in ships. . . .



This photograph shows an isolated cumulonimbus cloud with a shower reaching to the sea surface. It was taken by an aircraft flying at 1,600 feet over the North Atlantic on a routine meteorological flight.

1600 B.S.T., 24th January, 1945. Weather—cjp.

## THE BRITISH RADIOSONDE

BY A. J. LANDER, M.B.E.

Radiosondes are miniature weather stations which transmit, automatically by radio, observations made in the course of upper air explorations or " soundings ". They are carried aloft to heights in the neighbourhood of 10 miles by balloons of about 6 ft. in diameter.

Pioneer types of radiosonde were introduced in France and the U.S.S.R. in the late 1920's. Since then numerous patterns operating upon diverse principles have been produced in many countries. The system used in Britain was introduced by Dr. H. A. Thomas of the National Physical Laboratory in 1937 and was subsequently developed into its present form at Kew Observatory.

The principle employed is technically described as "variable audio-frequency modulation". More simply put, the radiosonde converts a meteorological measurement into a musical note which it then broadcasts by radio. On the ground this transmission is picked up by a sensitive radio receiver, and the pitch of the note so reproduced is measured by bringing into exact tune with it another note produced electrically by a calibrated oscillator.

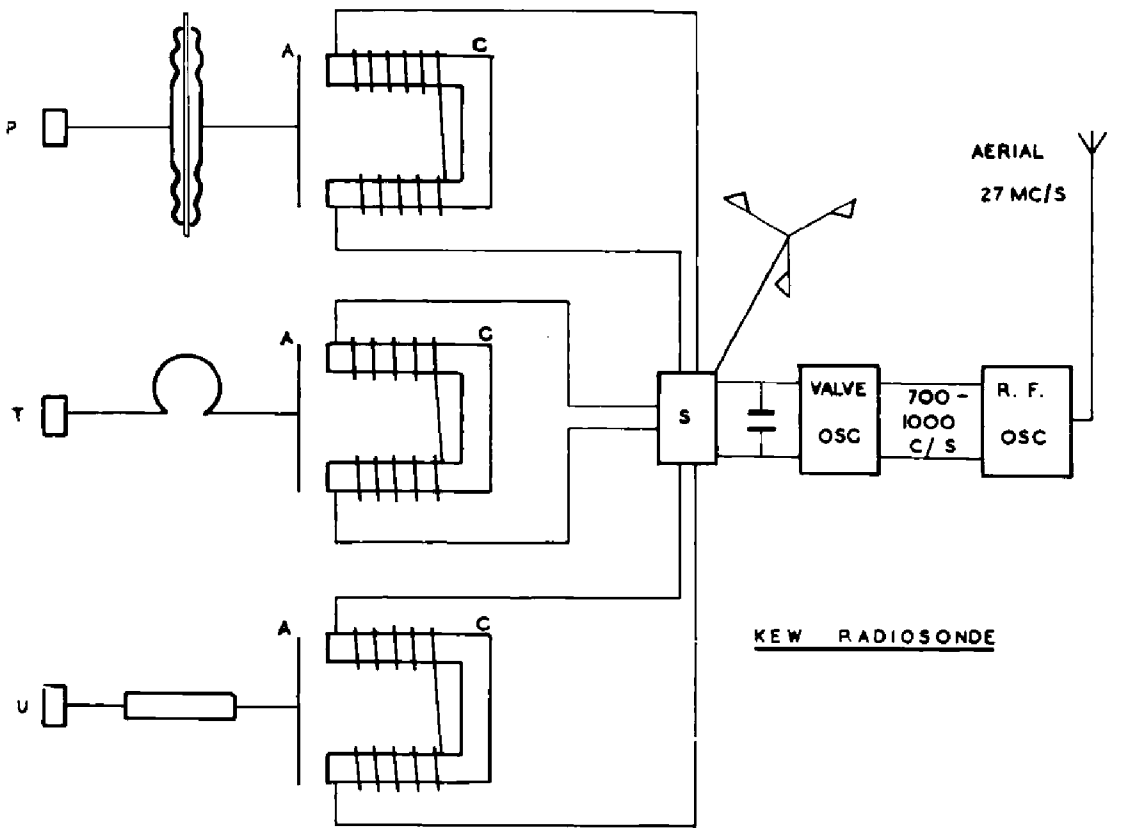



Fig. 1 Reproduced by courtesy of *Weather*

The way in which this radiosonde operates is shown diagrammatically in Fig. 1. On the left are the meteorological units, each comprising a low-frequency inductance (C) and a movable armature (A) whose position with respect to its inductance is controlled by : P, an aneroid capsule sensitive to barometric pressure ; T, a bi-metal coil sensitive to air temperature ; U, a strip of goldbeaters' skin sensitive to relative humidity. Each unit is connected in turn for a few seconds to the valve oscillator by means of a rotary switch (S), gear-driven by a small windmill. The circuit then completed generates a note whose frequency, or musical pitch, is determined by the size of the air gap between the armature and inductance in use. This note may vary in frequency between 700 and 1,000 cycles per second—roughly from F sharp in the second octave (724 cycles per second) up to C (1,024 cycles per second) at the beginning of the third octave. The output from the circuit just described is used to modulate the carrier frequency of 27 megacycles per second (equivalent wave-length = 11·1 metres) generated in the transmitting circuit on the right-hand side of the diagram. The power required for the valves is supplied by a special lightweight battery. The weight of the instrument in full working order is about 3 lbs.

The top photograph shows a radio sounding about to commence. The radiosonde is contained in a round cardboard case approximately 5 in. in diameter. Projecting from this case are the 3 meteorological elements in their polished aluminium shields and the small windmill which operates the switch. The instrument is suspended by its transmitting aerial from a parachute, which in turn is hung from a rubber balloon whose size can be judged from the photograph. The balloon expands, as it rises through the atmosphere, to more than twice its original diameter and finally bursts. The parachute then opens to allow the radiosonde to descend at a safe speed.

The other photograph is of a radiosonde ground station in action. The sergeant is acting as recorder and the airman as computer. Sometimes an additional computer is called in. The various pieces of apparatus in use are :

1. Radio receiver (above the recorder's right hand).
2. Cathode ray oscillograph—the device used to present the picture in a television receiver, and termed C.R.O. for short. (It is necessary to shade its screen with a hood in order that the image may be seen clearly without having to dim the general room illumination.)
3. Audio-frequency oscillator (at the recorder's left hand).

Audible signals produced by the radio receiver and the audio-frequency oscillator are both applied to the C.R.O. The frequency of the signal coming in from the radiosonde in the air is measured by adjusting the audio-frequency oscillator with the left hand until a simple stationary pattern forms on the C.R.O. screen, indicating that both notes are in exact tune. The frequency can then be read on the oscillator dial. This observation is recorded by plotting it on squared paper against time as indicated by a stop-watch which had been started at the moment the radiosonde left the ground. Since the duration of the signal from any one element pressure, temperature or humidity, is but 5 or 6 seconds, considerable skill and alertness are essential for accurate recording.

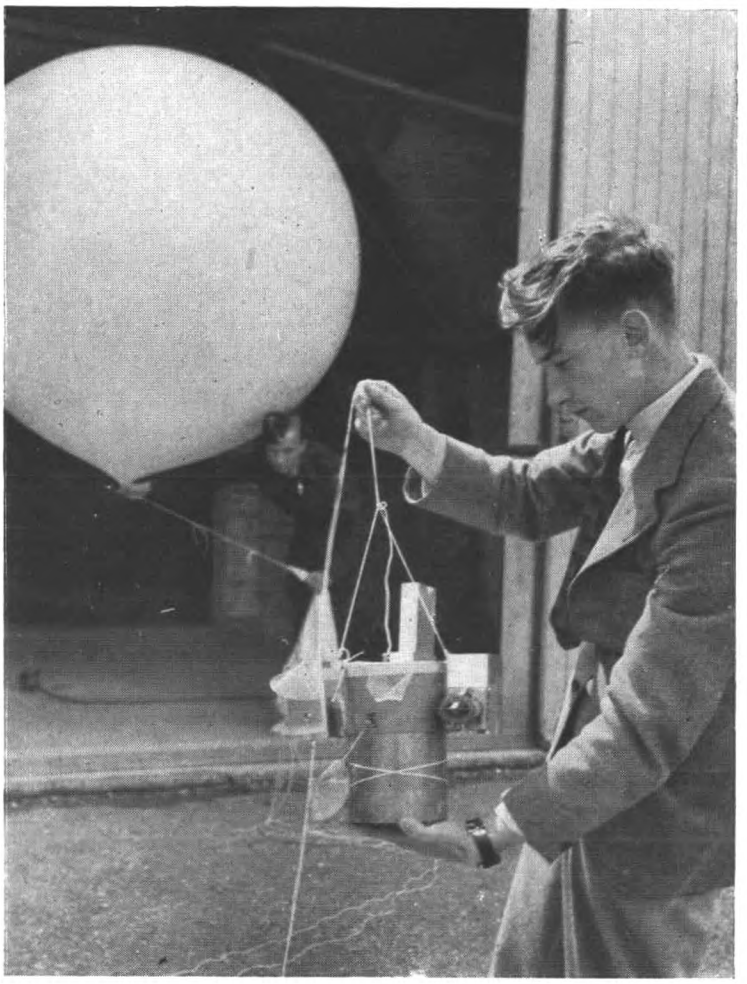
At intervals, completed sheets of the recording are passed to the computer who, by reference to calibration curves sent out with each radiosonde, resolves the observations into conventional units of pressure, temperature and humidity. These data are plotted on an appropriate chart upon which they can be inter-related and from which height can be deduced.

Measurement of upper winds is also undertaken at most radiosonde stations. Three satellite stations, equipped with direction finders, take simultaneous bearings on the radiosonde at intervals of 1 minute. These observations are telephoned to the central sounding office, where they are plotted to reproduce a horizontal projection of the path followed by the balloon under the influence of the wind. Wind directions and velocities are scaled off this plot, the height levels to which they refer having been calculated from the radiosonde signals as already described.

This method of tracking the balloon, however, is now becoming obsolete in favour of radar, which is considerably more accurate and which needs no network of substations.

The completed observations are combined into a compact coded report for dissemination by teleprinter to forecast offices and airfields.

Fig. 2 is a small-scale representation of the results obtained in a typical sounding. Heights are indicated on the left-hand edge and pressures on the right-hand edge ; temperature and relative humidity are shown by horizontal



Reproduced by courtesy of *Weather*

Reproduced by courtesy of *Weather*

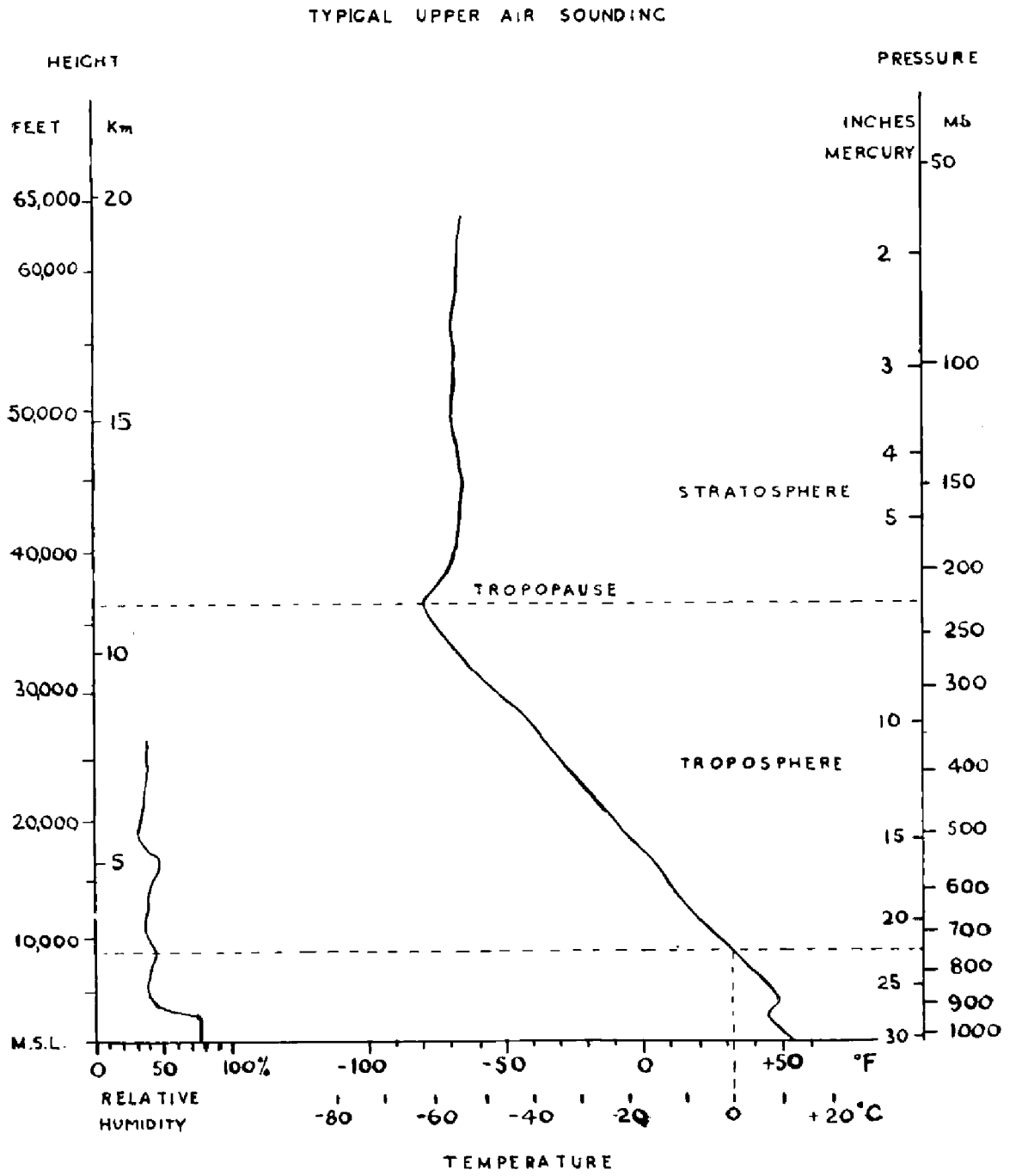



Fig. 2 Reproduced by courtesy of *Weather*

scales at the foot of the diagram. It will be seen that at ground-level, temperature and relative humidity are 53° F. and 79 per cent respectively. At about 2,500 ft. there are discontinuities of temperature and humidity associated with a cloud layer, above which the air is warmer and drier. Temperature then commences a fairly uniform decline. The freezing point is attained at a pressure of 750 millibars (22·18 in. of mercury), corresponding to a height of 8,400 ft. At 36,300 ft. (11·6 kilometres) the tropopause is reached. This is the boundary between the lower atmosphere—the troposphere, and the higher atmosphere—the stratosphere. These terms may be explained briefly as follows. In the troposphere temperature falls more or less rapidly with height. In the stratosphere a completely different régime

obtains ; in the lowest part, temperature may rise rapidly with height, but thereafter all temperature changes with height are small. In the sounding reproduced these characteristics are well marked. The temperature at the tropopause is — 80° F. (— 62° C.). Above this level temperature rises at first and then remains approximately constant.

A maximum height of 63,880 ft. (19·5 kilometres) was reached in the sounding illustrated.

Winds generally increase in strength with altitude in the troposphere, and at the higher levels speeds exceeding 200 miles an hour are not unknown. At the tropopause, however, there is often a marked reduction of speed.

A sounding such as that discussed would involve about an hours' recording, and computation (carried out during the actual flight) would require a further quarter of an hour to complete.

What happens to radiosondes after they have done their work ? Of those flown from stations in the British Isles some, inevitably, fall into the sea and are lost. Nevertheless, quite a good proportion come down on land and can be used again after overhaul. For this reason each instrument carries an officially stamped and addressed postcard advertising a 5/- reward for its recovery. If the finder will post this card, after filling in his name and address, the responsible office will give him every assistance needed for the disposal of the instrument.

## THE IMPORTANCE OF SHIPS' OBSERVATIONS TO THE FORECASTER

BY T. H. KIRK, B.SC.

### PART I. Ships' Observations and the Synoptic Method

#### 1. Introduction

Forecasting the weather depends primarily on an adequate supply of surface and upper air data from both ship and shore stations. Why should the importance of ships' observations, in particular, be considered worthy of special emphasis ? Here are some of the reasons :—

(i) Ships' observations have scarcity value. Taking as an example the North Atlantic Ocean, where ships' reports are perhaps more numerous than elsewhere, some 70 to 80 reports are received *daily*, whereas in the British Isles alone the Air-Met. broadcast gives weather reports from some 40 airfields *every hour*.

(ii) The oceans, acting as a storehouse of energy and water vapour, must play a major part in the atmospheric circulation. In particular, the large-scale ocean current systems modify profoundly the weather of adjacent land areas.

(iii) Accurate weather analyses for ocean areas are essential to the preparation of reliable forecasts, not only for the oceans themselves, but also for adjacent land areas. For example, owing to the general W to E run of the weather in temperate latitudes, forecasts for Western Europe must depend on information of weather over the Atlantic Ocean.

(iv) Observations at sea are, in general, more representative than those

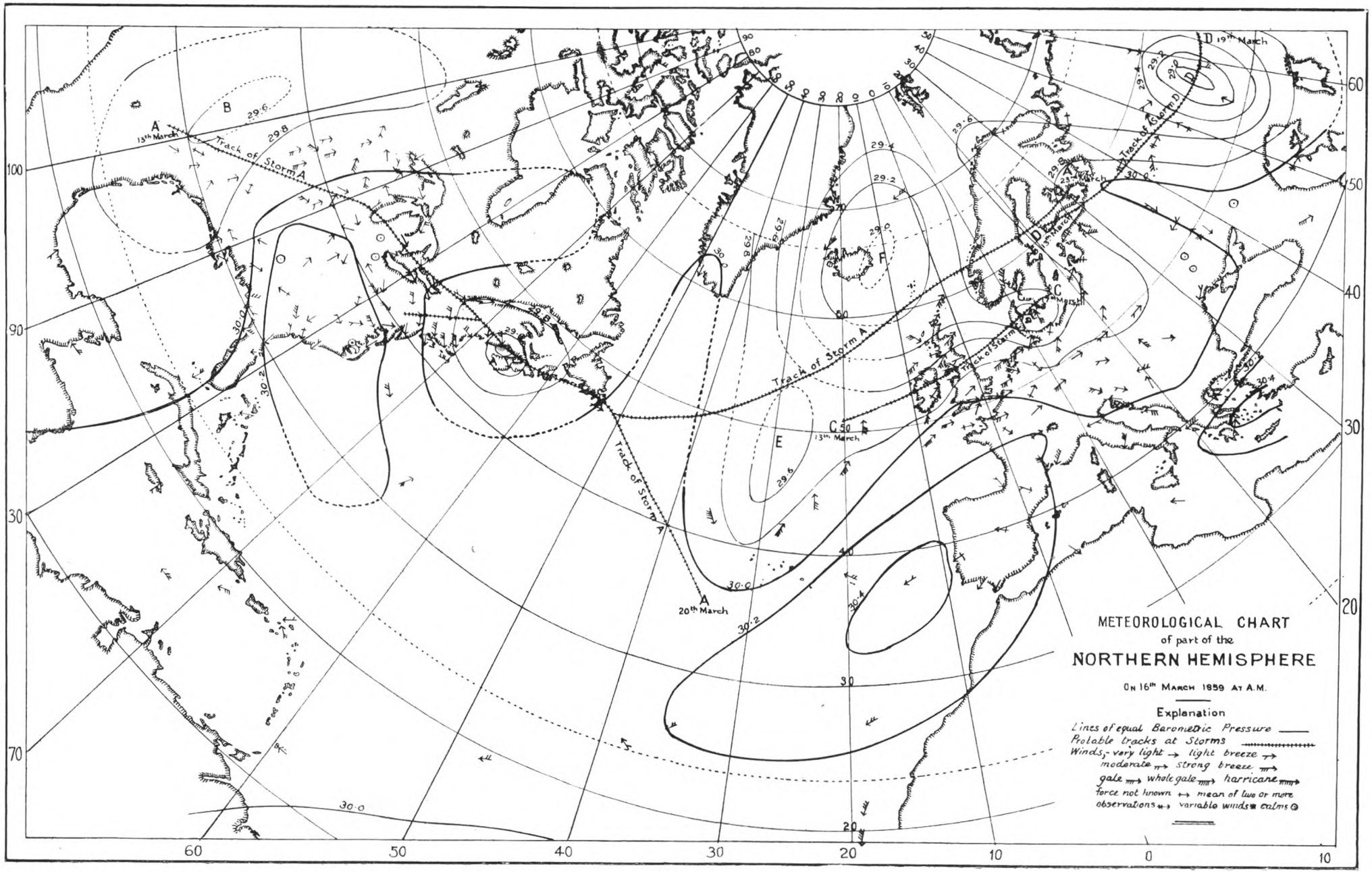

METEOROLOGICAL CHART
of part of the
NORTHERN HEMISPHERE
On 16th March 1859 At A.M.
Explanation
Lines of equal Barometric Pressure
Probable tracks at Storms
Winds,- very light → light breeze →→
moderate →→ strong breeze →→
gale →→ whole gale →→ harricane →→
force not known ↔ mean of two or more observations ↔ variable winds ✱ calms ⊙
Track of Storm A
Track of Storm D
A 13th March
A 20th March
D 19th March
B
C
D
E
F
29·6
29·8
30·0
30·2
30·4
29·4
29·2
29·0
29·6
29·8
30·0
30·2
30·4
100
90
70
30
60
50
40
30
20
10
0
10
60
50
40
30
20

