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# The Marine Observer



Volume XIX      No. 144

APRIL, 1949

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## METEOROLOGICAL INSTRUMENTS

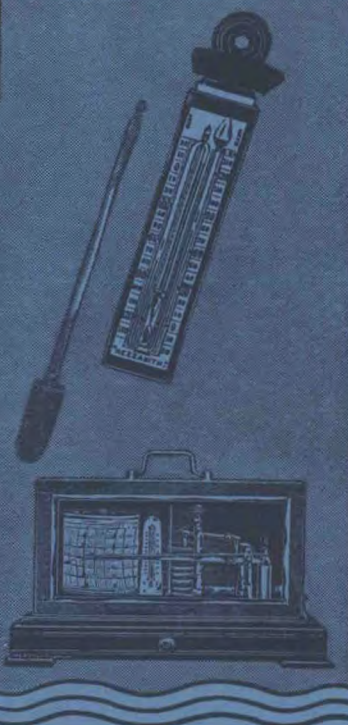
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**A Quarterly Journal of Maritime Meteorology**

prepared by the

**Marine Branch of the Meteorological Office**

**VOL. XIX**

**No. 144**

**APRIL 1949**

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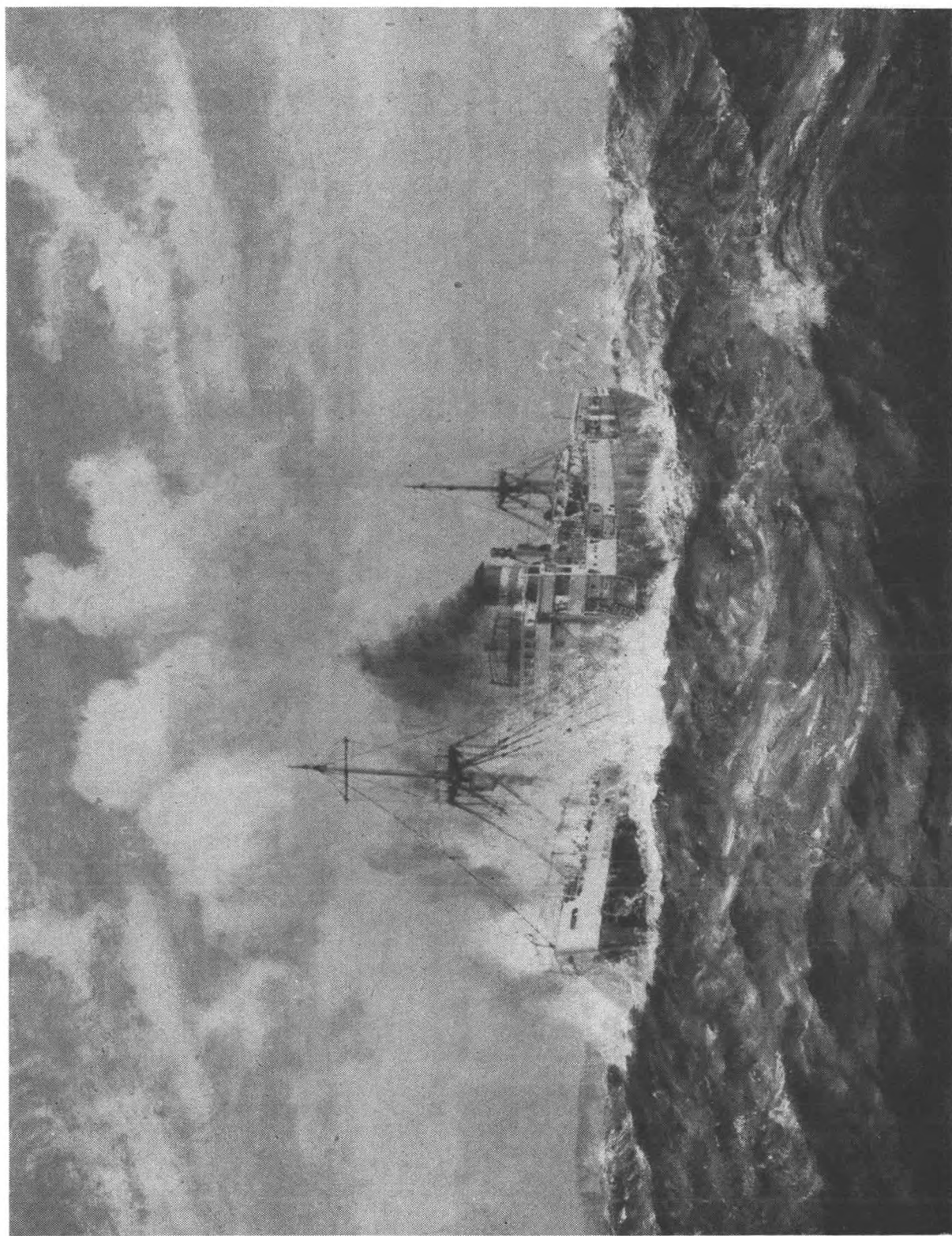
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“On the Long Trail—the trail that is always new,” by Arthur J. W. Burgess  
(Depicting the short steep sea and unsettled weather that might be experienced on leaving the Channel, westward bound,  
after the cold front of a depression had passed.—F.D.)