Fig. 1

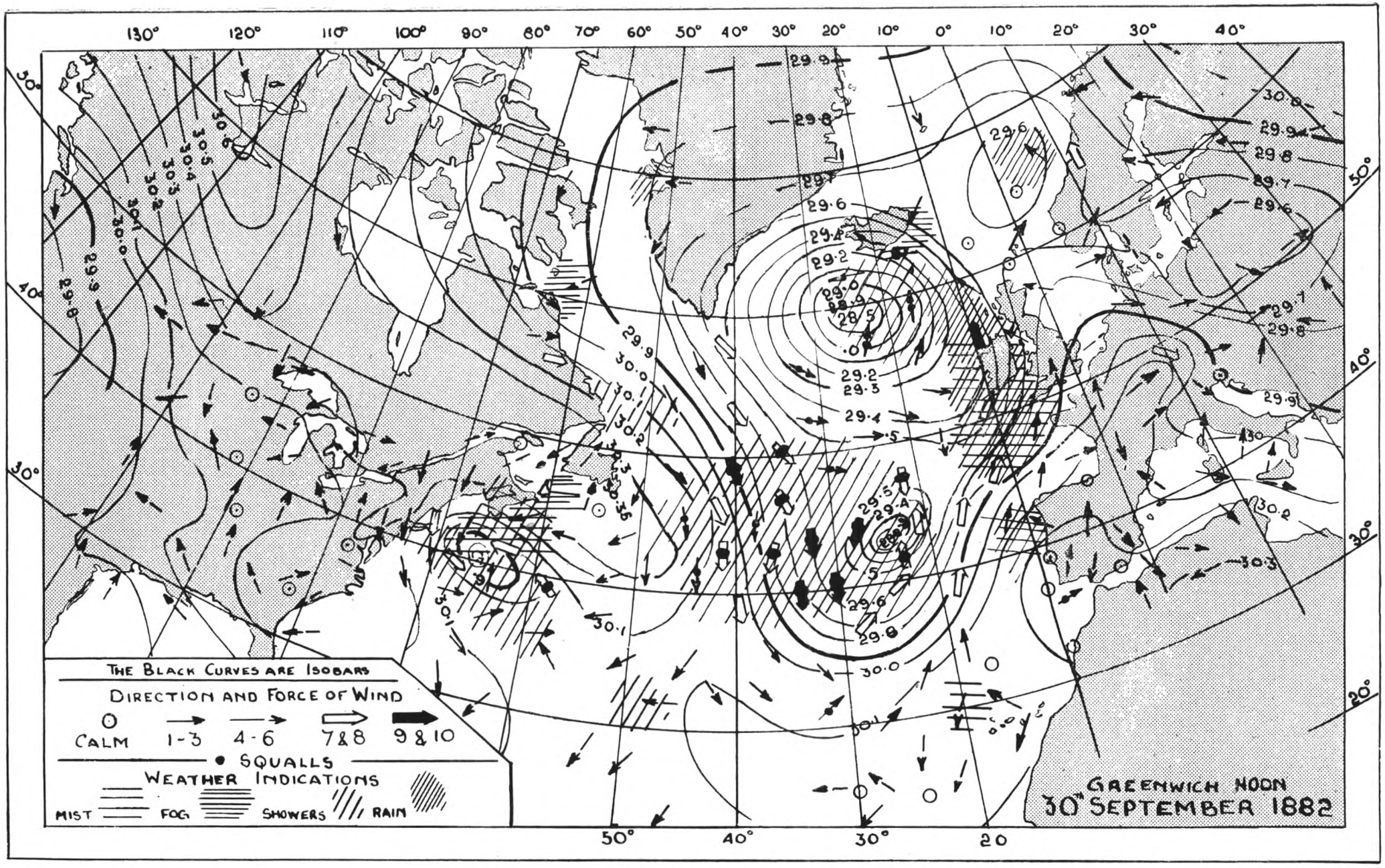

130° 120° 110° 100° 90° 80° 70° 60° 50° 40° 30° 20° 10° 0° 10° 20° 30° 40°
50° 40° 30° 20
THE BLACK CURVES ARE ISOBARS
DIRECTION AND FORCE OF WIND
CALM 1-3 4-6 7&8 9&10
SQUALLS
WEATHER INDICATIONS
MIST FOG SHOWERS RAIN
GREENWICH NOON
30TH SEPTEMBER 1882

Fig. 2

on land and hence are more useful in the analysis that precedes the preparation of forecasts.

(v) Observations of weather at sea are made almost exclusively by seamen, on a voluntary basis. A knowledge of the way in which the Forecaster utilises these observations in the preparation of forecasts is not only a matter of interest to the seaman but of considerable importance, enabling him to develop a new insight into the daily routine of taking observations.

To achieve a full appreciation of the role of ships' observations in synoptic meteorology, it will be necessary to examine at some length the tools and materials with which the Forecaster works.

## 2. The Synoptic Method

(*i*) *Presentation of data.*

The synoptic method, which in essence consists of taking a bird's-eye view, places the Forecaster in the privileged position of the traditional onlooker who sees most of the game. When observations are taken at a fixed time, and this is essential to the method, each individual observer, by coding and transmitting his observations, delivers, in effect, a statement of the weather at his particular position. The Forecaster, who receives many observations transmitted to him by W/T, is then able to plot the weather at each of the ship and shore stations from which he has received reports. The chart on which he plots or records these observations is called a synoptic chart, or, simply, a working chart.

The advantages of a synoptic presentation of data as a means of investigating the weather were apparent long before the introduction of Wireless Telegraphy. In 1868, Alexander Buchan, using ships' reports, drew up a series of synoptic charts to show the travel of depressions over the Atlantic. An example of these charts is shown in Fig. 1. Later, the Meteorological Council published a series of synoptic charts for the Atlantic Ocean for the year 1882–3. (For example see Fig. 2.) It should be remembered that the observations on these charts were extracted from ships' logs long after the actual date, and hence the charts, while of value for investigational purposes, were devoid of any forecasting value.

In considering the synoptic treatment of data, some inherent differences between ship and shore stations may be worth emphasising. Land stations form a fixed network whose density and distribution may be varied at will according to requirements. If an additional reporting station is required in a certain locality, there is usually no insuperable difficulty in establishing one, except perhaps for a few inaccessible areas. At sea, however, there are, as yet, few reporting stations in fixed positions. The Forecaster must perforce be content to accept ships' reports from any locality and hope to have a sufficiently good selection to enable him to complete his chart over the ocean areas. It is obvious that occasions must often occur when an additional ships' report in a key position would make a considerable difference in the drawing of the chart. An excellent example of a ship being in the right place at the right time is afforded by Figs. 3, 4 and 5 which show how the centre of a very deep depression was accurately determined from a ship's observations. The charts are also of particular interest inasmuch as they show the conditions in which M.V. *Chinese Prince* logged what is probably the lowest barometric pressure (27·18 in.) ever recorded by a British ship.

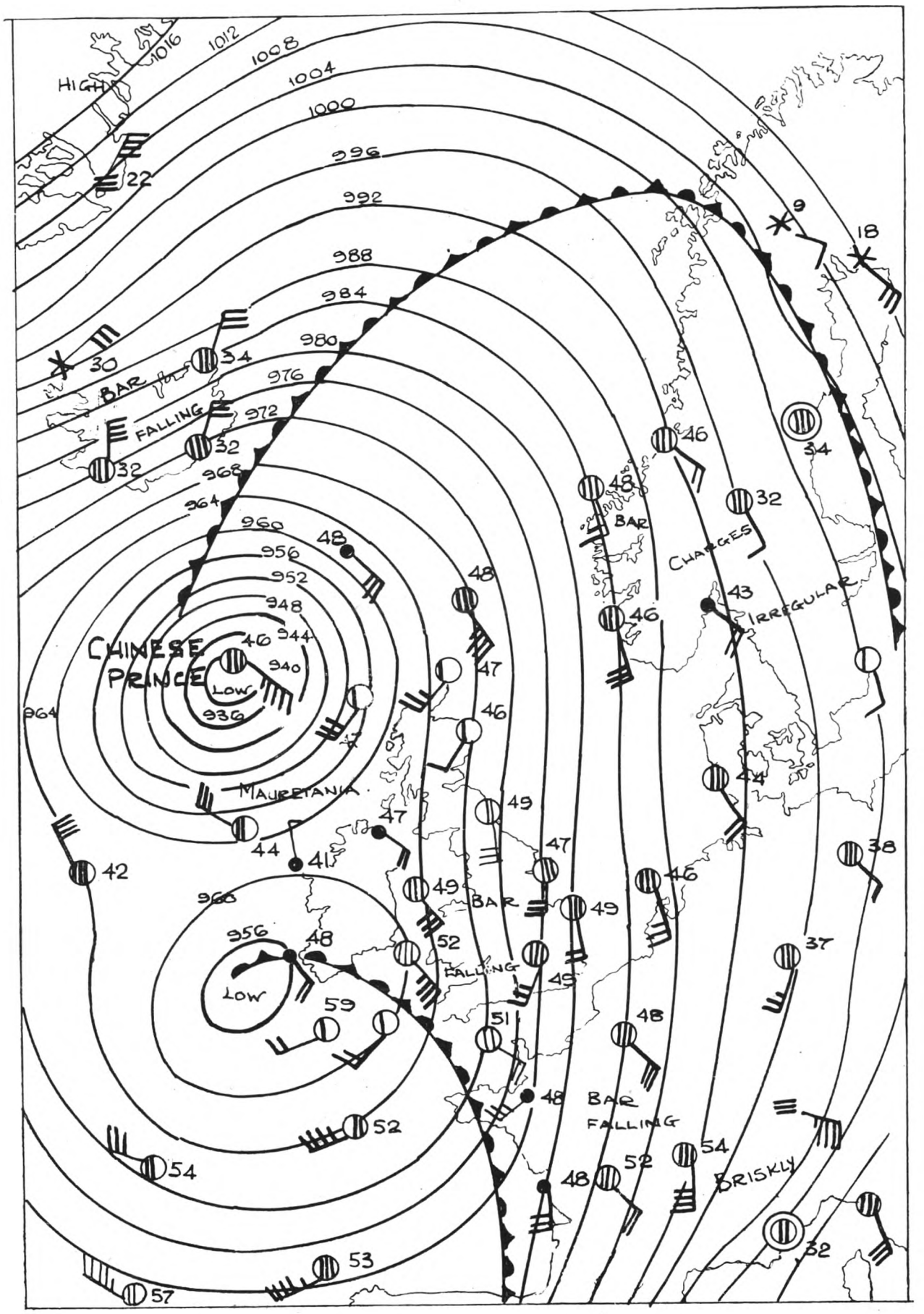



Fig. 3. Synoptic chart for 18 H. on 18th December, 1945

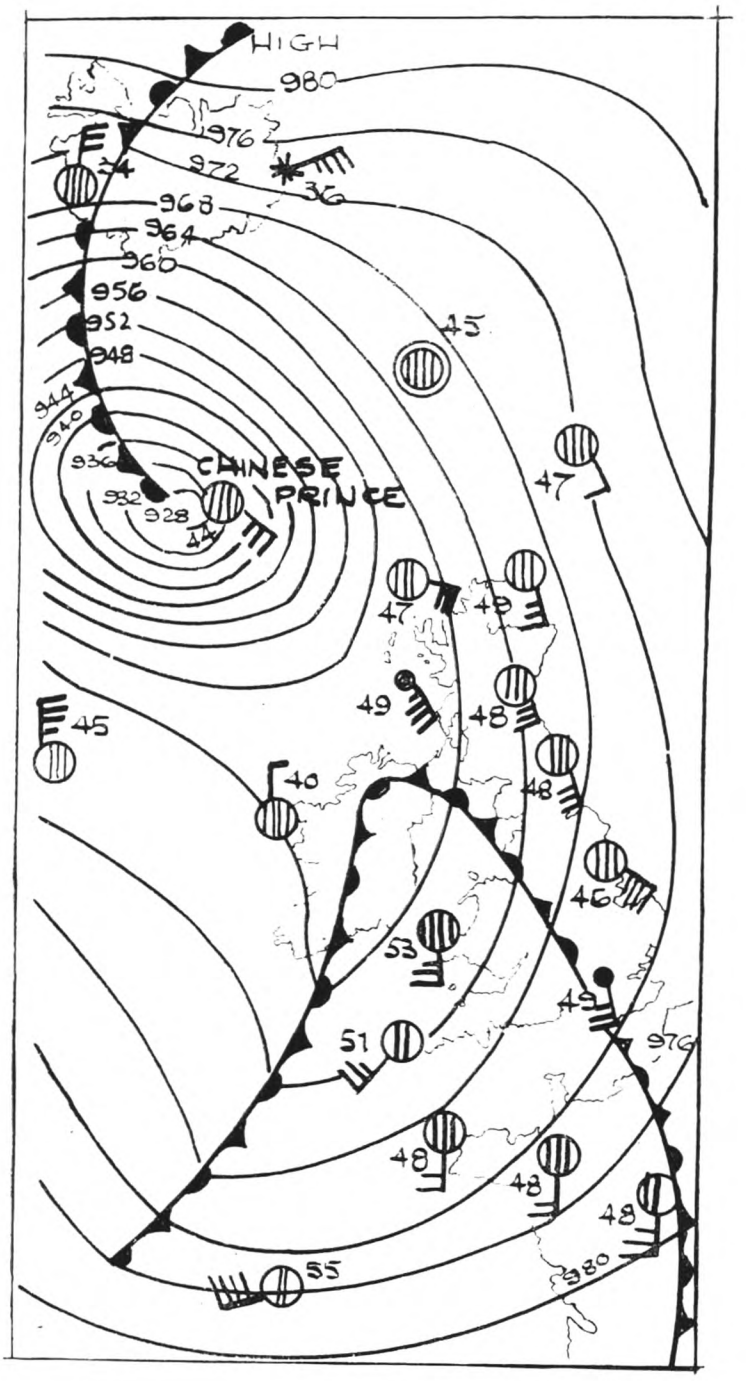



Fig. 4. Synoptic chart for 00 H. on 19th December, 1945

An increase in the number of ships' observations is being achieved by recruiting additional selected ships for meteorological work. The Marine Branch of the Meteorological Office is aiming at an Observing Fleet of some 1,000 voluntary observing ships, whose observations will provide a much improved network. It has been estimated that a desirable minimum for the distribution of reports from the oceans would be one from every 5° square. But an increase in the number of reporting ships provides only a partial solution to the problem of ensuring an adequate distribution of observations. Ships do not sail at random over the oceans, but along well-defined tracks or sea-lanes. Fig. 6 has been drawn to show the main routes followed by British shipping. Along these routes, once the Observing Fleet has been expanded, there will be no shortage of observations. But what of the large expanses of

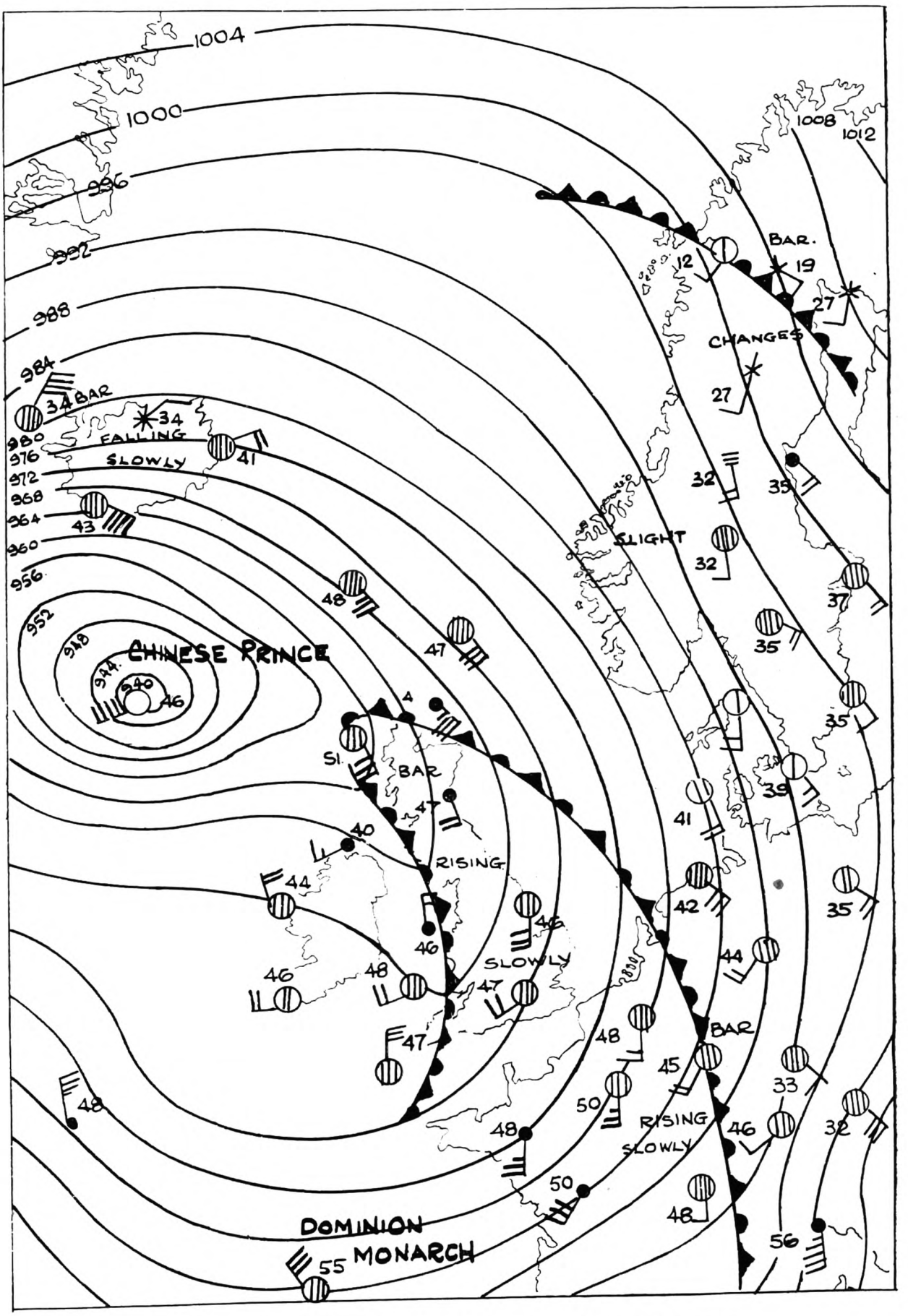



Fig. 5. Synoptic chart for 06 H. on 19th December, 1945

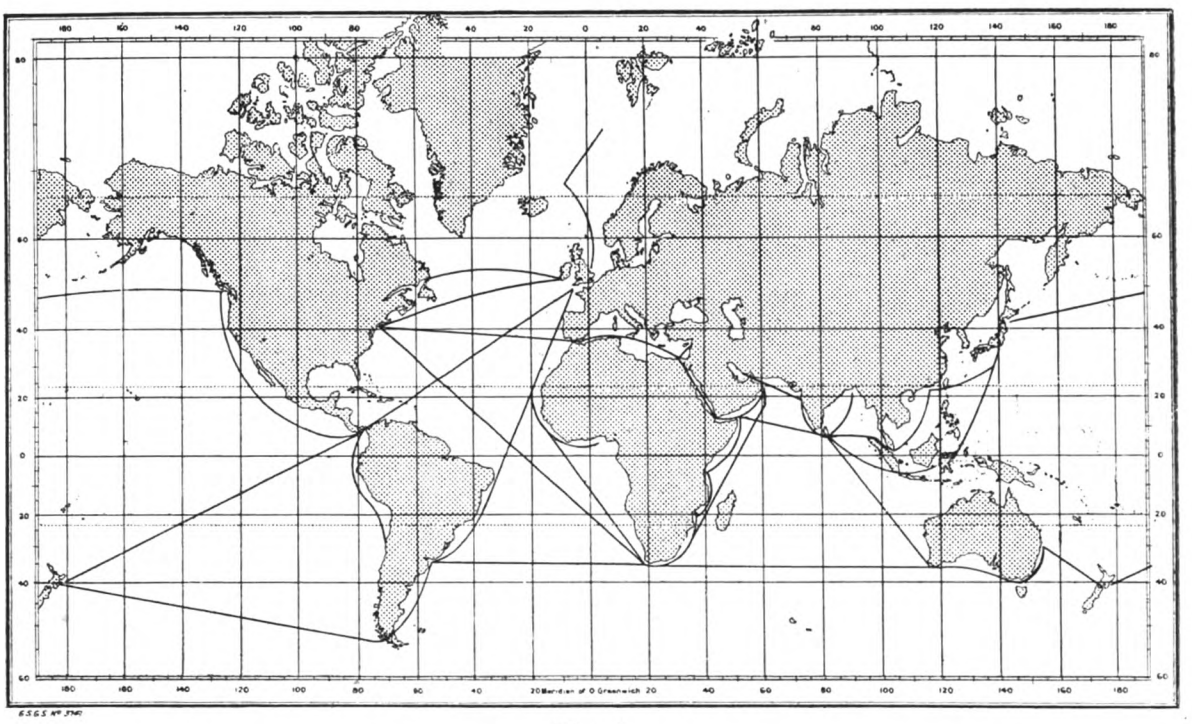


Fig. 6

ocean between these routes ? One solution which is already being put into force, is the establishment of stationary ships at fixed points in the oceans. These ships will serve the dual purpose of furnishing meteorological reports (surface and upper-air) from the less frequented parts of the oceans and of providing rescue facilities for the major civil air-line routes. Division of responsibility for these ships between the nations interested has been worked out by the Provisional International Civil Aviation Organisation (PICAO). Fuller details of the stationary ship scheme, as far as the Atlantic Ocean is concerned, are given in another article.

(*ii*) *When is an observation representative* ?

The tacit assumption that observations are strictly comparable lies at the basis of synoptic meteorology. If observations are to be comparable, not only must the instrumental equipment of the observers be standardised, but a standard technique of observation must be used. This standardised technique of observation is established by the official instructions and guidance issued by the various national meteorological services who are themselves advised by the International Meteorological Organisation. The fundamental aim is that different observers making an observation of weather at the same place and time should obtain essentially identical results, despite minor differences of aptitude and training. The fact that observations are strictly comparable, as far as the needs of the Forecaster are concerned, is usually expressed by saying that each observation is *representative*. By this is also meant that the observation is free from any peculiarly local influence which might prevent its being regarded as a fair sample of the weather in its neighbourhood. The fundamental fact, which cannot be overstressed, is that synoptic meteorology is concerned solely with representative observations. Let us look into this question of representative observations a little more closely for it throws much light on many aspects of observing practice.

A reading of barometric pressure, reduced to standard latitude and mean sea level, is non-representative only in so far as it is affected by the movement

of the ship and the suction effect of the wind on the instrument due to its location in a partially enclosed space in the ship (e.g. the chart room). The possibility of error introduced by pumping is to a large extent eliminated by taking the average of the extreme positions of the mercury column when making a reading. The suction effect depends on the site of the barometer ; it is not large except in strong, gusty winds when a door or window near the instrument has been left open.

Air temperature and humidity are usually measured by means of wet and dry bulb thermometers, either exposed in a portable screen or fitted as an aspirated psychrometer. The object is to measure the wet and dry bulb temperatures of a sample of air that is uninfluenced by the heating effect of the ship itself. For this reason observing instructions stress the need for exposing the portable screen always on the weather side of the ship, either on the bridge or as near the outside rail as possible, and away from any source of ships' heating. Dry bulb temperatures at sea are representative when adequate precautions are taken to guard against heat from the ship. For this reason they are generally more useful to the Forecaster for air-mass analysis than are temperature readings on land. Land readings, especially those from inland stations, are strongly influenced by many factors such as solar heating, nocturnal cooling, effect of altitude and faulty exposure, which severely limit their use in this respect. The fact that, providing appropriate precautions have been taken, air temperature at sea is much more representative than on shore, is of vital importance. It means that, as far as temperature is concerned, the use of upper air information is not of such urgent necessity over the sea areas as it is over land.

Humidity is determined from the wet and dry bulb readings taken conjointly. The precautions to be taken to ensure a representative value of the dry bulb temperature have already been emphasised. These precautions are equally applicable to wet bulb temperature readings. In addition, wet bulb temperatures are subject to another source of error—contamination of the muslin and reservoir by salt. The hygrometric tables in use for determining relative humidity and dew-point temperature are computed on the assumption that the evaporation from the wet bulb is from a pure water surface. In practice, the muslin tends to be more or less contaminated with salt and the wet-bulb depression may be correspondingly in error. This accounts for those frequent exhortations to change the wet-bulb muslin frequently. The Forecaster maintains a very healthy suspicion of humidity readings taken at sea, not only for the reason given above but also because humidity is usually always relatively close to the saturation value and does not show the wide variation that is possible over land. Humidity readings at sea are not very representative and their use in synoptic analysis requires experience and caution.

The taking of sea-surface temperature affords an excellent example of the difficulties involved in securing a representative value. The normal method consists in taking a sample of surface water by means of a bucket and measuring its temperature. Various difficulties must be overcome if the result is to be regarded as representative. First, the sample must not be contaminated by effluence from the ship, which means casting the bucket well forward. Secondly, cooling processes begin to affect the temperature of the water in the bucket immediately it has been drawn. Experience has

shown that the cooling effect may be appreciable in certain circumstances as, for example, when the air temperature is much lower than the sea temperature and a moderate or strong wind is blowing. It is essential therefore to read the temperature as soon as possible after drawing the water (recent instructions say within 30 seconds after hauling on deck). The practice has arisen in certain meteorological services of measuring and reporting, not the sea surface temperature as obtained above, but the temperature of the engine-intake, some 15–20 ft. below the water line. In certain circumstances engine-intake temperature is not representative of the sea-surface temperature, and such readings are not then comparable with those taken by the bucket method.

On land, representative values of wind are obtained by erecting an anemometer at a standard height (usually taken to be 10 metres) on open level ground free from obstructions. The use of an anemometer at sea always involves the major difficulty of finding a satisfactory exposure. In practice a compromise usually has to be made, for it is generally found that no one position will give satisfactory results for winds from every quarter. An anemometer, of course, measures the relative wind, and the true wind is obtained by correcting for the course and speed of the ship. On most ships, during daylight hours, wind speed and direction are estimated directly from the appearance of the sea surface. The method is independent of the motion of the ship and, in the open sea, the result is perhaps more representative than an anemometer reading, provided it can be assumed that the wind is not changing rapidly. In such a case the appearance of the sea surface would no longer be an adequate guide to the force or direction of the wind. The Forecaster is usually in a position to judge when a reported wind is likely to be non-representative.

(iii) *Introducing the time element.*

Once the Forecaster has plotted the observations on his synoptic chart, he can see how the weather is varying *from one place to another* at the time of his observations. But he is more interested in the change of the weather *with time* at any place. How is this time element introduced ? In the first place some of the observations themselves give information about changes with time. Perhaps the first example that comes to mind is the " barometric tendency ", or change of barometric pressure during the past 3 hours. Barometric tendency, measured on board ship, is not representative because it is affected, both in characteristic and magnitude, by the course and speed of the ship. By applying a correction for this, the Forecaster can, in effect, make the observation representative. The use of ships' barometric tendencies in the analysis of synoptic charts will be illustrated in a later article. The " Past Weather " code and the " Present Weather " code, taken together, allow of a comparison of weather over a short period of time. In addition, the idea of sequence is introduced in the " Present Weather " code by the use of descriptive terms such as " occasional ", " intermittent " and " continuous ", and in the codes for reporting the state of sky, by descriptions such as the following :—

" Stratocumulus formed by the spreading out of cumulus ",
" Altocumulus in bands (increasing) ",
" Fine cirrus increasing (usually in tufts) ".

The introduction of the time element into synoptic meteorology is,

however, primarily achieved by ensuring that observations are taken at fixed times (synoptic hours), the charts constructed for each of these times then forming a sequence by which the time variation of any element may be estimated. The shorter the time interval between the charts, the nearer will the sequence of weather shown by the charts approximate to reality. As an illustration think of some game, e.g. football, of which information can only be secured from a series of photographs taken at equal intervals of time. Obviously, intervals of a quarter of an hour would be much too long to afford any connected view of the game, though it might be possible to judge whether play was nearly always in favour of one side. With shorter intervals it would be possible to form a much better idea of the game, whereas if photographs were taken at cinematograph speed an excellent reproduction of play would be afforded. The weather is a gigantic game whose state of play is only revealed to the Forecaster at the synoptic hours. At present these are 0000, 0600, 1200, 1800 hrs. G.M.T. together with supplementary times 0300, 0900, 1500 and 2100 hrs. G.M.T. These supplementary times are in use at land stations but are not in general use at sea. It is therefore of the utmost importance that ships' observations, being available only at 6 hour intervals, should be of such quantity and quality as to enable the best possible charts to be drawn at the main synoptic hours.

Summarising the attributes of the synoptic method, we see that it not only allows of an effective comparison of weather from place to place at a fixed time (the synoptic hour), but by means of a sequence of charts permits the time variation of weather at each place to be estimated. The analysis of synoptic charts involves a fusion of these two aspects.

---

1 Details of the Air-Met broadcast are as follows :

AIR MINISTRY AVIATION WEATHER BROADCASTS
(AIR-MET BROADCASTS by R/T)

TRANSMITTING STATION : Borough Hill.

FREQUENCY : 245 kc/s (1224 m).

TIMES OF ISSUE : Hourly from 0700–1800 G.M.T. in winter.
0600–2100 G.M.T. in summer.

CONTENTS OF MESSAGES : (repeated every hour).

(1) 00–Time Signal.
(2) 00–10 minutes : Navigational Warnings and unserviceability reports (Aviation only).
(3) 10–20 minutes : Plain language statement of the general meteorological situation in relation to conditions expected over the British Isles and neighbouring Continent, followed by meteorological warnings.
(4) 20–30 minutes : Plain language description of existing conditions and changes expected in immediate future.
(5) 30–40 minutes : " Actuals " (station reports) from about 40 stations.
(6) 40–50 minutes : As (4).
(7) 50–60 minutes : Supplementary " actuals."

2 " Ocean Weather Ships," by Commander C. Frankcom, O.B.E., R.D., R.N.R., in this issue.

---

Cloud formed over the erupting crater of Mount Vesuvius on 24th March, 1944

## SOUTHERN ICE REPORTS

### During the year 1946

July, August, September. No reports received.

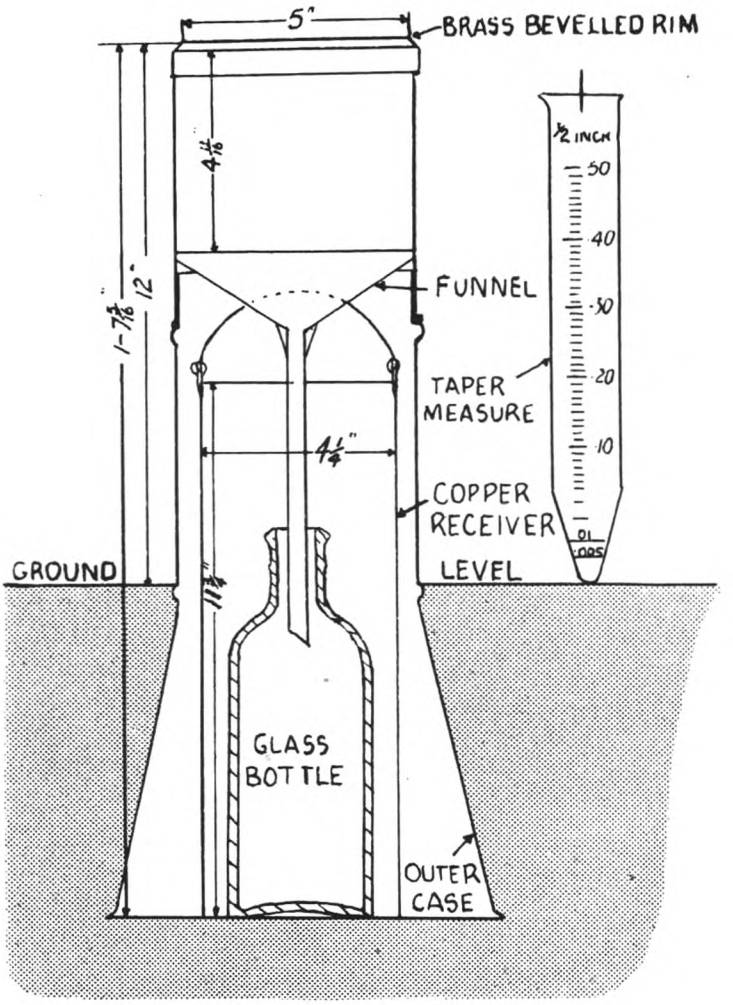
Reports of ice previous to July, August and September, 1946, will be found in the *Marine Observer*, Volume XVI, No. 135, page 103.


Rainfall is a national asset of economic importance. It maintains our crops and plant life, feeds the rivers and streams, and provides our water supply. It is desirable therefore to study the variations in rainfall from place to place and its incidence in time. In water supply and hydro-electric schemes the engineering problem is to utilise to the fullest extent the rainfall of wet years or wet winter months to tide over the runs of dry years or spring and summer droughts.

Our knowledge as to rainfall experienced over the British Isles is based in the main on the records of voluntary observers. In some cases the record has been kept primarily to ascertain the rainfall day by day for gardening or agricultural purposes, in others the observer desired to know whether his own locality was wetter or drier than some other region. Other observers required some precise information as to the amount of water which could be relied upon for some specific purpose, such as a domestic supply from the roof of a house, or for a mill supplied by a local stream. Water undertakings in all parts of the country have kept rainfall records, while civil engineers of large towns and Catchment Board engineers have found them essential in dealing with problems of drainage. With the increased cost of coal production the economic advantage to be derived from the development of water-power resources is becoming more apparent and information about rainfall continues to be of prime importance in planning such schemes.

These records, maintained for so many diverse reasons, can be put to their fullest use only if collected and compared in some central office. The late G. J. Symons, F.R.S., realised this and founded the British Rainfall Organisation in 1860. He will be remembered as the organiser who collected rainfall records for earlier years, arranged for subsequent records to be maintained as far as possible in a similar manner, for the gauges to be of a suitable pattern, read at the same time, entered on similar forms and preserved for the common use. The standard gauge and measure now in use is shown in the diagram.

Dr. H. R. Mill, who became Director in 1900, introduced, with striking success, the cartographical methods now in use for defining the variations in the rainfall experienced over the British Isles. He studied the type of distribution which prevailed with different types of pressure distribution and with orographical, cyclonic and convectional rains. In 1919 the accumulated records were acquired by H.M. Government, and the Director of the Meteorological Office of the Air Ministry assumed responsibility for continuing the work. The number of rainfall records, of which a summary is given in the annual volumes of *British Rainfall* has grown from 470 in 1861, to 3,500 in 1901 and 5,700 in 1939.




FIVE-INCH RAIN GAUGE AND TAPER MEASURE

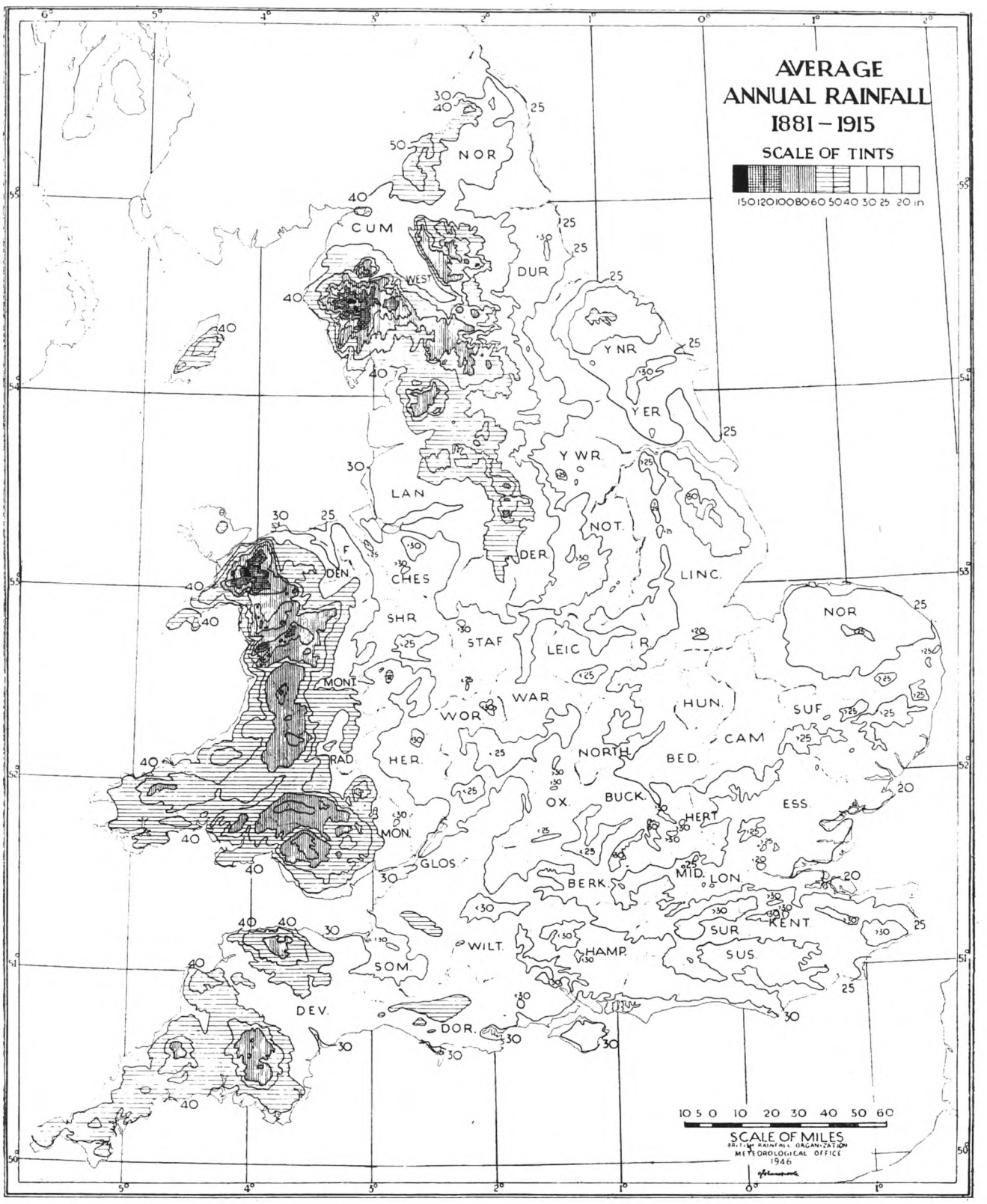
One of the more important developments in the study of rainfall since 1919 has been the preparation of maps on a scale of 2 miles to one inch showing the distribution of average annual rainfall. For this purpose the period 1881–1915 was adopted as the standard. For this period complete records were available for some 600 stations. An average for this period can be computed for any record maintained for at least 5 years, since the ratio between the annual rainfalls at 2 neighbouring stations remains nearly constant, in spite of the fluctuations of amount of rainfall from year to year. The procedure is to compare the total amount recorded with that for the same period at the nearest station for which an average is available. By this method the mean annual rainfall at a short period station can be corrected by a factor which takes into account whether the record covers a preponderance of wet or dry years. The preparation of these averages was carried out county by county and averages for some 20,000 stations were computed. The number of stations is large because records outside the period 1881–1915 were used. When the first maps were prepared it became apparent that there was considerable relationship between the average annual rainfall and the configuration of the land. In many urban areas and in a few mountainous regions the data were sufficient to enable the isohyets, or lines of equal rainfall, to be drawn directly from the figures, while elsewhere some reliance had to be placed on the accumulated knowledge of the relationship of rainfall to configuration gained in other areas. This technique of defining the probable

distribution of the average annual rainfall in areas of few records has been developed by checking the drawing of the isohyetal lines as new averages became available. During the last 20 years there has therefore been an increasing precision in the drawing of the average annual rainfall maps, due both to the growing number of station averages and to added experience. This increasing precision has met the demand for greater accuracy in determinations of the general rainfall over specified areas by water engineers. The average annual rainfall has now been defined on each of the 74 sheets of ½-inch Ordnance Survey of Great Britain. The results have met the needs of the Ministry of Town and Country Planning, who are reproducing the isohyetal lines on maps on a scale of 10 miles to 1 in. A small scale map showing the distribution of average annual rainfall 1881–1915 over England and Wales is reproduced in this article.

This rainfall survey has been utilised in estimating the general rainfall for individual years over specified areas. The monthly and annual values of both rainfall and run-off have been published in The Surface Water Year-book of Great Britain 1935–6 and 1936–7 of the Ministry of Health and Scottish Office, and publication of similar data for later years is in hand. The comparison of the rainfall and run-off data enables estimates to be made of the loss by evaporation. Measurements of run-off have largely been restricted to the upper parts of streams where weirs could be constructed, but the data could be used to give estimates of the amount of fresh water flowing into the sea from each river. The general rainfall over the British Isles has been computed at 41·41 in. per year and, allowing 16·4 in. as the annual loss by evaporation, the volume of fresh water which might flow into the sea from the British Isles is about 25 in. per year from the whole area. This corresponds to 195,000 million tons of water or 6,850,000 million cu. ft. This is sufficient water to fill Lake Windermere (area 5·69 sq. miles and mean depth 78 ft.) 560 times or to fill, to the same mean depth, a lake rather bigger than Kent and Sussex combined. It is interesting to note in this connection that the mean annual rainfall over the sea areas of the world has been put at 47·2 in. The mean rainfall over the globe is put at 40·9 in. and this must also be the mean annual evaporation. Rainfall data for the oceans are scanty, the existing maps having been mostly compiled from a consideration of the frequency of rain, combined with a few observations of the rate of fall.

The average annual rainfall (in inches) recorded at some large towns may be of interest: Bombay 67·8; Cairo 1·2; Chicago 33·5; Copenhagen 22·9; Lisbon 27·1; London 23·2; New York 42·8; Rome 26·7; Shanghai 44·7; Singapore 95·0; Sydney 47·1; Tokyo 64·1; Washington 42·2.

An examination of the maps of average rainfall shows that the rainfall decreases towards the sea, especially on low-lying promontories. These maps provide therefore some indication of the rainfall over the sea bordering on the land. Additional records on such promontories and on islands would be of service in defining the rainfall over the sea areas. Experiments carried out in this country with rain-gauges in different exposures demonstrate the difficulty of determining the rainfall at sea. It has been found that the amount of rain caught in a rain-gauge decreases as the rim is raised above the standard height of 1 ft. This loss is due to wind-eddies set up round the rim of the rain-gauge in the more exposed position. In fact a rain-gauge will only catch a fair sample of the precipitation if the wind speed at the rim of the




gauge does not exceed about 10–15 m.p.h. On the other hand it has been found that some rain is obstructed from a rain-gauge if any object is nearer the gauge than twice the height of that object above the rim of the gauge. In exposed situations, as in mountainous districts, the difficulty of securing a reliable catch in a rain-gauge has been overcome by the erection of a turf wall of defined dimensions to serve as a break to the wind without obstructing the rain. It will be appreciated therefore that it has often proved impossible to find a suitable site for a rain-gauge in the limited space available at

lighthouses, where there are the additional difficulties of the varying height of the sea and the risk of spray getting into the gauge. Reliable measurements of rainfall on ships at sea present similar difficulties. Since November, 1939, a ship plying between Heysham and Belfast has been recording rainfall at 9 h. A standard gauge has been mounted on the top rail of " Monkey Island " and to the lee-side to avoid as far as possible the eddy effects of wind. The rim of the gauge is mounted 3 in. above the top of the rail, to minimise any insplashing from the rail itself. The gauge is approximately 35 ft. above the water line. The rain-water, stored on days of much sea-spray, is chemically analysed for salt content and a daily record is kept of the general wind-force and weather experienced. The location of the ship, whether in harbour at Heysham or Belfast, or travelling between these places, is also noted. It is hoped that an analysis of these records will materially add to our knowledge of the rainfall across the Irish Sea and result in standardising a method for recording rain at sea.

The rainfall records for the British Isles can also be used to give an indication of the variations in the amount of fresh water supplied to the sea year by year and of the variations of the rainfall over the sea in the neighbourhood of these islands. The general monthly rainfall over England and Wales has been defined from 1727 to date, while maps showing the distribution of the rainfall, as a percentage of the average, have been prepared for each year from 1854 to date. The serial values have been used in a number of statistical investigations, but so far no cycles have been found of sufficient permanence or magnitude to be of service in long-range forecasting. Only twice in the 92 years was the variation from the average in the same direction all over the British Isles ; these were the 2 wettest years, 1872 and 1903. The usual distribution shows a considerable range on each side of the average. For this reason a large number of rainfall stations is necessary to define the annual rainfall.

## OBSERVING WEATHER AT SEA

### (I) Air Temperature and Humidity

BY H. JAMESON, D.SC.

What exactly are we trying to measure, when we take observations of temperature and humidity at sea ? What the meteorologist requires for his synoptic charts are the temperature and humidity of the air unaffected by the presence of the ship. As these observations, however, can only be made on board the ship itself, care must be taken that its disturbing influence on the observations is reduced to a minimum, if it cannot be altogether eliminated. It is the purpose of this article to show, not only how these observations can best be made, but also how the sailor can make use of them for his own immediate needs, in addition to their value for weather forecasts.

Temperature is a relatively simple matter, which needs no explanation, but there are several different ways of expressing the humidity of the air, and some further explanation of this factor may not be out of place.

All air contains more or less water vapour, but there is a limit to the amount of vapour that can be contained in a unit of volume ; this amount depends only on the temperature, and increases very rapidly as the temperature rises. For example, a rise of 18° F., from 35° F. to 53° F., will double the maximum amount of water vapour that can be contained in unit volume. It is redoubled at 73° F. and doubled again at 94° F. In fact, at ordinary atmospheric temperatures, it is nearly true to say that the maximum amount of vapour increases in geometrical progression as the temperature increases in arithmetical progression.

The humidity of the air, however, is not usually expressed in terms of the amount of water vapour in unit volume, but by giving either the relative humidity or the dew point. Relative humidity is the proportion, expressed as a percentage, which the actual quantity of water vapour in any volume of air bears to the total amount that could be contained in that volume, if the air were saturated at the same temperature. It is important to realise that, even when the actual amount of water vapour in the air is unchanged, relative humidity varies very rapidly with the temperature. For example, air that is saturated (100% relative humidity) at 40° F. has its relative humidity reduced to 69% by an increase in temperature of only 10° F. to 50° F., while a further increase of 10° F. reduces it to 47%. The dew point, which depends only on the amount of moisture in the air, and remains unchanged with changes of temperature, so long as moisture is neither added nor taken away, is in many ways a more useful indication of atmospheric humidity.

The dew point is the temperature at which the water vapour actually present in the air would be just sufficient to saturate it, if the air were cooled to that temperature. Reversing the example in the previous paragraph, air at a temperature of 60° F. and a relative humidity of 47% has a dew point of 40° F., since its relative humidity rises to 100% if it is cooled to that temperature, while air at a temperature of 50° F. and a relative humidity of 69% has the same dew point. The dew point is so called because it is the temperature at which dew begins to form when the air is cooled. The dew point is an important factor when considering the care of cargo, a subject dealt with later in this article.

In practice, the most convenient method of determining the relative humidity and the dew point is by observations of the dry and wet bulb thermometers. The wet bulb thermometer is an ordinary thermometer, fitted with a single thickness of fine muslin, secured lightly round the neck of the bulb. This coating is kept damp by a few strands of cotton wick, which convey water from a small reservoir, placed near the thermometer. This water steadily evaporates from the muslin, and thus absorbs heat from the bulb and lowers its temperature. The drier the air, the more rapidly evaporation takes place from the muslin, and the lower the temperature of the wet bulb falls, till a state is reached when the loss of heat by evaporation is just balanced by the gain of heat by convection from the neighbouring air. Tables are provided by which the relative humidity and the dew point can be obtained from readings of the dry and wet bulb thermometers.

There is, however, a source of error here that must be guarded against. The air in contact with the muslin soon becomes saturated and, unless removed by ventilation, tends to form an obstacle to the evaporation of more water from the bulb. It is esssential, therefore, that the thermometer should

be in a current of air strong enough to remove this cushion of air before it reaches saturation point, and to replace it by drier air. An air flow of 2 to 3 knots is sufficient for this purpose. This source of error can be completely eliminated by the use, instead of dry and wet bulb thermometers in a screen, of an aspirated psychrometer, in which there is a small fan. This produces a constant current of air, which flows over the bulbs of the thermometers. The same effort can be produced by a sling or whirling psychrometer, in which the thermometers are whirled by hand. Care must be taken that the thermometers are shielded from radiation.

For accurate wet bulb observations, the water should be as pure as possible, and the muslin and thread free from dirt and grease. At sea, contamination by salt is the source of error that has to be guarded against most carefully. The seaman will know from experience how everything at sea, which is exposed to the outside air, tends to get a coating of salt. The muslin and thread, and the water in the wet bulb reservoir, are no exception to this. If left unattended, they soon collect so much salt that the supply of water to the muslin, and the evaporation from it, are checked. An incorrect reading of the wet bulb results. They should, therefore, be kept under observation, and replaced when necessary, and at least once a week. It is essential that pure water be used to moisten the muslin—tap water, which always contains some salt in solution, is not pure enough. It is best to use distilled water. Perhaps the radio officer can spare some, in which case the observer should make sure that it is not contaminated by acid. Failing distilled water, condenser water from the engine room can be used.

The temperature of the air is another observation that requires special precautions. It is not sufficient merely to suspend a thermometer in the air ; it must be shielded, not only from direct radiation from the sun, but also from the radiation from sky, sea, and the surface of the ship, otherwise it will show a temperature which is not that of the air in which it is suspended. Thermometers are shielded from radiation by enclosing them in the " Stevenson " screen. This has louvres at the sides, front and back, which hinder the entry of radiation, while at the same time allowing ventilation.

Even with this precaution, however, there is still another source of error. You may get an absolutely accurate measurement of the temperature of the air passing through the screen, but if that air has been for any appreciable time in contact with the structure of the ship, its temperature may have altered from that of the air which has not yet reached the ship, either by radiation or conduction from the surface of the ship, or by heat given off from the interior of the vessel through the funnels or ventilators. To avoid this source of error, the thermometer screen should always be placed in such a position that the air reaching it has passed over as small a part of the ship as possible. The windward side of the bridge is usually the most suitable spot, but the screen will often need moving when the direction of the wind changes, or the ship changes course. The most difficult case, of course, is with a following wind of the same speed as the ship (i.e. when there is no relative wind and the funnel smoke ascends vertically). In such a case there is probably nothing to be done but to take the observations, and to make a note in the register that, because of this following wind, the observations of temperature and humidity may be unreliable. Fortunately, such cases are comparatively uncommon.

A more detailed account of these observations, and of the precautions to be taken with them, is given in the *Marine Observer's Handbook.*

When these observations have been taken, with all the necessary precautions, and transmitted to the meteorologist, you have given him data which will help him to identify the type of air through which the ship is moving, and thus to build up a picture of the general weather situation in that area. Just how useful marine data can be to the meteorologist will be explained by Mr. Kirk, in his series of articles in the *Marine Observer*, entitled " The Importance of Ships' Observations to the Forecaster."

The mariner can, however, also turn these observations to his own immediate advantage, by using them, together with observations of the temperature of the cargo, to minimise damage to cargo through humidity. When air of a certain dew point comes into contact with a surface whose temperature is below that dew point, the air may be cooled down enough to cause the deposition of moisture on that surface. If, therefore, the dew point of the outside air is above that of the cargo in the hold, as might happen when a cargo is loaded in a cold climate, and the vessel then sails into tropical waters, the ventilation of the hold by outside air may lead to heavy deposition of moisture on the cargo. For example, a ship may load up cargo at Vancouver, at a temperature of 50° F. The wet bulb is 45°, and the dew point therefore 39°, well below the temperature of the cargo. As the ship proceeds south, the temperature increases, but the cargo, being insulated to some extent from this increase in temperature, warms up much more slowly, in spite of the ventilation to which it is subjected. There comes a point when the outside temperature is, say, 60°, wet bulb 57°, giving a dew point of 54°, while the cargo has only risen to this same temperature, 54°. Ventilation should now be stopped. In passing through the Panama Canal, the temperature may be, say, 80°, wet bulb 70°, and the temperature of the cargo 60°. The air is now relatively dry, with a relative humidity of only 59%, but the dew point is 64°, well above the temperature of the cargo, and ventilation would cause the deposition of moisture on the cargo. As the ship leaves the tropics for more northerly latitudes, the dew point of the outside air will in time fall below the temperature of the cargo, and ventilation may be recommenced.

An article by Commander J. S. Metcalf, in the *Marine Observer* of October, 1939, on " The Ventilation of Holds containing General Cargo . . . " gives the following recommendations for cargo ventilation, formulated by Mr. S. J. Duly, who has given considerable study to the subject of condensation in ships' holds, its causes, and the means by which it might be minimised. These recommendations have been tested with success. They are :—

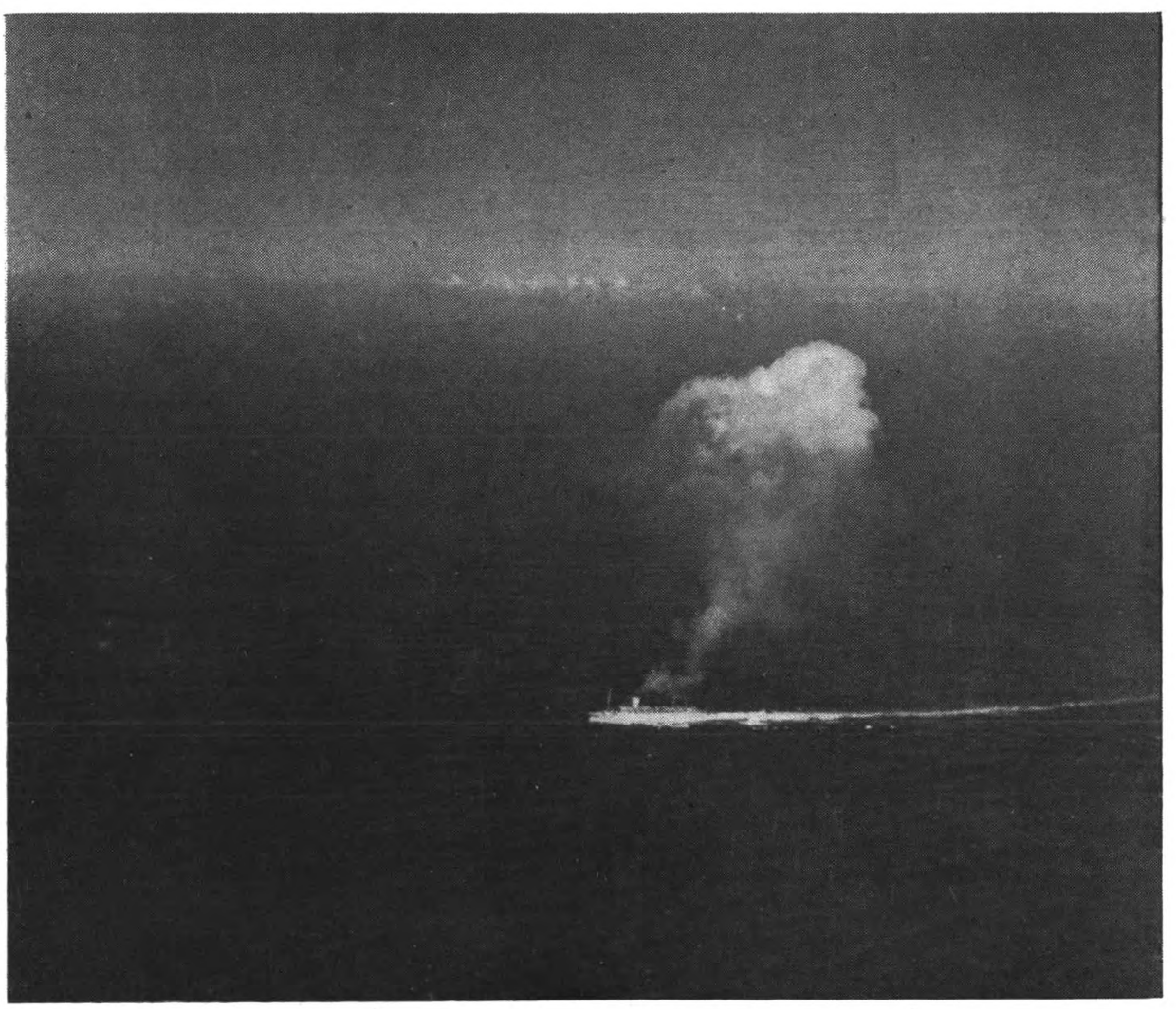
(1) To take dew point readings of the atmosphere each watch.
(2) To take the temperature of the cargo once a day.
(3) To plot those readings on a graph
(4) To ventilate when (1) is below (2)
(5) To cease ventilation when (2) is below (1).

He also states that for practical purposes it is unnecessary to plot a separate graph for each compartment. A compartment in which the temperature is typical of those throughout the vessel should be selected.

Distant reading thermographs would be found useful in taking cargo

temperatures. In these instruments, changes in the volume of the mercury with change of temperature can be transmitted over distances up to 130 ft., by means of a capillary tube, and then made to record on a chart.

Accurate and regular readings of temperature and humidity may also assist the mariner to anticipate the probability of fog occurring in his vicinity. Most fogs at sea are caused by relatively warm moist air flowing over colder water. The cold water reduces the temperature of the warm air below its dew point, and fog results. A few observations of temperature, humidity, wind, and sea temperature from other ships in his neighbourhood, together with his own observations, should give the mariner a fair idea of where fog is likely to occur.

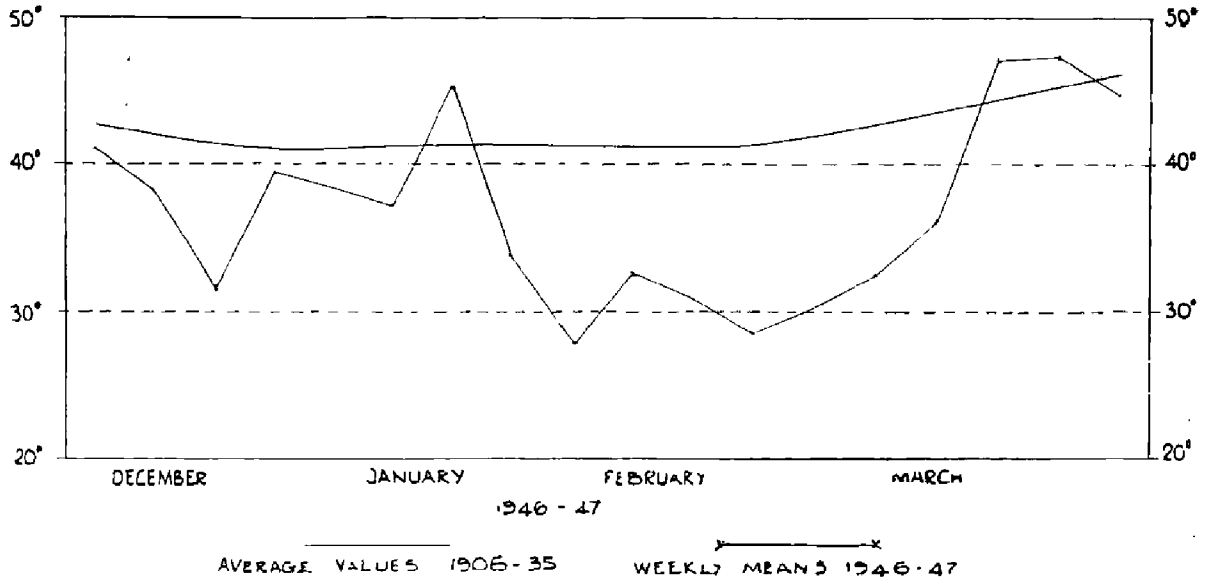


Cloud formed over the smoke trail of a moving vessel. Small cumulus clouds can be faintly discerned on the horizon. 1750 G.M.T., 2nd June, 1944. Position 41°07′ N., 30° 20′ W.

## THE SEVERE WINTER OF 1946-1947

Last winter will long be remembered as one of the most severe experienced in this country for many years. A brief summary of weather conditions over that season may be of interest to readers of the *Marine Observer*.

Weekly Means of Air Temperature at Kew




The diagram shows weekly means of air temperature recorded at Kew Observatory between December, 1946, and March, 1947, together with the curve of average weekly values, over the period 1906–35, for the same station. The most severe and prolonged spell of wintry conditions set in shortly after the middle of January, and continued with hardly a break till about the middle of March. Over this period the mean air temperature at Kew averaged about 10° below the normal, just below freezing point, while night temperatures were, in general, several degrees below freezing point; the lowest night air temperatures recorded at Kew were 15° F. on January 28–29, 14° on February 23–24, and 17° on February 24–25. These temperatures, however, were mild compared with some recorded at other meteorological stations in the southern half of England about the same time. On the night of January 28–29, Writtle (Essex) recorded an air temperature of — 5° F. (or 37° of frost), while on January 29–30, Elmstone (Kent) recorded — 6° and Bodiam (Sussex) — 3°. On February 23–24, Luton recorded — 3°, Stratford-on-Avon and Hereford each — 2°, and Droitwich — 1°; and on February 24–25, Woburn (Bedfordshire) recorded — 5° and Alungdun (Berkshire) — 2°.

Snowfall figures for the winter of 1946–47 also illustrate the severity of the winter. The table below shows, for Kew Observatory, the number of days on which snow fell, and the number of days on which at least half the ground near the Observatory was snow-covered, for each of the 4 months December, 1946, to March, 1947, together with the corresponding averages over the period 1913–38.

| Month | Days of snowfall | | Days of snow lying | |
|---|---|---|---|---|
| | 1946–47 | Average | 1946–47 | Average |
| Dec. | 2 | 2·4 | 3 | 0·8 |
| Jan. | 10 | 3·1 | 8 | 1·0 |
| Feb. | 18 | 2·9 | 26 | 0·9 |
| Mar. | 9 | 3·5 | 10 | 0·5 |

## PERSONNEL

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

RETIREMENT.—COMMODORE R. G. CLAYTON, D.S.C., R.D., R.N.R., has recently retired from the service of the Royal Mail Lines after 42 years with that company. Richard George Clayton was born at Kilnhurst, Yorkshire, in 1884, the third son of the late Reverend A. P. Clayton and Mrs. Clayton. After finishing his education in the *Conway* in 1900 and 1901, he went to sea as an apprentice in the four-masted barque *Dunfermline* of Liverpool and served in her until 1905, when he joined the Royal Mail Steam Packet Company as 5th Officer of their R.M.S. *Atrato*.

In January, 1907, he was 4th Officer of the company's Jamaica coast steamer *Arno* at Kingston at the time of the great earthquake. After assisting with fire-fighting and rescue work, the ship proceeded to Port Morant, and Clayton was sent to the cable hut at Holland Bay to despatch the first messages to leave the island after the disaster.

In 1911 he obtained his extra master's certificate, from mate, with 99·6 marks, the highest percentage on record to that date. He was promoted to Chief Officer in 1914 and was in R.M.S. *Monmouthshire* in Yokohama when war broke out and as an R.N.R. officer he was called up for service with the Royal Navy. He served on the staff of the C.-in-C., China, and later in H.M.S. *Usk*, one of the China Flotilla destroyers, he went to the Dardanelles, and was then in various destroyers during that campaign, returning to England in 1916. After commanding H.M.T.B. 050 at Queenstown he was transferred in 1917 to H.M.T.B. 31, based at Leith and employed on escort and patrol duties in the North Sea. For these services he was awarded the Distinguished Service Cross.

Returning to the Royal Mail Line in 1919, he served as Chief Officer of R.M.S *Deseado* and later in the *Arlanza* until promoted to command in 1923.

From 1925 to 1927 he commanded the passenger and mail ships *Chaudierre* and *Chignecto* on the Canada-West Indies run, and in 1928 was promoted to Commander, R.N.R.

When the Nelson Line was taken over by the Royal Mail Line in 1932 he was appointed Master of the *Highland Monarch* and remained almost continuously in that class of ship until the outbreak of war in 1939. In 1934 he was promoted to Captain, R.N.R., and commanded R.M.S. *Asturias* when she was present at the Diamond Jubilee Review at Spithead in 1935. He was appointed an A.D.C. to the King in 1939.

Captain Clayton was the first captain of the *Andes* when she began her career as a troopship in December, 1939, and brought part of the First Canadian Division from Halifax, N.S. After commanding other troopships he was in April, 1942, appointed a Commodore of Ocean Convoys, with the rank of acting Commodore, R.N.R.

He conducted in all 25 convoys. The largest of these, from New York to the United Kingdom, contained 106 ships, all of which arrived safely. For this duty he was mentioned in despatches and confirmed in the rank of Commodore.

On his release from naval service in 1945 he was appointed Commodore of the Royal Mail Lines fleet and resumed command of the *Andes*, in which ship he made 10 voyages, carrying personnel of the three Services.

During his 24 years as Master he commanded 26 ships of the Royal Mail Lines fleet.

Commodore Clayton is a younger Brother of Trinity House, and is a Liveryman of the Honourable Company of Master Mariners. C. H. W.

APPOINTMENT.—CAPTAIN H. F. WAY, at present in command of the liner *Alcantara*, has been appointed Commodore of the Royal Mail Lines fleet in succession to Commodore R. G. Clayton, D.S.C., R.D., R.N.R., who recently retired.

After 5 years in sail, Captain Way joined the Royal Mail Company in April, 1910, as 5th Officer, and was appointed to his first command, the *Culebra*, in 1935. Since then he has commanded 12 different Royal Mail Line vessels, including the company's flagship the *Andes*.

## FLEET LIST
## VOLUNTARY OBSERVING SHIPS

The following is a list of British regular observing ships, voluntarily co-operating with the Marine Division 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 sixth 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 will be made at the end of the financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards will be published in a special list in the *Marine Observer*.

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

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

| Name of Vessel | Captain | Observing Officers | Senior Radio Officer | Owners | Last Return Received |
|---|---|---|---|---|---|
| *Admiral Sir John Lawford* | J. Tomlinson | S. Nettleton | S. Nettleton | Iago Steam Trawler Co., Ltd. | 29.8.39 |
| *Adviser* | L. H. Harriman | T. Winstanley, W. G. Jackson, W. Watson | M. Hird | T. & J. Harrison | 18.2.47 |
| *Afghanistan* | T. H. Farrar, O.B.E. | R. L. Cain, J. Lawton, A. J. Rayon | O. Cooney | F. C. Strick & Co., Ltd. | 20.3.47 |
| *Ajax* | D. Rees | F. G. Harris, B. J. Steel, J. A. Reid | F. G. Short | A. Holt & Co. | 1.5.47 |
| *Albion Star* | T. N. Johnson | A. S. Wood, A. K. White, H. D. Windle | A. C. Elliott | Blue Star Line, Ltd. | 2.5.47 |
| *Alcantara* | H. Way | W. B. Avison, J. L. Perkins, R. Thompson | R. E. Hammond | Royal Mail Lines, Ltd. | 11.2.47 |
| *Amastra* | A. K. Bamberry | F. Pinkell | | Anglo-Saxon Petroleum Co., Ltd. | 8.3.47 |
| *Amersham* | A. Spence | E. S. Ward | H. Murray | The Thompson Steamshipping Co., Ltd. | 13.2.47 |
| *Aquitania* | J. D. Snow | M. Robertson | J. M. Parsons | Cunard White Star Line, Ltd. | 4.2.47 |
| *Arabistan* | J. H. Metcalf | W. G. Smith | F. Fawcett | F. C. Strick & Co., Ltd. | 1.5.47 |
| *Arakaka* | D. R. C. Onslow | J. A. Carter, S. Armitage, J. Webster | E. Howes | Booker Bros., McConnell & Co., Ltd. | 25.4.47 |
| *Artic Ranger* | J. W. Hamling | J. W. Hamling | J. Milne | Boyd Line, Ltd. | 5.11.46 |
| *Ariguana* | J. A. Wallis | H. Pulman | A. N. Taylor | Elders & Fyffes, Ltd. | 4.2.47 |
| *Artisan* | H. Coates | E. P. Simmons, W. L. Ashton | R. When | T. &. J. Harrison | 30.4.47 |
| *Arundel Castle* | L. P. Wilkie | Taylor, Rutherford, Fancourt | Williams | The Union Castle Mail S.S. Co., Ltd. | 2.4.47 |
| *Ascania* | R. Sell, R.N.R. | J. Hughes, G. Drinkwater, H. Huntley | S. K. Alston | Cunard White Star Line, Ltd. | 17.4.47 |
| *Asturias* | F. R. Miles | C. W. Webster, R. J. Finch, Plunkett-Cole | T. Bradfield | Royal Mail Lines, Ltd. | 19.7.39 |
| *Athelchief* | T. Maskwell | R. C. Stone, J. Coffey, W. E. Brown | J. Clark | Tankers, Ltd. | 22.4.47 |
| *Athelprince* | A. W. Pegg | J. M. Lloyd, C. C. Billson, R. Mathews | R. Jackson | Athel Line, Ltd. | 17.1.47 |
| *Athelregent* | C. Ray | S. Barbour | N. Martin | Athel Line, Ltd | 8.2.47 |
| *Atlantis* | P. Cooper | J. Gulliford, R. Phillips, W. T. Smith | L. S. Hoskins | Royal Mail Lines, Ltd. | 10.4.47 |
| *Auricula* | H. Sangster | A. S. W. Jamieson, J. W. Powell, J. Walter | J. Vaughan | Anglo-Saxon Petroleum Co., Ltd. | 13.2.47 |
| *Australia Star* | O. C. Roberts | J. R. Merrills | R. C. Rollason | Blue Star Line, Ltd. | 11.3.47 |
| *Australind* | J. F. Wood | A. E. Lawrence | | Trinder, Anderson & Co. | |
| *Balaena* | | | | United Whalers, Ltd. | |
| *Banff Park* | E. Bursby | | | Ohlson Steamship Co., Ltd. | |
| *Barjama* | M. Frazer | T. Ferguson, J. Green | | Charles R. Mauritzen | 1.4.47 |
| *Baron Napier* | R. Reid | W. C. Casson, D. W. Crowe, J. Thorburn | D. N. Powell | H. Hogarth & Sons | 12.3.47 |
| *Baskerville* | E. Pugh | R. J. Lingley, N. McLean | | Runciman (London), Ltd. | |
| *Bassano* | A. D. Seath | H. Edwards, B. W. Waldie | H. J. Griffiths | Ellermans Wilson Line, Ltd. | 10.3.47 |
| *Beaverburn* | J. B. Smith, O.B.E. | S. Fieldhouse, B. G. Evans, J. B. Laflin | T. Ainsworth | Canadian Pacific S.S., Ltd. | 20.5.47 |
| *Beaverdell* | C. E. Duggan | L. Walgate, G. Bateman, L. E. McDowell | L. Norton | Canadian Pacific S.S., Ltd. | 25.4.47 |
| *Beaverford* | R. A. Leicester | E. R. Connarton, E. R. Shaw, J. B. Laflin | L. Paingdestre | Canadian Pacific S.S., Ltd. | 12.2.47 |
| *Beaverglen* | J. P. Dobson, D.S.C., R.D., R.N.R. | G. M. Ball, J. D. Jevons, L. E. McDowell | J. S. Skinner | Canadian Pacific S.S., Ltd. | 21.3.47 |
| *Beaverlake* | C. L. de H. Bell, D.S.C., R.D., R.N.R. | R. Rawlings, D. Blow, W. Whitfield | R. Humphries | Canadian Pacific S.S., Ltd. | 19.4.47 |
| *Ben H. Miller* | S. Johnson | T. F. Hawkins | R. E. Wilson | Ellerman Line, Ltd. | 6.5.47 |
| *Benedict* | A. Allan | A. S. Richardson, H. Gill, J. Gibson | R. M. Stevens | The Booth Steamship Co., Ltd. | 10.1.47 |
| *Benledi* | A. P. Paterson | J. Gilmour, G. Spears, G. Miller | B. Saltwell | W. Thomson & Co. | 28.4.47 |
| *Benreoch* | J. C. Harvey | J. Goodled, G. Spriss | E. A. West | W. Thomson & Co. | 12.8.46 |
| *Bibury* | A. Roche | T. R. Ison, G. W. Forward | | Houlder Bros. & Co., Ltd. | |
| *Black Prince* | P. F. Owens | V. D. Joames | | Rio Cape Line, Ltd. | 1.1.47 |
| *Brisbane Star* | F. N. Riley, D.S.O. | Russel, J. W. Rogers, L. Tessier | A. C. Webb | Blue Star Line, Ltd. | 25.11.46 |
| *British Colonel* | E. L. Miller | W. S. Jaeger | R. MacLeod | British Tanker Co., Ltd. | 29.1.47 |
| *British Commodore* | W. H. Sharp | N. J. Peckard | J. Higgins | British Tanker Co., Ltd. | 4.12.46 |
| *British Endurance* | W. Watkins-Thomas | A. Derrick, J. E. Robinson, P. Leech | J. Anderson | British Tanker Co., Ltd. | 24.1.47 |
| *British Escort* | D. F. Ward | | | British Tanker Co., Ltd. | |

| | | | | | |
|---|---|---|---|---|---|
| *British Hussar* | W. F. Beddison | G. R. MacKellican, B. W. Hope, P. Hawkins | A. J. Berryman | British Tanker Co., Ltd. | 9.9.39 |
| *British Lancer* | W. S. Vittle | W. R. Symon, E. A. Ross | | British Tanker Co. Ltd. | 5.2.47 |
| *British Marquis* | J. C. Lea, O.B.E. | S. Allen, F. Robinson, S. Davies | W. Anderson | British Tanker Co., Ltd. | 1.4.47 |
| *British Patience* | G. A. Dickson | J. H. Jones | L. Cooper | British Tanker Co., Ltd. | 20.2.47 |
| *British Pilot* | F. J. Goodchild | G. Forster | | British Tanker Co., Ltd. | |
| *British Piper* | M. W. Good | H. White, A. Bradind, J. Milburn | J. Pearcer | British Tanker Co., Ltd. | 19.4.47 |
| *British Power* | W. D. Jeffries | | | British Tanker Co., Ltd. | 29.11.46 |
| *British Resolution* | J. C. Leybourne | T. Dawson | | British Tanker Co., Ltd. | 25.2.47 |
| *British Statesman* | T. Gaffney | H. S. Munn, H. Evans, A. Brading | W. R. Dunderdale | British Tanker Co., Ltd. | 4.10.39 |
| *British Swordfish* | | | | British Tanker Co., Ltd. | |
| *Brittany* | H. A. Wright | J. Fox, J. L. Perkins, M. H. Blackmoor | L. Brumpton | Royal Mail Lines, Ltd. | 24.2.47 |
| *Brockleymoor* | D. J. Jones | F. W. Grant | J. Hannahan | Runciman Shipping Co., Ltd. | 21.2.47 |
| *Brontes* | E. Drinkall | | | Henriksen & Co. | |
| *Bulby* | G. Bull | | | Seddon Fishing Co., Ltd. | |
| *Cairnavon* | F. S. Usher | C. R. Picker | C. Johnstone | Cairns, Noble & Co. | 11.2.47 |
| *Cairnesk* | I. G. Foster | J. Shotton, W. Pargeter, W. Rush | J. Howard | Cairns, Noble & Co. | 19.2.47 |
| *Cairnvalona* | A. Molineaux | G. Nowell, T. Hand, J. W. Cuthbertson | G. Adamson | Cairns, Noble & Co. | 6.3.47 |
| *Cameronia* | J. M. Brown | G. Russell, J. Watson, T. Langlands | D. Thomson | Anchor Line, Ltd. | 28.4.47 |
| *Cape Barfleur* | W. J. Jonsen | | | Hudson Brothers Trawlers, Ltd. | 26.4.38 |
| *Cape Cleveland* | G. W. Thompson | | | Hudson Brothers Trawlers, Ltd. | |
| *Cape Gloucester* | C. Agerskow | J. Hamilton | | Hudson Brothers Trawlers, Ltd. | |
| *Cape Mariato* | W. E. Woodall | W. E. Woodall, R. N. Dixon | R. N. Dixon | Hudson Brothers Trawlers, Ltd. | 13.2.47 |
| *Cape Trafalgar* | R. A. Cook | | | Hudson Brothers Trawlers, Ltd. | |
| *Capetown Castle* | J. C. Brown | S. J. Findlay, J. V. H. Drummond | J. Gilbart | The Union Castle Mail S.S. Co., Ltd. | 17.2.47 |
| *Carella* | J. Crewdson | | | J. Marr & Son, Ltd. | 14.12.46 |
| *Carnarvon Castle* | M. H. Williams | J. M. Rushworth, Kendra, Hillstept | Brown | The Union Castle Mail S.S. Co., Ltd. | 1.4.47 |
| *Cavina* | S. Brown | A. Magill, R. D. Philpott, D. Clark | A. O'Sullivan | Elders & Fyffes, Ltd. | 17.4.47 |
| *Celtic Monarch* | J. Keir | E. A. Muir | | Monarch Steamship Co., Ltd. | 12.3.47 |
| *Cheshire* | F. C. Brooks | A. R. Moore, P. Saunders, J. K. Finlay | J. E. Usworth | Bibby Line, Ltd. | 19.3.47 |
| *Chinese Prince* | F. S. Thornton, O.B.E. | H. E. Jennings, P. Creatnall, P. Eccles | E. Wearmouth | Prince Line, Ltd. | 26.3.47 |
| *Chitral* | D. G. H. O. Baillie | J. Newland, J. W. Owen, B. B. Jones, D. Persons | A. R. Porter | Peninsular & Oriental Steam Nav. Co. | 18.4.47 |
| *Chupra* | M. C. Williams | C. Allerton, J. Wills, W. Hillcoat | R. C. Whiting | British India Steam Nav. Co., Ltd. | 29.4.47 |
| *City of Auckland* | H. G. Jenkins | T. V. Birkett, R. G. Jones, J. C. Stevey | J. Cummins | Ellerman Hall Line, Ltd. | 29.6.39 |
| *City of Barcelona* | H. G. Williams, O.B.E. | A. M. Bowman, R. G. Lewis, I. Mayo | J. E. Martlieu | Ellerman Hall Line, Ltd. | 16.4.47 |
| *City of Bristol* | J. I. Andrew | R. J. Windsor, J. B. Somerville, L. R. Keith | S. Gracie | The City Line, Ltd. | 18.1.47 |
| *City of Calcutta* | W. H. Matheson | | | The City Line, Ltd. | |
| *City of Canberra* | N. R. Jackson | D. W. Penberthy, R. H. Ward, J. Sapp | C. Kerridge | Ellerman & Bucknall Steamship Co., Ltd. | 19.7.39 |
| *City of Capetown* | W. S. Coughlan, O.B.E. | W. R. Robertson, A. H. Davies | A. E. Bissett | Ellerman Hall Line, Ltd. | 27.2.47 |
| *City of Carlisle* | S. L. Hoare, O.B.E. | J. Field | | Ellerman & Bucknall Steamship Co., Ltd. | |
| *City of Chester* | R. Longstaff | J. B. Lister | J. A. Vallance | Ellerman Hall Line, Ltd. | 9.4.47 |
| *City of Delhi* | A. M. Hamilton | | R. Mackine | The City Line, Ltd. | 22.2.47 |
| *City of Dieppe* | W. J. Marchant | J. F. Mitchell, E. A. Chapman, E. N. Colville | A. Earnslie | Ellerman & Bucknall Steamship Co., Ltd. | 17.5.39 |
| *City of Durham* | T. H. Speakman | D. S. McQueen | | The City Line Ltd., | 21.3.47 |
| *City of Evansville* | A. F. Goring | A. Fry, K. Dews, A. Ramsden | A. Lupton | Ellerman Hall Line, Ltd. | 21.3.47 |
| *City of Exeter* | J. I. Andrew | P. N. Will, W. Black, D. B. Barry-Edwards | J. G. Whyte | The City Line, Ltd. | 24.9.46 |
| *City of Hereford* | G. A. Ring | W. R. Tinsley | | Westcott & Laurance Line, Ltd. | 3.5.47 |
| *City of Khartoum* | J. A. Beynon | R. Frame, D. G. Dalgiell, R. Wakefield | J. A. Sharland | Ellerman Hall Line, Ltd. | 15.5.47 |
| *City of Lincoln* | H. Spencer, O.B.E. D.S.O. | G. K. Stewart | G. Stirling | Ellerman & Bucknall Steamship Co., Ltd. | 5.10.46 |
| *City of Lyons* | R. L. Stewart | A. R. Horan, E. E. Mason, E. Callow | G. McGubbing | Ellerman Hall Line, Ltd. | 10.5.46 |
| *City of Paris* | H. Percival, O.B.E. | W. H. Wilson, J. McDermid, B. M. Perry | T. L. Corbett | The City Line, Ltd. | 1.11.46 |
| *City of Swansea* | F. C. Dashley | T. Dickenson, P. Appleton, K. Haslam | J. Mann | Ellerman Hall Line, Ltd. | 20.5.47 |
| *City of Sydney* | H. Johnson | B. Walker, S. Hider, P. Carter | A. Owen | Ellerman Hall Line, Ltd. | 12.5.47 |
| *City of Windsor* | T. G. Mathias | T. Rigg, M. Graham, E. F. Buck | A. C. Macauley | Ellerman & Buckall Steamship Co., Ltd. | 21.1.47 |

| Name of Vessel | Captain | Observing Officers | Senior Radio Officer | Owners | Last Return Received |
|---|---|---|---|---|---|
| *Clan Brodie* | W. Vernon Browne | J. Baxter | | The Clan Line Steamers, Ltd. | |
| *Clan Campbell* | C. W. Banbury | T. L. Kirby | | The Clan Line Steamers, Ltd. | |
| *Clan Chattan* | H. C. Simpson | F. Turtin, J. W. Ward, P. H. Howells | P. Parish | The Clan Line Steamers, Ltd. | 24.4.47 |
| *Clan Chisholm* | J. H. Crellin | R. S. Russell, A. G. Allson, N. Wray-Cook | | The Clan Line Steamers, Ltd. | 6.12.46 |
| *Clan Farquhar* | A. G. Storkey | L. Graham, R. C. McCullock | A. G. Campbell | The Clan Line Steamers, Ltd. | 3.3.47 |
| *Clan Forbes* | H. Andrews | P. F. Carpenter, J. Turner | W. H. Saville | The Clan Line Steamers, Ltd. | 29.3.47 |
| *Clan Macauley* | J. D. Mathews, O.B.E. | T. R. Halliday, I. M. Shearer | R. Gosseman | The Clan Line Steamers, Ltd. | 13.2.47 |
| *Clan Macdonald* | H. Cater | J. P. Dumphy | G. Martyn | The Clan Line Steamers, Ltd. | 24.1.47 |
| *Clan Macdougal* | R. P. Gayler | R. G. Bagnall, J. A. Baxter, K. A. Sutherland | E. E. Crewe | The Clan Line Steamers, Ltd. | 6.3.47 |
| *Clan Maclaren* | H. J. Anchor | R. Helme, A. Mair, J. Duff | R. M. Moore | The Clan Line Steamers, Ltd. | 19.5.47 |
| *Clan Macnair* | R. F. Buckley | L. Pogson, N. Wallace, A. T. Campbell | F. Bobby | The Clan Line Steamers, Ltd. | 13.12.46 |
| *Clan Macneil* | S. F. Carter | A. M. Vaughan | P. B. Healy | The Clan Line Steamers, Ltd. | 27.3.47 |
| *Clan Macrae* | A. P. MacPherson | G. W. Graham, G. S. Gann | R. W. Mortimore | The Clan Line Steamers, Ltd. | 15.1.47 |
| *Clan Urquhart* | C. C. Parfitt | W. C. Rodger, F. J. Guttridge, P. R. Kent | I. MacIntyre | The Clan Line Steamers, Ltd. | 1.4.47 |
| *Clotilde* | A Crewdson | D. Ellwood | | J. Marr & Son, Ltd. | |
| *Clydebank* | W. Broome, O.B.E. | E. Craig, L. Witheridge, W. Freemont | E. O'Neill | Andrew Weir & Co. | 15.4.47 |
| *Clydefield* | M. E. Friskney | C. S. Owsten | M. Wilson | Hunting & Son, Ltd. | 9.5.47 |
| *Columbia Star* | C. J. W. Jones | C. G. Lea, J. Davies, L. Berridge | A. E. Clark | Blue Star Line, Ltd. | 10.3.47 |
| *Comanchee* | D. L. Pugsley | G. Union, E. J. Little | C. Barratt | Anglo-American Oil Co., Ltd. | 24.2.47 |
| *Comedian* | R. Williams | V. F. Harrison | | T. & J. Harrison | |
| *Comliebank* | W. Mendus | A. J. Whiston, R. Clark, S. J. East | A. H. Elder | Andrew Weir & Co. | 21.4.47 |
| *Condesa* | R. Smiles, O.B.E. | A. Shea | H. Raw | Furness Houlder Argentine Line, Ltd. | 13.3.46 |
| *Consuelo* | F. Barnard | H. Edwards, S. B. Wade, K. Logan | D. Withers | Ellerman's Wilson Line, Ltd. | 2.5.47 |
| *Corfu* | C. S. Parker | R. T. McNish | J. T. Macdonald | Peninsular & Oriental Steam Nav. Co., Ltd. | 29.3.47 |
| *Custodian* | A. M. Thomson | C. S. S. Boam, A. C. Sandeford | A. J. Long | T. & J. Harrison | 22.4.47 |
| *Darro* | B. A. Gammon | R. Finch, D. Buckle, J. Sutherland | D. Crombie | Royal Mail Lines, Ltd. | 23.1.47 |
| *Deebank* | R. Rivett | S. M. Allan, A. A. Rayner | J. Freeman | Andrew Weir & Co. | 1.5.47 |
| *Defoe* | G. E. Roberts, O.B.E. | A. H. Watson | | Lamport & Holt Line, Ltd. | |
| *Delilian* | A. Bankier | J. Downier, J. McNichol, L. Mitchell | A. Brooke | The Donaldson Line, Ltd. | 30.1.47 |
| *Delius* | H. Underhill | R. H. Turner | | Lamport & Hall Line, Ltd. | |
| *Denbighshire* | H. V. Coulton | V. E. Matthews, J. H. Laurie, J. B. Scott | J. E. Hands | Glen Line, Ltd. | 21.3.47 |
| *Deseado* | A. Anderson | R. W. Avison, P. J. Keakes, R. J. Kicker | N. T. Ryan | Royal Mail Lines, Ltd. | 18.3.47 |
| *Devis* | A. Bibby | P. G. Talbot | | Lamport & Hall Line, Ltd. | |
| *Devon* | H. Goater | H. C. Turner, J. Salmon, D. Bunn | H. Ridgeway | Federal Steam Nav. Co., Ltd. | 24.8.39 |
| *Devonshire* | J. E. Cullen, O.B.E. | D. Hine, J. Carr, L. E. Mollen | G. Nutter | Bibby Line, Ltd. | 9.4.47 |
| *Dilwara* | F. L. Sampson, D.S.C. | W. B. Gray, N. P. Morrison, E. L. Sleeman | S. J. Taylor | British India Steam Nav. Co., Ltd. | 19.3.47 |
| *Dominion Monarch* | Sir H. R. Gordon, K.B., D.S.C. | A. W. B. Anderson, G. H. Pugh, R. Rogers | J. Murphy | Shaw, Savill & Albion Co., Ltd. | 13.3.47 |
| *Drina* | W. H. Roberts | C. M. Wrightman, J. Filford | D. B. Douglas | Royal Mail Lines, Ltd. | 8.10.46 |
| *Dryden* | H. Hill | | | Lamport & Holt Line, Ltd. | |
| *Dunottar Castle* | R. Wren, D.S.O. | K. M. Knight, J. E. Toogood | E. Pitt | The Union-Castle Mail Steamship Co., Ltd. | 24.2.47 |
| *Dunster Grange* | S. Christie | Neal, Parker, Buchan | P. B. McNab | Houlder Bros. & Co., Ltd. | 19.3.47 |
| *Durango* | A. R. Osburn | M. Weekes, J. Brennand, S. Stafford | H. Littlecott | Royal Mail Lines, Ltd. | 17.3.47 |
| *Durham* | G. R. Pilcher, O.B.E. | P. L. Kemp, E. N. Eyre-Walker | E. S. Saunders | Federal Steam Nav. Co. | 12.11.46 |
| *Eastern* | C. Underhill | | | Eastern & Australian Steamship Co., Ltd. | |

| | | | | | |
|---|---|---|---|---|---|
| *El Gallo* | P. Peterson | G. Bennett, L. D. A. Lee | W. G. Fletcher | C. T. Bowring & Co., Ltd. | 28.11.46 |
| *Empire Cutlas* | E. O. Evans | C. Hoodless, D. Waters, C. Mumford | T. Sandham | Furness, Withy & Co., Ltd. | 20.3.47 |
| *Empire Halberd* | W. F. Swann | J. Ferres, G. W. Whitby | C. R. Blanc | Furness Lines | 15.2.47 |
| *Empire Halladale* | J. O. Dunn | T. Moodie, J. D. Craighead | J. N. MacDonald | Anchor Line, Ltd. | 5.2.47 |
| *Empire Kinsman* | J. Gibson | | | Bullard, King & Co., Ltd. | |
| *Empire Lance* | W. R. Thorburn | M. R. Organ | | Canadian Pacific Steamships, Ltd. | |
| *Empire MacCullum* | F. Piper | G. Joslin, J. G. Sleight, W. H. Kirkbride | H. G. Burton | The Hain Steamship Co., Ltd. | 8.2.47 |
| *Empire MacDermott* | D. Hunt | F. J. Adams | | The Hain Steamship Co., Ltd. | |
| *Empire MacKendrick* | P. J. Ewart | A. A. Roberts, H. Smallwood, J. Woodworth | R. A. Bristy | Goulandris Bros., Ltd. | 8.4.47 |
| *Empire Macrae* | E. A Jenkins | T. W. Marshall | | Mollers', Ltd. | 28.1.47 |
| *Empire Martaban* | R. Cook | G. McGowan, D. B. Butler | J. M. Keddie | Bolton Steam Shipping Co., Ltd. | 10.4.47 |
| *Empire Pride* | A. Beharrel | E. J. Harding, C. M. Hughes, R. Hammond | F. Blinco | Bibby Line, Ltd. | 9.4.47 |
| *Empire Rapier* | W. Edmunds | P. McCullough | D. Barber | Furness Lines | 4.7.46 |
| *Empire Spearhead* | A. N. Anderson | R. E. Shim | H. J. Roberts | Royal Mail Lines, Ltd. | 8.7.46 |
| *Empire Star* | S. J. Phillips, C.B.E. | R. H. Hall Soloman | | Blue Star Line | |
| *Empire Tagralia* | R. Snoddy | W. E. Owen | S. H. Mitchell | Galbraith, Pembroke & Co., Ltd. | 25.9.46 |
| *Empire Viceroy* | D. C. Hamilton | P. Pryde, R. G. McMahon, W. Scott-Craig | W. Elivers | Ellerman Lines, Ltd. | 22.4.47 |
| *Empire Victory* | E. Christoffersen | O. Vestrum | | United Whalers, Ltd. | |
| *Empire Wharfe* | A. McColm | H. C. Key, A. C. Caird | R. Williams | Elders & Fyffes, Ltd. | 28.10.46 |
| *Empress of Australia* | D. Dunn | D. H. Jessop, H. L. Kinns | W. Campbell | Canadian Pacific Steamships, Ltd. | 8.5.47 |
| *Empress of Scotland* | J. W. Thomas, O.B.E. | | H. W. Turner | Canadian Pacific Steamships, Ltd. | 11.12.46 |
| *Eros* | R. C. Vigurs | V. Irving, J. I. Clark, C. P. Turquand | McBride | Elders & Fyffes, Ltd. | 6.3.47 |
| *Esso Glasgow* | O. G. Broughton | P. L. Hopkins | | Anglo-American Oil Co., Ltd. | 17.4.47 |
| *Ettrickbank* | T. Watkins | E. G. Stevenson, O. J. Brown, W. Charlesworth | F. V. Marford | Andrew Weir & Co. | 4.9.39 |
| *Explorer* | R. L. Williams | C. C. Heaton, C. T. Mercer, A. Highet | W. J. Vine | T. & J. Harrison | 9.4.47 |
| *Fanad Head* | E. W. Black | W. L. Nelson, C. M. Stark, J. Young | T. P. Jones | Head Line | 27.2.47 |
| *Fantee* | A. M. Scobbie | G. M. Griffiths | J. J. Gilmore | Elder Dempster Lines, Ltd. | 29.4.47 |
| *Ficus* | S. Thompson | S. W. Dean, J. R. Johnson | A. S. Stirling | Anglo-Saxon Petroleum Co., Ltd. | 8.4.47 |
| *Folda* | E. Tulloch | L. B. Anderson | | Chr. Salveson & Co. | |
| *Fordsdale* | R. E. Ireland | C. Knox, H. G. B. Moss, R. T. Welch | H. S. Knight | Shaw, Savill & Albion Co., Ltd. | 2.5.47 |
| *Fort Brandon* | A. D. Seybold | L. Parnell, W. Stoodley, D. Chandler | S. Johnson | Houlder Bros. & Co., Ltd. | 11.3.47 |
| *Fort Cadotte* | A. MacKellar | K. D. Lamb, E. L. Mitchell, J. Coltham | M. Doran | Cunard White Star, Ltd. | 10.3.47 |
| *Fort Charnisay* | H. Burgess, O.B.E. | F. Clare, H. Sasstinal, R. M. Croce | J. Cairncross | Anning Bros. | 18.4.47 |
| *Fort Musquarro* | J. Francis Drake, O.B.E., R.D., Cdr. R.N.R. | R. G. L. Hunt | | Cunard White Star, Ltd. | |
| *Fort Nakasley* | A. Cant | T. Greenough | T. A. Harris | J. & J. Denholm, Ltd. | 9.5.47 |
| *Fort Pembina* | R. S. Rouse | E. Steddy, J. F. Blakie, W. P. Russell | | J. A. Billmeir & Co., Ltd. | |
| *Fort Perrot* | W. Armstrong | A. Webb | | Headlam & Son | |
| *Fort Steele* | C. G. Mallet | J. Mellan, A. McLean | J. Sheridan | Lyle Shipping Co., Ltd. | 30.10.46 |
| *Fort Ticonderoga* | J. Quayle, R.D., Comdr. R.N.R. | B. T. Tanach | | Chellew Navigation Co., Ltd. | 28.2.47 |
| *Franconia* | C. J. Thompson | M. Trichir, A. G. Thurswayte, H. W. Locke | J. P. Blanchard | Cunard White Star, Ltd. | 21.4.47 |
| *Georgic* | J. Chapman | G. Burd | A. Errington | Cunard White Star, Ltd. | 8.3.47 |
| *Geo. W. McKnight* | W. Robins | W. Bridge | | Anglo-American Oil Co., Ltd. | |
| *Glaucus* | T. Bell | J. C. Dougall, K. Crawford, S. Crump | J. Lewis | A. Holt & Co. | 14.2.47 |
| *Glenaffaric* | P. S. Atkins | C. C. J. Neaves, G. W. Elliott, F. J. Squires | T. N. Marsham | Glen Line, Ltd. | 24.6.46 |
| *Glenartney* | W. E. Coates | D. Main | J. H. Butler | Glen Line, Ltd. | 11.12.46 |
| *Glenbank* | E. Dibble | J. F. Reed, M. Murphy, J. H. Ferguson | C. R. Ball | Andrew Weir & Co. | 3.2.47 |
| *Gloucester* | P. S. Calcutt | G. Holland, F. O. Sladen, B. Applegate | J. Delvin | Federal Steam Navigation Co., Ltd. | 6.2.47 |
| *Hartington* | G. K. Bell | J. H. Payne, A. G. Laws, L. D. Gladsdon | P. Proctor | J. & C. Harrison, Ltd. | 1.3.47 |

A

| Name of Vessel | Captain | Observing Officers | Senior Radio Officer | Owners | Last Return Received |
|---|---|---|---|---|---|
| *Heather Island* | J. Banks | | | H. T. Scales & Sons, Ltd. | |
| *Helicina* | F T. Vine | E. O. Jones | G. W. Evans | Anglo-Saxon Petroleum Co., Ltd. | 28.1.47 |
| *Herefordshire* | A. Thomson | N. Sheldrake, J. Hellowell | F. W. Greaves | Bibby Line, Ltd. | 9.1.47 |
| *Highland Chieftain* | G. A. Bannister | Brooks, Hawkins, Gardner | Desboro | Royal Mail Lines, Ltd. | 29.1.47 |
| *Highland Princess* | D. R. Lee | F. N. Dickenson, J. C. Cotton, A. J. Field | F. Goodall | Royal Mail Lines, Ltd. | 21.4.47 |
| *Highwear* | J. S. Mallaby | | | E. R. Newbiggin, Ltd. | |
| *Hilary* | A. Elliott | J. MacKereth, J. A. Ravan, E. P. Gilmore | J. Stuart | The Booth Steamship Co., Ltd. | 19.3.47 |
| *Historian* | J. Hamden | | | T. & J. Harrison | |
| *Hopecrown* | T. Georgeson | N. Hanson | W. Thomas | Stott, Mann & Fleming, Ltd. | 22.4.47 |
| *Hopepeak* | G. Grindrod | A. J. Dobson, T. MacArthur, J. R. Dixon | R. Gladden | Stott, Mann & Fleming, Ltd. | 28.2.47 |
| *Hopestar* | J. Davison | H. D. Bauckham | | Stott, Mann & Fleming, Ltd. | |
| *Hororata* | F. S. Hamilton, O.B.E. | | | New Zealand Shipping Co., Ltd. | |
| *Horsa* | D. Dickson | F. King, C. A. Plummer, G. Driscoll | | Currie Line, Ltd. | 8.3.47 |
| *Inishowen Head* | W. A. Haddock | N. C. Stark, J. Smythe, A. H. Brines | J. Beilby | Head Line | 12.5.47 |
| *Inverbank* | A. M. Williamson | J. Mitchell | W. Chalmers | Andrew Weir & Co. | 17.3.47 |
| *Iolite* | A. Crewdson | | | Kingston Steam Trawling Co. | |
| *Jamaica Producer* | P. D. Allen, O.B.E. | R. W. Macfarlane, A. Grossland, A. C. Caird | F. C. Brown | Kaye, Son & Co., Ltd. | 19.3.47 |
| *Jersey City* | J. M. Cox | F. J. Johns | | Sir W. Reardon Smith & Sons, Ltd. | |
| *Jessmore* | A. C. Bailey | C. T. Ringrosie, J. T. Attwell | A. Milne | Johnston Warren Lines, Ltd. | 4.3.47 |
| *John Holt* | A. Kennedy | S. Burrows, W. L. Harrison, H. Pearce | T. Murdock | John Holt & Co. (Liverpool), Ltd. | 28.3.47 |
| *Kelmscott* | R. E. Richardson | P. F. Carnochan, D. Burgess, W. Haggarty | G. Williams | Runciman (London), Ltd. | 28.4.47 |
| *Kenilworth Castle* | P. H. Mayhew | T. Allen, C. A. Hinton, W. N. Mitchell | J. Gillespie | The Union-Castle Mail Steamship Co., Ltd. | 9.4.47 |
| *Kent* | J. V. Williams | C. Cremin, G. Willis, T. Gibbon | J. Crocker | Federal Steam Navigation Co., Ltd. | 12.4.38 |
| *King Robert* | G. Craze | W. Keith, G. Griffiths, P. Kidd | W. Fielding | King Line, Ltd. | 5.3.47 |
| *King William* | A. B. Drever | W. H. Hobday, L. F. Potter | J. Broad | King Line, Ltd. | 22.4.47 |
| *Kingston Pearl* | A. R. Cornish | A. R. Cornish | W. Weaves | Kingston Steam Trawling Co. | 12.5.47 |
| *Kohistan* | S. A. Bashford | A. Baird, W. Simons, C. O. Jones | E. A. H. Hayward | F. C. Strick & Co., Ltd. | 10.2.47 |
| *Lachlan* | W. H. Willcox | J. S. W. Reid | H. E. Morrison | Socony Vacuum Transport Co., Ltd. | 19.3.47 |
| *Lady Elsa* | W. Parkinson | | | Jutland Amalgamated Trawlers | |
| *Lafonia* | F. W. White | W. R. Dick | W. Beverley | Falklands Islands Co., Ltd. | 27.3.47 |
| *Lagarto* | P. L. Hockey | | J. R. Pringle | Pacific Steam Navigation Co. | |
| *Lambrook* | H. F. McInnes | J. Orr, H. G. Winkle | A. Leader | Galbraith, Pembroke & Co., Ltd. | 18.2.47 |
| *Lanarkshire* | C. E. O'Byrne | F. H. Petheridge, E. R. Cooper | C. Budge | Turnbull, Martin & Co. | 18.2.47 |
| *Lancashire* | H. Kirbyson | P. Saunders, R. Mason, J. Harwood | A. Jones | Bibby Line, Ltd. | 3.4.47 |
| *Largs Bay* | A. V. Richardson | G. W. Houchen, W. G. Barron | D. Macrae | Shaw, Savill & Albion Co., Ltd. | 18.11.46 |
| *Latia* | P. G. G. Dove | R. K. Nicholls | | Anglo-Saxon Petroleum Co., Ltd. | |
| *Leeds City* | J. D. Lloyd | Parry | | Sir W. Reardon Smith & Sons, Ltd. | |
| *Levernbank* | H. A. Jones | D. Robertson, D. Harrison | P. L. O'Byrne | Andrew Weir & Co. | 21.8.39 |
| *Lobos* | R. H. Sissons | P. H. Ray, R. H. Scarff, O. A. Baker | F. Murray | Pacific Steam Navigation Co. | 27.2.47 |
| *Lochmonar* | H. G. Whittle | G. B. Medleycott, J. E. Robson, P. C. T. Davies | J. Coutts | Royal Mail Lines, Ltd. | 7.3.47 |
| *Loch Ryan* | B. C. Dodds, O.B.E. | N. F. Seaton, C. Harthy, L. W. Green | W. T. Lewis | Royal Mail Lines, Ltd. | 14.5.47 |
| *Lord Gladstone* | J. Abuelo | M. M. Turner | | Ships Finance & Management Co., Ltd. | |
| *Lord Glentoran* | W. J. Lenister | R. M. Hall, T. Templeton, J. Anderson | J. Fletcher | Head Line | 11.2.47 |
| *Lord O'Neill* | L. A. Ferguson | N. Walsh, R. Coffey | L. Morris | Head Line | 10.4.47 |
| *Loriga* | M. B. Croft | C. R. Mayne | J. M. Lewis | Pacific Steam Navigation Co. | 3.7.39 |
| *Losada* | E. Potter | J. E. Evans, G. E. Turner, H. B. Vance | E. W. Wrightson | Pacific Steam Navigation Co. | 30.12.46 |

| | | | | | |
|---|---|---|---|---|---|
| *Lulworth Hill* | J. Reed | J. S. Henderson | | Counties Ship Management Co., Ltd. | |
| *Luminous* | S. J. Smith | J. Billett | | H. E. Moss & Co. | |
| *Macharda* | H. E. MacGregor | T. H. Wardle, R. J. Frazer, J. F. Baker | D. Storey | T. & J. Brocklebank, Ltd. | 25.2.47 |
| *Magdapur* | A. Hill | | | T. & J. Brocklebank, Ltd. | 31.3.47 |
| *Mahanada* | L. T. Owen, O.B.E. | D. M. Morris, P. A. Gunson, P. K. Ralti | | T. &. J Brocklebank, Ltd. | 20.2.47 |
| *Mahia* | J. W. Hart | P. M. Williams, J. Hurst | J. J. Nolan | Shaw, Savill & Albion Co., Ltd. | 8.4.47 |
| *Mahout* | P. C. Eddy | A. Anderson, D. Pritchard | A. Prentice | T. & J. Brocklebank, Ltd. | 18.2.47 |
| *Mahsud* | R. A. Penston | H. Defty, G. Taylor, A. Briggs | G. Caddy | T. & J. Brocklebank, Ltd. | 21.2.47 |
| *Maihar* | J. P. Paisley | H. P. Ackerley | | T. & J. Brocklebank, Ltd. | |
| *Makalla* | J. B. Newman | J. Clarke, A. H. Fawcett, J. H. Moore | A. N. Orum | T. & J. Brockelbank, Ltd. | 1.5.47 |
| *Malakand* | J. Owen | C. Calcutt | | T. & J. Brocklebank, Ltd. | |
| *Malancha* | A. S. Bain | W. Gibson, D. I. Carter, P. Doughty | B. Smith | T. & J. Brocklebank, Ltd. | 22.4.47 |
| *Malayan Prince* | J. D. Fraser | H. Gates, G. Wilkinson, E. Knaggs | L. Andrews | Rio Cape Line, Ltd. | 20.8.46 |
| *Malmo* | J. Reeves | A. J. Bayley | | Ellerman's Wilson Line, Ltd. | - |
| *Manchester City* | F. L. Osborne | D. S. Millord | L. Phillips | Manchester Lines, Ltd. | 30.10.46 |
| *Manchester Commerce* | H. Hancock | F. Bagshaw, W. E. Quirk, P. N. Fielding | G. Barlow | Manchester Lines, Ltd. | 20.11.46 |
| *Manchester Division* | E. W. Epsley | J. Jones, A. W. Leyland, H. V. Neilson | A. Campbell | Manchester Lines, Ltd. | 5.5.47 |
| *Manchester Port* | F. Downing | J. M. Mann, E. J. Eccles | W. Lecham | Manchester Lines, Ltd. | 28.1.47 |
| *Manchester Progress* | W. H. Downing | F. Lewis, J. E. Askew, D. R. Button | J. J. Bourke | Manchester Lines, Ltd. | 20.2.47 |
| *Manchester Regiment* | F. D. Struss, O.B.E., D.S.C. | J. L. McLaren, D. S. Millard, E. J. Eccles | F. Park | Manchester Lines, Ltd. | 23.4.47 |
| *Manchester Shipper* | F. D. Struss, O.B.E. D.S.C. | J. L. McLaren, A. Cookson | E. H. Ambler | Manchester Lines, Ltd. | 14.1.47 |
| *Manchester Trader* | E. W. Roper | R. Hoffman, J. Olsson, R. H. Hudson | A. Gavin | Manchester Lines, Ltd. | 0.5.47 |
| *Mandasor* | L. C. Jeans | J. Nuttall, D. Evans, S. Percival | F. Bailey | T. & J. Brocklebank Ltd. | 8.2.47 |
| *Maplebank* | N. P. McLeod | | | Andrew Weir & Co. | |
| *Margay* | E. A. Prentice | | | R. P. Houston & Co., Ltd. | |
| *Marinda* | J. Clarkson | H. C. Coplin | H. C. Coplin | Seddon Fishing Co., Ltd. | 25.10.46 |
| *Markhor* | W. Hill, O.B.E. | I. A. MacLaren, G. J. Kenyon, R. N. Bonnry | J. Shofield | T. & J. Brocklebank, Ltd. | 3.12.46 |
| *Marna* | R. R. Hume | | | Chr. Salveson & Co. | |
| *Marsdale* | M. Ferguson | H. Jones, J. Tiere, L. Mansell | | Kaye, Son & Co., Ltd. | 8.11.46 |
| *Martand* | T. Fox-Lloyd | S. S. Allen | S. W. Magill | T. & J. Brocklebank, Ltd. | 1.5.47 |
| *Marwarri* | H. C. Kinley | P. D. McKenzie, J. M. Baymont, J. B. Gough | R. W. Corbett | T. & J. Brocklebank, Ltd. | 10.4.47 |
| *Mataroa* | G. M. Robertson | P. H. Currie, P. S. P. Yeoman, B. E. Mahy | S. O'Neill | Shaw, Savill & Albion Co., Ltd. | 18.4.47 |
| *Matheran* | A. B. Bannatyre | H. Simpson, J. A. Miller, A. W. Wiltshire | P. Neeson | T. & J. Brocklebank, Ltd. | 1.5.47 |
| *Matina* | R. A. Thorburn | J. C. Crane, A. Walbourne, J. Nicholson | G. C. Knight | Elders & Fyffes, Ltd. | 13.5.47 |
| *Mauretania* | G. E. Love | J. Hughes, J. C. Porter | C. Roberts | Cunard White Star, Ltd. | 21.8.46 |
| *Memling* | D. C. Roberts | L. A. Ankers, M. C. Roberts, B. A. Griffith | E. A. Gregson | Lamport & Holt Line, Ltd. | 21.1.47 |
| *Millais* | J. Byrne | A. Corlett | | Lamport & Holt Line, Ltd. | |
| *Mirror* | S. A. Gammon | | | Cable & Wireless, Ltd. | |
| *Monarch* | R. H. J. Wallis | H. K. Joy | | Postmaster General | |
| *Mooltan* | C. H. Baxter | A. E. Clay, B. Thomson, J. O. Drysdale | F. E. Ash | Peninsular & Oriental Steam Nav. Co. | 24.3.47 |
| *Moveria* | J. L. McQueen | D. N. Allen, A. K. McFarlane, J. C. Young | J. C. Wilson | The Donaldson Line, Ltd. | 7.5.47 |
| *Mulbera* | T. J. Murphy | T. A. Robinson, D. C. Morrison, J. S. Davies | J. McMinn | British India Steam Nav. Co., Ltd. | 10.3.47 |
| *Myrtlebank* | L. W. Thorne | R. R. Mitchell | H. F. Greenhalgh | Andrew Weir & Co. | 4.11.46 |
| *Nab Wyke* | P. E. Bedford | | | Merchants (Fleetwood), Ltd. | |
| *Nairnbank* | J. Edward | C. Eveningham | | Andrew Weir & Co. | 23.11.39 |
| *Nascopie* | J. Waters | | R. Bromley | Hudson's Bay Co. | 5.11.46 |
| *Naticina* | W. D. Speakman | J. E. Gill, E. Palmer, C. B. Davidson | C. D. Grimster | Anglo-Saxon Petroleum Co., Ltd. | 3.4.47 |

| Name of Vessel | Captain | Observing Officers | Senior Radio Officer | Owners | Last Return Received |
|---|---|---|---|---|---|
| *Nestor* | J. Blyth, O.B.E., D.S.C. | R. A. Hansell, T. W. Williams, J. R. McCarthy | D. S. Perks | A. Holt & Co. | 20.9.46 |
| *New Zealand Star* | D. R. Macfarlane, O.B.E., D.S.O. | J. McQuiston, R. G. Taylor, L. W. Evans | C. J. Carter | Blue Star Line, Ltd. | 4.12.46 |
| *Northumberland* | F. Lougheed | R. G. Anderson, A. H. Ryland, R. S. Linly | A. Riyan | Federal Steam Navigation Co., Ltd. | 31.1.47 |
| *Ocean Valley* | W. McMellin | J. S. Dalgueno | | Houlder Bros. & Co., Ltd. | |
| *Ocean Wanderer* | J. Clinton | J. M. Proctor, R. Anderson | E. C. Owen | Bolton Steam Shipping Co., Ltd. | 24.6.46 |
| *Orari* | F. Pover | J. Bennett, C. Embrosi, G. Rennie | C. G. Williams | New Zealand Shipping Co., Ltd. | 25.10.46 |
| *Orbita* | W. A. Hearle | J. H. Allenby | | Pacific Steam Navigation Co. | 28.1.47 |
| *Orduna* | J. Williams | B. A. King, J. Norman, W. Camprice | D. P. Byrne | Pacific Steam Navigation Co. | 26.2.47 |
| *Orion* | C. Fox, C.B.E., L.M. | C. K. Knight, J. Farrell, G. S. Willis | W. A. Boon | Orient Steam Navigation Co. | 9.4.46 |
| *Ormonde* | J. E. Goldsworthy | G. R. Guardage, S. Hickman, C. Thomas | R. Oakley | Orient Steam Navigation Co. | 9.4.47 |
| *Orontes* | Sir A. J. Baxter, K.B.E., D.S.C., R.D., Comdr. R.N.R. | Nairthy, Noble, Cook | M. J. Murphy | Orient Steam Navigation Co. | 4.3.47 |
| *Otranto* | N. Savage, C.B.E. | E. T. Harris, D. K. Kinlock, J. W. Cook | C. T. Seaton | Orient Steam Navigation Co., Ltd. | 6.5.47 |
| *Pachesham* | G. Lindsay | D. Macdonald, K. E. Howard | D. Duffy | Runciman (London), Ltd. | 9.1.47 |
| *Pacific Enterprise* | M. E. Cogle, O.B.E. | A. L. Dales | I. A. Waddell | Norfolk & North American Steam Shipping Co., Ltd. | 29.3.47 |
| *Pacific Exporter* | R. E. Holland | Head, Gouldstone, Williams | B. McEwan | Norfolk & North American Steam Shipping Co., Ltd. | 17.3.47 |
| *Pacific Shipper* | E. V. Richards | E. S. Watson, R. Hughes | E. Elliot | Furness, Withy & Co., Ltd. | 14.1.47 |
| *Palacio* | D. L. Thomas, M.B.E. | R. M. Lidgate | | MacAndrews & Co., Ltd. | |
| *Palana* | H. S. Allan | F. J. Whiffin, C. Mayne, M. Greasley | H. Olding | Peninsular & Oriental Steam Nav. Co. | 29.4.47 |
| *Papanui* | E. A. Burton | G. Fulcher, D. Farmer, A. Chapman | P. Broome | New Zealand Shipping Co., Ltd. | 17.4.47 |
| *Paparoa* | E. A. J. Williams | J. K. Ball, R. L. Daniels, V. LeBreton | R. Prince | New Zealand Shipping Co., Ltd. | 13.2.47 |
| *Paraguay* | P. M. Burrell | J. H. Napper | | Royal Mail Lines, Ltd. | 2.4.47 |
| *Pardo* | H. H. Treweeks | J. Green, R. Killey, J. Postill | R. O'Shea | Royal Mail Lines, Ltd. | 9.12.46 |
| *Parima* | G. N. Duncan | R. Hunnisceth | J. Schofield | Royal Mail Lines, Ltd. | 31.1.47 |
| *Paringa* | C. E. Pollett | G. C. Blythe | | Peninsular & Oriental Steam Nav. Co. | |
| *Perthshire* | W. R. Roberts | J. Browne, J. Y. Smith, J. W. Bennett | F. Rayner | Turnbull, Martin & Co. | 10.4.47 |
| *Pilcomayo* | J. S. Wrake, Lt.-Cmdr. R.N.R. | P. G. Driver | | Royal Mail Lines, Ltd. | |
| *Pipriki* | H. A. Fryer | P. Bowden, H. Owen | L. Whittington | New Zealand Shipping Co., Ltd. | 3.1.47 |
| *Planter* | J. J. Wallis | J. L. Cule | | T. & J. Harrison | |
| *Port Chalmers* | R. S. Durham, O.B.E., D.S.C. | D. J. B. Blanford | | Port Line, Ltd. | 9.4.47 |
| *Port Fairy* | D. G. H. Bradley | O. N. Harris, A. J. Richardson, T. Sayles | E. N. Gunner | Port Line, Ltd. | 3.1.47 |
| *Port Hobart* | T. F. Kippings, O.B.E., D.S.C. | W. J. Williams, J. D. Aitchison | C. R. Coats | Port Line, Ltd. | 12.2.47 |
| *Port Jackson* | L. N. Swan, O.B.E. | C. Guest, R. R. Rowlinson, E. Newstead | J. A. McAskill | Port Line, Ltd. | 20.11.46 |
| *Port Lincoln* | H. H. Smith | A. Miller | F. Griffiths | Port Line, Ltd. | 25.1.47 |
| *Port Macquarrie* | G. J. Hazlewood | A. W. Kinsett, T. S. Paton, A. S. Baird | G. W. Bailey | Port Line, Ltd. | 22.1.47 |
| *Port Phillip* | J. G. Lewis | F. M. Barton, T. W. Dalton | J. Macpherson | Port Line, Ltd. | 22.2.47 |
| *Port Pirie* | W. J. Enright, O.B.E., R.D., R.N.R. | H. F. Lunn | | Port Line, Ltd. | |
| *Port Wellington* | F. J. Lavers | E. J. Arnold, D. N. Devonport, J. D. Goddard | H. Whitmore | Port Line, Ltd. | 8.3.47 |

| | | | | | |
|---|---|---|---|---|---|
| *Port Wyndham* | H. Steele | J. N. Bedwell, W. H. Hopward, H. A. Scran | A. F. Bonner | Port Line, Ltd. | 28.12.46 |
| *Potaro* | S. J. G. Hill | T. A. Evans, W. A. Tressiden | C. B. Townley | Royal Mail Line, Ltd. | 17.2.47 |
| *Priam* | L. W. Kersley | R. A. Hansell, T. G. Nelson, C. H. Jolly | A. C. Evans | A. Holt & Co. | 30.4.47 |
| *Queen of Bermuda* | A. T. Church | J. L. Anson, E. Cole, A. Irons | A. Morris | Furness, Withy & Co., Ltd. | 8.5.47 |
| *Ranchi* | R. E. T. Tunbridge | E. R. Rose, H. Griffiths, R. L. Pigeon | R. V. Gregory | Peninsula & Oriental Steam Nav. Co. | 19.4.47 |
| *Rangitata* | G. Kinnell, O.B.E. | H. P. Lunn | | New Zealand Shipping Co., Ltd. | 4.2.47 |
| *Rangitiki* | E. Holland, C.B.E. | L. Stewart-Scott, R. Harding, P. Busby | P. Smythe | New Zealand Shipping Co., Ltd. | 24.3.47 |
| *Recorder* | R. F. Longster | G. W. Sigworth, R. G. Abbott | H. E. Duffett | T. & J. Harrison | 10.12.46 |
| *Red Charger* | R. Nash | C. Noble | | Iago Steam Trawler Co., Ltd. | |
| *Red Crusader* | B. Rogerson | | | Iago Steam Trawler Co., Ltd. | |
| *Red Lancer* | M. Wright | C. Noble | | Iago Steam Trawler Co., Ltd. | |
| *Red Sword* | J. Tomlinson | | | Iago Steam Trawler Co., Ltd. | |
| *Regent Hawk* | J. Ward | C. R. Arthur, M. McLeod | J. Twindle | Trinidad Leaseholds, Ltd. | 19.2.47 |
| *Reighton Wyke* | G. Clixby | | R. Bell | West Dock Steam Fishing Co. | 29.3.47 |
| *Rembrandt* | J. J. Grugan | R. Thompson | | Bolton Steam Shipping Co., Ltd. | |
| *Richmond Castle* | J. A. Snowden | E. H. J. Hall | R. Santillo | The Union-Castle Mail Steamship Co., Ltd. | 3.2.47 |
| *Richmond Hill* | A. C. Gillanders | E. J. McHarg, J. A. Williams, S. B. Ormes | B. A. Palin | Countries Ship Management Co., Ltd. | 30.9.46 |
| *Riebeeck Castle* | J. E. R. Wilford | D. A. Rees, J. C. W. Ladcoat | | The Union-Castle Mail Steamship Co., Ltd. | |
| *Rimutaka* | P. B. Clarke, M.V.O., O.B.E., D.S.C. | R. C. Downie, I. C. Davison | A. Stenning | Peninsular & Oriental Steam Nav. Co. | 23.11.46 |
| *Rippingham Grange* | A. B. Friend, O.B.E. | H. S. Butler, J. C. Taylor, A. H. Robinson | R. Taker | Houlder Bros. & Co., Ltd. | 27.4.46 |
| *Robert F. Hand* | E. J. Instone, O.B.E. | A. Cresswell, R. Phillips, J. Rochford | A. W. Toor | Anglo-American Oil Co., Ltd | 29.3.47 |
| *Robert Hewett* | G. Elliot | H. Wilcock | | The Hewett Fishing Co., Ltd. | |
| *Rochester Castle* | D. D. MacKenzie | P. E. Carter, J. C. Foster | | The Union-Castle Mail Steamship Co., Ltd. | 13.3.47 |
| *Roslin Castle* | J. B. McReynolds | N. A. Rigg | D. T. Drover | The Union-Castle Mail Steamship Co., Ltd. | 8.3.47 |
| *Rowallan Castle* | J. F. Oakley | J. Stewart, J. D. Cutliffe, R. R. Knowles | R. Cullen | The Union-Castle Mail Steamship Co., Ltd | 12.2.47 |
| *Roxburgh Castle* | J. M. Rayner | W. B. Fletcher | S. P. C. Marden | The Union-Castle Mail Steamship Co., Ltd. | 9.4.47 |
| *Royal Star* | G. M. Duff | T. G. Hughes, M. R. Brenberg, E. J. Jones | E. C. Owen | Blue Star Line, Ltd. | 17.12.46 |
| *Ruahine* | E. A. Letterington | J. Gaylor, E. White, J. Mead | J. Payner | New Zealand Shipping Co., Ltd. | 11.3.47 |
| *Rutland* | W. Thom | J. Pryde | J. Macfarlane | Currie Lines, Ltd. | 8.1.47 |
| *Sacramento* | J. E. Robinson, M.B.E. | J. H. Hunter | W. H. Parratt | Ellermans' Wilson Line, Ltd. | 17.2.47 |
| *St. Crispin* | R. A. Cook | R. A. Cook | | St. Andrews Fishing Co. | |
| *St. Elstan* | A. Robinson | A. Robinson | | Thomas Hamling & Co., Ltd. | |
| *St. Just* | V. A. Buschini | V. A. Buschini | | The Hewitt Fishing Co., Ltd. | |
| *St. Nectan* | J. Gibbs | J. Gibbs | | Thomas Hamling & Co., Ltd. | 7.11.46 |
| *St. Zeno* | J. H. Ellis | J. H. Ellis | J. Cadman | Thomas Hamling & Co., Ltd. | 11.12.46 |
| *Salaverry* | J. Whitehouse | S. Ayland, P. D. O'Driscoll, W. Johnston | J. O'Shea | Pacific Steam Navigation Co. | 17.3.47 |
| *Saluta* | J. Torgeson | J. M. Horner | | Chr. Salveson & Co. | |
| *Samanco* | A. Litherland | A. Lang, J. A. Greenwood, G. N. Howe | J. D. Dalzell | Pacific Steam Navigation Co. | 29.3.47 |
| *Samaria* | H. Guttridge | | | Cunard White Star, Ltd. | 11.2.47 |
| *Samfaithful* | F. A. C. Thacker | E. J. Mitchell, J. Hall | J. D. Mason | Royal Mail Lines, Ltd. | 30.1.47 |
| *Samkansa* | R. W. Roberts, O.B.E., D.S.C. | R. F. Underwood, A. M. L. Murray, H. Moore | L. P. Cottell | Orient Line | 12.5.47 |
| *San Adolfo* | H. C. Croker | J. Dallace | | Eagle Oil & Shipping Co., Ltd. | 25.5.46 |
| *San Cirilo* | J. L. Pearson | J. W. Pratt, G. G. B. Putt, W. Harper | R. Lamas | Eagle Oil & Shipping Co., Ltd. | 6.5.47 |
| *San Felix* | J. B. Macarthy | T. B. Wright, D. Stevenson, J. Mulligan | W. L. Radcliffe | Eagle Oil & Shipping Co., Ltd. | 13.3.47 |
| *San Velino* | J. Thomspon, O.B.E. | W. D. Lamb, J. Wallace, L. P. Bell | R. M. Evans | Eagle Oil & Shippiing Co., Ltd. | 9.11.46 |
| *San Veronico* | A. R. Hicks | R. R. Griffiths, J. R. Stephens, D. C. Fox | A. F. Carpenter | Eagle Oil & Shipping Co., Ltd. | 12.4.47 |

| Name of Vessel | Captain | Observing Officers | Senior Radio Officer | Owners | Last Return Received |
|---|---|---|---|---|---|
| *San Vulfrano* | W. Wigham | K. E. Spencer, R. R. Williams, K. Hancock | P. M. Geraghty | Eagle Oil & Shipping Co., Ltd. | 28.4.47 |
| *Santander* | J. Sutherland | F. J. Leicester, R. K. C. Thomas, R. Russell | E. Robson | Pacific Steam Navigation Co., Ltd. | 23.4.47 |
| *Sarmiento* | M. Armstrong | A. Powell, J. Beamish, J. Newberry | A. R. Cox | Pacific Steam Navigation Co., Ltd. | 6.1.47 |
| *Sarpedon* | E. W. Berry | A. G. Sturtees, A. G. Hopkins, K. Jones | G. E. Clarke | A. Holt & Co. | 20.12.46 |
| *Saxon Star* | F. B. Brown | J. B. Kennedy | | Blue Star Line, Ltd. | |
| *Scythia* | O. Bateman | D. Johnstone, J. Boyce | M. Doyle | Cunard White Star, Ltd. | 11.2.47 |
| *Silverguava* | W. G. Cole | I. C. Jones, J. Evans, R. Sankins | R. Burrows | S. & J. Thompson, Ltd. | 17.4.47 |
| *Silverlarch* | J. Duncan | J. Stott, V. Strafford | A. Satchwell | S. & J. Thompson, Ltd. | 3.3.47 |
| *Silveroak* | R. H. Woodrow, O.B.E. | H. Harrison, J. H. Crane, K. A. Wise | R. L. Sinclair | S. & J. Thompson, Ltd. | 26.3.47 |
| *Silversandal* | R. H. Woodrow, O.B.E. | | | S. & J. Thompson, Ltd. | |
| *Silverteak* | E. J. Tilmouth | A. W. Maconkey | | S. & J. Thompson, Ltd. | 1.2.47 |
| *Silverwalnut* | C. Metcalf | R. Darby | R. Smith | S. & J. Thompson, Ltd. | 22.11.46 |
| *Sinnington Court* | J. Schofield | J. W. Nicholson, C. W. Marshall | M. T. Abbot | Haldin & Phillips, Ltd. | 3.4.47 |
| *Socotra* | E. R. Bodley, D.S.O. | E. Lowen, H. Bush, J. Knowles | E. T. Beveridge | Peninsular & Oriental Steam Nav. Co. | 10.3.47 |
| *Southern Collins* | D. Hunter | W. Spence, J. Short, J. Foster | J. Hurley | Chr. Salveson & Co. | 1.7.46 |
| *Southern Harvester* | S. Begg | E. G. Sutton | J. Johnson | Chr. Salveson & Co. | 1.3.47 |
| *Southern Opal* | W. J. Swanson | J. Cramb | J. Edmond | Chr. Salveson & Co. | 12.3.47 |
| *Southern Venturer* | H. Milsen | | | Chr. Salveson & Co. | 1.6.46 |
| *Sovac* | S. F. Living | W. S. Lewis | D. McMurdoe | Socony Vacuum Transportation Co., Ltd. | 25.1.47 |
| *Staffordshire* | P. H. Potter | J. Farrow, R. Woodhouse, W. Pye | A. Rodger | Bibby Line, Ltd. | 27.3.47 |
| *Stancourt* | F. H. Wainford | W. Lambert | A. R. Holroyd | Stanhope Steamship Co., Ltd. | 8.4.47 |
| *Stanhall* | H. V. Wightman | W. R. Rodger | | Stanhope Steamship Co., Ltd. | |
| *Stanhill* | C. P. Vaughan | C. Bennett, D. Organ, D. Ball | R. Penrose | Stanhope Steamship Co., Ltd. | 20.12.46 |
| *Stirlingshire* | A. Mackinley | A. M. Kennedy, H. Lockyer, J. Bowlerwell | W. D. Gooderidge | Turnbull, Martin & Co. | 19.8.39 |
| *Strathmore* | D. M. Stuart, D.S.C. | J. MacArthur, J. Hamilton | J. Carey | Peninsular & Oriental Steam Nav. Co. | 19.2.47 |
| *Strathnaver* | R. B. Beck | N. J. Jenner, Holmes, Neal | J. Armiston | Peninsular & Oriental Steam Nav. Co. | 11.3.47 |
| *Suffolk* | W. Wilson | A. J. Mactinger | | Federal Steam Navigation Co., Ltd. | 31.1.47 |
| *Suncrest* | L. G. Barwell | J. Johnson, J. Collins, P. Tate | G. W. Morris | Crest Shipping Co., Ltd. | 26.3.47 |
| *Sutherland* | J. Lewis | S. Gait | E. Rymer | B. J. Sutherland & Co., Ltd. | 7.3.47 |
| *Swainby* | C. Yare | G. W. Hammond, W. Huntley, G. Bricknell | B. G. Kimble | Sir W. Ropner & Co., Ltd. | 24.4.47 |
| *Sydney Star* | T. S. Horn | J. C. Smart, A. H. White, A. G. Smith | J. Malcolm | Blue Star Line, Ltd. | 27.2.47 |
| *Tactician* | A. Robertson | A. Sutherland, D. Bloom | A. E. Weedall | T. & J. Harrison | 23.4.47 |
| *Tamaroa* | S. O. Oswald | H. H. Falkiner, K. M. Brown, A. R. Stephenson | P. Maloney | Shaw, Savill & Albion Co., Ltd. | 29.3.47 |
| *Tamele* | J. J. Smith | P. J. Finan, R. E. Foster | J. Broomfield | Elder, Dempster Line, Ltd. | 14.5.47 |
| *Taranaki* | F. A. Smith | D. S. Upton, J. Collins | E. Heywood | Shaw, Savill & Albion, Co. Ltd. | 30.4.47 |
| *Tarkwa* | W. C. Baxter | | | Elder, Dempster Lines, Ltd. | 12.10.46 |
| *Tasso* | H. Scraborough | S. H. Bennett, T. Plumtree | L. Richardson | Ellerman's Wilson Line, Ltd. | 11.12.46 |
| *Tekoura* | F. Sutton | D. E. Edmonds | D. E. Edmonds | The Hewett Fishing Co., Ltd. | 26.2.47 |
| *Telemachus* | J. F. Webster | J. F. C. Dowie, I. H. Browning, V. Knowles | J. C. Wilson | A. Holt & Co. | 31.1.47 |
| *Teviot* | W. W. Dovell | D. Hogarth | | Royal Mail Lines, Ltd. | |
| *Thamesfield* | D. A. Law | T. Shanks, H. Shaw, A. D. Lombard | G. Middleton | Hunting & Son, Ltd. | 19.3.47 |
| *Themistocles* | W. J. Williams | | | Shaw, Savill & Albion Co., Ltd. | 25.5.46 |
| *Tinto* | S. H. Bennett, M.B.E. | N. O. Cook | | Ellerman's Wilson Line, Ltd. | |
| *Tongariro* | A. E. Williams | C. Robinson, H. R. Swift, J. E. Millington | G. M. Parsons | New Zealand Shipping Co., Ltd. | 1.6.46 |

| | | | | | |
|---|---|---|---|---|---|
| *Torr Head* | M. Kennedy | S. T. Ross, R. Harper, C. E. Pringle | B. K. Davey | Head Line | 6.2.47 |
| *Trepassey* | E. Burden | N. Stone, F. Windsor | R. Kelly | c/o G. W. Henlew | 10.12.46 |
| *Tresillian* | C. Crouch | R. B. Oliver, G. Potts, W. Cussens | S. Cox | Hain Steamship Co., Ltd. | 15.4.47 |
| *Trevaylor* | W. Agnew, O.B.E. | J. G. Sleight | | Hain Steamship Co., Ltd. | |
| *Tweed* | C. E. Mason | N. L. Tapp, M. B. Wingate, J. G. Robertson | T. F. Edwards | Royal Mail Lines, Ltd. | 12.5.47 |
| *Umtali* | F. E. J. O'Hea | J. McDermott, A. Gibson, H. Nock | N. Hewitt | Bullard King & Co., Ltd. | 30.1.47 |
| *Umtata* | J. W. Miles | N. C. Beadle | | Bullard King & Co., Ltd. | 8.1.47 |
| *Valacia* | W. Stewart | A. W. Foyle | | Cunard White Star, Ltd. | |
| *Vancouver City* | B. Carnaffan | M. J. Cheary, O. J. Lindsay, J. King | J. J. Dean | Sir W. Reardon Smith & Sons, Ltd. | 19.4.47 |
| *Vasconia* | P. L. Williams | A. L. Davies, R. G. W. Clayton, M. Duke | P. Patrick | Cunard White Star, Ltd. | 28.1.47 |
| *Victrix* | E. Garnett | C. F. Lawrence | | Henriksen & Co. | |
| *Vivienne Louise* | G. McLeod | E. W. C. Sullivan | A. S. G. Broadbent | Arthur A. Rapp | 28.2.47 |
| *Volo* | A. Morrill | F. Briggs | | Ellerman's Wilson Line, Ltd. | |
| *Waipawa* | W. G. West | R. F. Hamilton, D. MacCullum, A. O. Griffiths | J. Hammond | Shaw, Savill & Albion Co., Ltd. | 26.3.47 |
| *Wairangi* | H. S. Cox | | H. Jardine | Shaw, Savill & Albion Co., Ltd. | 7.5.47 |
| *Waiwera* | R. Forbes Moffat | J. L. Carroll, J. E. Fairgrieve, A. H. Baber | W. H. Holmes | Shaw, Savill & Albion Co., Ltd. | 3.4.47 |
| *War Nizam* | J. Hall | G. Baxter | | Bulk Storage Co. | |
| *Warwick Castle* | J. C. Simpson | J. E. Malton | J. Gilbert | The Union-Castle Mail Steamship Co., Ltd. | 17.7.39 |
| *Welsbach* | P. E. Bedford | | | Merchants (Fleetwood), Ltd. | |
| *Winchester Castle* | W. A. Pace, O.B.E. | G. Murray | J. Hodgson | The Union-Castle Mail Steamship Co., Ltd. | 18.4.47 |
| *Worcestershire* | R. S. Evans | M. Mills, W. Boyle | R. Fletcher | Bibby Line, Ltd. | 14.5.47 |

## 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 which may occur in the list.

| NAME OF VESSEL | CAPTAIN | OWNERS |
|---|---|---|
| *Actuality* | J. Lewis | F. T. Everard & Sons, Ltd. |
| *Alouette* | F. J. Casey | General S. N. Co., Ltd. |
| *Ariosto* | G. W. Pountney, O.B.E. | Ellerman's Wilson Line, Ltd. |
| *Atlantic Coast* | T. Humphreys | Coast Lines, Ltd. |
| *Baltraffic* | F. Waldron | United Baltic Corporation |
| *Bury* | J. L. Davison | Associated Humber Lines |
| *Cambria* | A. Marsh | L.M.S. Railway, Holyhead. |
| *Clyde Coast* | D. Cowan | Coast Lines, Ltd. |
| *Corfen* | E. Allen | Wm. Cory & Son, Ltd. |
| *Corfleet* | R. J. Barrow | Wm. Cory & Son, Ltd. |
| *Cormoat* | R. B. Armstrong | Wm. Cory & Son, Ltd. |
| *Cortachy* | J. Stewart | Dundee, Perth and London Shipping Co., Ltd. |
| *Crane* | E. C. Painter, D.S.C. | General S. N. Co., Ltd. |
| *Crichtoun* | H. M. Brown | G. Gibson & Co, Ltd. |
| *Denbigh Coast* | J. Maddrell | Coast Lines, Ltd. |
| *Drake* | J. S. Lickes | General S. N. Co., Ltd. |
| *Duke of Argyll* | H. Clarke | L.M.S. Railway, Heysham. |
| *Duke of Lancaster* | F. Arden | L.M.S. Railway, Heysham. |
| *Eastern Coast* | R. E. Holt | Coast Lines, Ltd. |
| *Falcon* | F. W. Wethy | General S. N. Co., Ltd. |
| *Granta* | D. A. Hunter | Witherington & Everett. |
| *Guernsey Coast* | C. Metcalfe | British Channel Islands S.S. Co. |
| *Hantonia* | A. L. Light | Southern Railway, Southampton. |
| *Harrogate* | C. H. Tully | Associated Humber Lines. |
| *Hibernia* | W. H. Hughes, D.S.C. | L.M.S. Railway, Holyhead. |
| *Highwood* | J. Coupland | E. R. Newbiggin, Ltd. |
| *Isle of Jersey* | H. H. Golding | Southern Railway, Southampton. |
| *Isle of Sark* | W. A. Harper | Southern Railway, Southampton. |
| *Lairdsburn* | J. McColl | T. & J. Brocklebank, Ltd. |
| *Lairdswood* | I. McGuggan | T. & J. Brocklebank, Ltd. |
| *Lancashire Coast* | B. Williams | Coast Lines, Ltd. |
| *Lapwing* | W. G. James | General S. N. Co., Ltd. |
| *Majorca* | J. Henderson | Currie Line, Ltd. |
| *Mallard* | H. Clayton | General S. N. Co., Ltd. |
| *Medway Coast* | J. McQuirk | Coast Lines, Ltd. |
| *Melrose Abbey* | R. Good | Ellerman's Wilson Line, Ltd. |
| *Minna* | T. Mather | Scottish Home Department. |
| *Moray Coast* | E. Griffiths | Coast Lines, Ltd. |
| *Norna* | W. Pirrie | Scottish Home Department. |
| *Northern Coast* | W. Quirk | Coast Lines, Ltd. |
| *Ocean Coast* | J. Webber | Coast Lines, Ltd. |
| *Otterhound* | A. M. Kennedy | Coastal Tankers, Ltd. |
| *Pass of Ballater* | R. Reid | Bulk Oil S.S. Co., Ltd. |
| *Persian Coast* | T. Taylor | Tyne, Tees S.S. Co., Ltd. |
| *Petrel* | Tomlin | General S. N. Co., Ltd. |
| *Royal Daffodil* | G. Johnson, D.S.C. | General S. N. Co., Ltd. |
| *St. Julien* | L. J. Richardson | G.W. Railway, Cardiff. |
| *Salerno* | A. Morrill | Ellerman's Wilson Line, Ltd. |
| *Scottish Co-operator* | T. Robertson | Scottish Co-operative Wholesale Society |
| *Slieve Bearnagh* | A. E. Wilmott, D.S.C., R.D., Comm., R.N.R. | L.M.S. Railway, Heysham. |
| *Slieve Bloom* | E. G. J. Manning | L.M.S. Railway, Heysham. |
| *Slieve League* | V. S. Phillips | L.M.S. Railway, Heysham. |
| *Slieve More* | R. Woodhall | L.M.S. Railway, Heysham. |
| *Southern Coast* | G. Mearns | Coast Lines, Ltd. |
| *Stork* | C. Carr | General S. N. Co., Ltd. |
| *Tern* | R. H. Urquhart | General S. N. Co., Ltd. |
| *Thames Coast* | G. Clarke | Coast Lines, Ltd. |
| *Wandle* | T. W. Corney, M.B.E. | Wandsworth and District Gas Co. |
| *Welsh Coast* | T. Humphries | Coast Lines, Ltd. |

## 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.

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

S.S./M.V..... Captain.....

Port of Call .....

Date of Homeward Departure .....

Postal Address .....

When this information is not given the *Marine Observer* will be addressed to the Commanding Officer, 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 abroad are asked to kindly facilitate the despatch and delivery of postal matter, received at their offices from the Meteorological Office and Air Publications and Forms Stores, to their ships abroad.

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

Much of the information referred to is published in the *Marine Observer* and is of a seasonal nature. This journal also contains advice to observing ships which enables them to perform voluntary service by wireless communication for the benefit of all shipping.

### 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 the Admiralty Charts and Sailing Directions.

Marine observers will greatly assist by noting the conditions of ice, either drifting or fast.

For this purpose Form 912 is supplied direct to all regular observing ships using regions where ice may be encountered, and this Form may be supplied to the captain of any British ship on application to the Port Meteorological Officers and Merchant Navy Agents.

Regular observing ships using the Trans-North Atlantic tracks are requested to send in these Forms, 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.

## MARINE METEOROLOGY

### Co-operation of British Shipowners, Masters and Mates

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

In accordance with the International Convention for Safety of Life at Sea, the Meteorological Office arranges for a number of ships to record meteorological observations at specified hours, throughout their voyage, and to transmit coded observations, by wireless telegraphy, for the benefit of other ships and the various meteorological services.

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

The list of regular observing ships with the names of commanders, officers, and other particulars, is published in the *Marine Observer*.

The quarterly *Marine Observer* is sent regularly to the captain of every observing ship, for the information and guidance of his observing and radio officers. The captains of observing ships are also supplied on request with charts and atlases, according to trade, as meteorological equipment.

To ensure the accuracy of data collected for the purpose of research and for weather forecasting, ashore and afloat, and to provide a pattern, which may be copied with advantage to all concerned for general use in merchant ships, sufficient tested instruments are lent by the Meteorological Office to the captains of observing ships.

Commanders of observing ships are requested to return their Fair Logbooks (Form 911) when full, or when insufficient space remains for the recording of observations during a further complete passage, to the Meteorological Office.

Pages from the Coded Messages Record (Form 911A), when filled, or at the end of each voyage, should be detached, folded, and returned to the Meteorological Office.

The Port Meteorological Officers and Merchant Navy Agents inspect instruments in observing ships quarterly, when possible, and they will replace, as necessary, any gear lent by the Meteorological Office. These officers will also check the accuracy of barometers, etc., in observing ships, but marine observers should themselves frequently check by comparison.

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

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, Minories, London, E.C.3. (Telephone : Royal 1721).

## AGENTS

### Bristol Channel

Captain E. Hall, Room 120, Exchange, Mount Stuart Square, Cardiff Dock.

### Clyde

Captain W. W. Elliott, c/o Messrs J. Goldie & Sons, 27 Oswald Street, Glasgow, C.1. (Telephone : Central 7435).

### 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.

### Southampton

Captain Sir Benjamin Chave, K.B.E., Royal Mail House, Southampton.

### Tyne

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

## SOME ATLASES PREPARED IN THE MARINE BRANCH OF THE METEOROLOGICAL OFFICE AND ISSUED BY THE AUTHORITY OF THE METEOROLOGICAL COMMITTEE

**Atlantic Ocean**

Quarterly Surface Current Charts of the Atlantic Ocean (No. 466). 22½″ × 18″. 12s. (7d.)

Monthly Ice Charts of the Western North Atlantic (No. 478, 1944). 12″ × 7½″. 4s. (2d.)

Monthly Meteorological Charts of the Atlantic Ocean (No. 483). 24″ × 19¾″. £4 10s. 0d. (11d.) In the press.

**Arctic Ocean**

*Monthly Ice Charts of the Arctic Seas (Hudson Bay to Kara Sea). (M.O.M. 390a Revised 1944). 12″ × 6¾″. 2s. 6d. (2d.)

*Monthly Meteorological and Current Charts of the Greenland and Barents Seas. (M.O.M. 402b 1942). 20″ × 13″. £2 10s. 0d. (7d.)

**Indian Ocean**

Indian Ocean Currents (No. 392 Second Edition 1939). 30″ × 20″. 10s. (8d.)

**Pacific Ocean**

Southern Pacific Ocean Currents (No. 435 1938). 34″ × 22″. 7s. 6d. (9d.)

Monthly Meteorological Charts of the Western Pacific Ocean (No. 484 Revised 1945). 16¾″ × 23¾″. £2 2s. 0d. (8d.). In the press.

*Prices in brackets give postage (inland)*

The publications in this list, excepting those marked with an asterisk, can be purchased directly from H.M. Stationery Office at the following addresses :—

York House, Kingsway, London, W.C.2 ; 13a Castle Street, Edinburgh, 2 ; 39–41 King Street, Manchester, 2 ; 1 St. Andrews Crescent, Cardiff ; 80 Chichester Street, Belfast ; or though any bookseller.

* Publications marked with an asterisk can be purchased on application to the following address :—

The Director, Meteorological Office, M.O.10(c), Victory House, Kingsway, London, W.C.2.

**PUBLICATION RESUMED**

# THE METEOROLOGICAL MAGAZINE

Founded by G. J. Symons, F.R.S., in 1866
Publication suspended for the first time in 1940

IN its new form the Magazine contains authoritative articles in non-technical language on a wide variety of topics, including the first accounts of much recent research of great importance, international collaboration in meteorology and aviation, reports of scientific meetings, official notices of interest to observers, notices of Meteorological Office publications, reviews of new books and figures of interesting weather of the past month in this country and abroad, and letters from correspondents.

First Issue of the New Volume
JANUARY 1947

**Single Issues Price 1s. 0d.**
*By Post 1s. 1d.*

**Annual Subscription 13s.**
*Including Postage*

HIS MAJESTY'S STATIONERY OFFICE
LONDON, W.C.2: York House, Kingsway. (Post Orders—P.O. Box No. 569, London, S.E.1.)
EDINBURGH 2: 13a, Castle Street.
MANCHESTER 2: 39-41, King Street.
CARDIFF: 1, St. Andrew's Crescent.
BELFAST: 80, Chichester Street. BRISTOL 1: Tower Lane.
Or through any bookseller.

# SOME PUBLICATIONS ISSUED UNDER THE AUTHORITY OF THE METEOROLOGICAL COMMITTEE

---

Obtainable from H.M. Stationery Office at the addresses shown on the title page of this book, or through any bookseller. (Prices in brackets include postage.)

---

**Cloud Forms.** Definitions and descriptions, with photographs of clouds. M.O. 233. 5th edition. 1941 (reprinted 1946). 1*s.* 3*d.* (1*s.* 5*d.*)

**The Observer's Primer.** M.O. 266. 1940. 3*d.* (4*d.*)

**Meteorological Observer's Handbook.** Instructions in the care and manipulation of meteorological instruments and in the making of observations, both instrumental and non-instrumental. M.O. 191. 1942 edition (reprinted 1946). 6*s.* (6*s.* 5*d.*)

**Supplement No. 1.** Instructions to observers at synoptic stations (in continuation of "Instructions for Meteorological Telegraphy"). M.O. 191–1. 7th edition. 1944. 1*s.* 3*d.* (1*s.* 5*d.*)

Amendment List No. 1. 1945. 1*d.* (2*d.*)

**Weather Map.** An introduction to modern meteorology. M.O. 225i. 3rd edition. 1939 (reprinted 1946). 3*s.* (3*s.* 4*d.*)

**Meteorological Glossary.** M.O. 225ii. 3rd edition. 1939 (reprinted 1944). 5*s.* (5*s.* 4*d.*)

**A Short Course in Elementary Meteorology.** W. H. Pick, B.Sc., F.C.P. M.O. 247. 5th edition. 1938 (reprinted 1946). 2*s.* 6*d.* (2*s.* 9*d.*)

**Monthly Weather Report.** 1*s.* (1*s.* 1*d.*)
(Annual Subscription 15*s.* post free, including preface and index.)

22809. Wt. 46. N.2312. 8/47. S.P. & S. Code 476.