## EDITORIAL

“Fog everywhere. Fog up the river, where it flows among green aits\* and meadows; fog down the river, where it rolls defiled among the tiers of shipping, and the waterside pollutions of a great (and dirty) city. Fog on the Essex marshes, fog on the Kentish heights. Fog creeping into the cabooses of collier-brigs; fog lying out on the yards, and hovering in the rigging of great ships; fog drooping on the gunwales of barges and small boats. Fog in the eyes and throats of ancient Greenwich pensioners, wheezing by the firesides of their wards; fog in the stem and bowl of the afternoon pipe of the wrathful skipper, down in his close cabin; fog cruelly pinching the toes and fingers of his shivering little 'prentice boy on deck. Chance people on the bridges peeping over the parapets into a nether sky of fog, with fog all round them, as if they were up in a balloon, and hanging in the misty clouds.”

Thus wrote Charles Dickens in the opening chapter of *Bleak House*. Fog is a devilish unpleasant acquaintance—cold and clammy and damp—and is scarcely an inspiring subject about which to write. But to most of us, inhabiting the western European seaboard, fog had a very real and significant meaning during the six days, 26th November to 1st December, 1948. During this period a blanket of fog enveloped most of the British Isles and, as far as central London was concerned, an all-time record of 114 hours continuous fog was recorded. Transport by road, rail, sea and air was considerably affected by this unceasing thick weather, and race meetings and football matches had to be abandoned—a very serious matter to the British public. The *Queen Elizabeth*, having been held up in Southampton for several days due to an “unofficial” strike was further delayed for the period of the fog. Considerable delays to shipping occurred at other ports, including the Mersey, where the famous shore-based radar equipment is in operation. In the Thames, visibility was down to twenty yards at times. Coal shipments down the East Coast were almost at a standstill and colliery production figures were affected due to lack of empty wagons at the pitheads. Air traffic was almost non-existent on some days, although it is noteworthy that despite the fog in that area the Berlin airlift continued almost unbroken.

For the meteorological picture we need to go back to 22nd November, when there was a small centre of high pressure over the British Isles with a complex depression in the central Atlantic, giving southerly winds in the eastern Atlantic. By 26th November, the anticyclone had intensified and moved eastward to south Germany and the southerly winds off the British Isles had encroached slowly eastwards and backed to the south-east. This combination of anticyclonic conditions with light winds and moist, stable air was very favourable for fog formation, and the fog duly arrived.

By 28th November, the high-pressure centre had moved farther eastwards, leaving a belt of high pressure from eastern France to Russia and there was a cold front over northern England, while there had been more or less continuous cyclonic activity in the Atlantic. The high-pressure centre moved to the Balkans by the 30th, and by 1st December a secondary depression was able to move in to the British Isles from the Atlantic and clear away the fog.

In the vicinity of the industrial areas of England the amount of smoke

\*An “ait” or “eyot” is a name used locally for a small island.

pollution which is a heritage of the industrial revolution makes fog particularly thick and unpleasant. Most of us who have navigated in the North Sea will know the "industrial haze" which prevails with westerly winds off the Tyne and Tees areas. Despite the good work of the Smoke Abatement Society and the Atmospheric Pollution Committee, it will inevitably be many years before the problem is solved in this country. But ordinary atmospheric fog will still prevail, and it seems that all the meteorologists can hope to do is to forecast its probability with reasonable accuracy on a relatively short-term basis. The use of "Fido"—which implies the dispersal of fog by artificial heating over a small area—has been used with some success on airfield runways, but it is obviously too expensive to be economically practicable. There remains the use of electronic aids—radar and similar apparatus—whereby aircraft and shipping can navigate with reasonable safety, irrespective of the degree of obscurity. The individual skill, courage and judgment of the navigator is still called to account—be he seaman or airman—for all instruments have their limitations.

As far as the seaman is concerned—despite the aids that science has placed at his disposal—the value of the three "L's" (lead, log, or its more modern counterpart of engine revolutions, and lookout) still hold good in foggy weather. And the navigator must still pay constant attention to tides, currents and leeway and to his compass—just as his opposite number in the air must make allowance for wind drift, air speed, altimeter reading, etc.

A note in *The Times* of 21st November suggests that birds are apt to lose their bearings in fog—but this is presumably not true in the case of bats, which are alleged to be fitted with some reflective sense, analogous to radar. One hears of trawlermen and others who are gifted with some sixth sense of being able to "smell" their way clear of danger in thick weather, but a study of the casualties which occur to such vessels as trawlers tends to emphasise that it is only by constant vigilance and an intelligent use of the aids to navigation that are placed at his disposal that the mariner can expect to keep water under his vessel's keel.

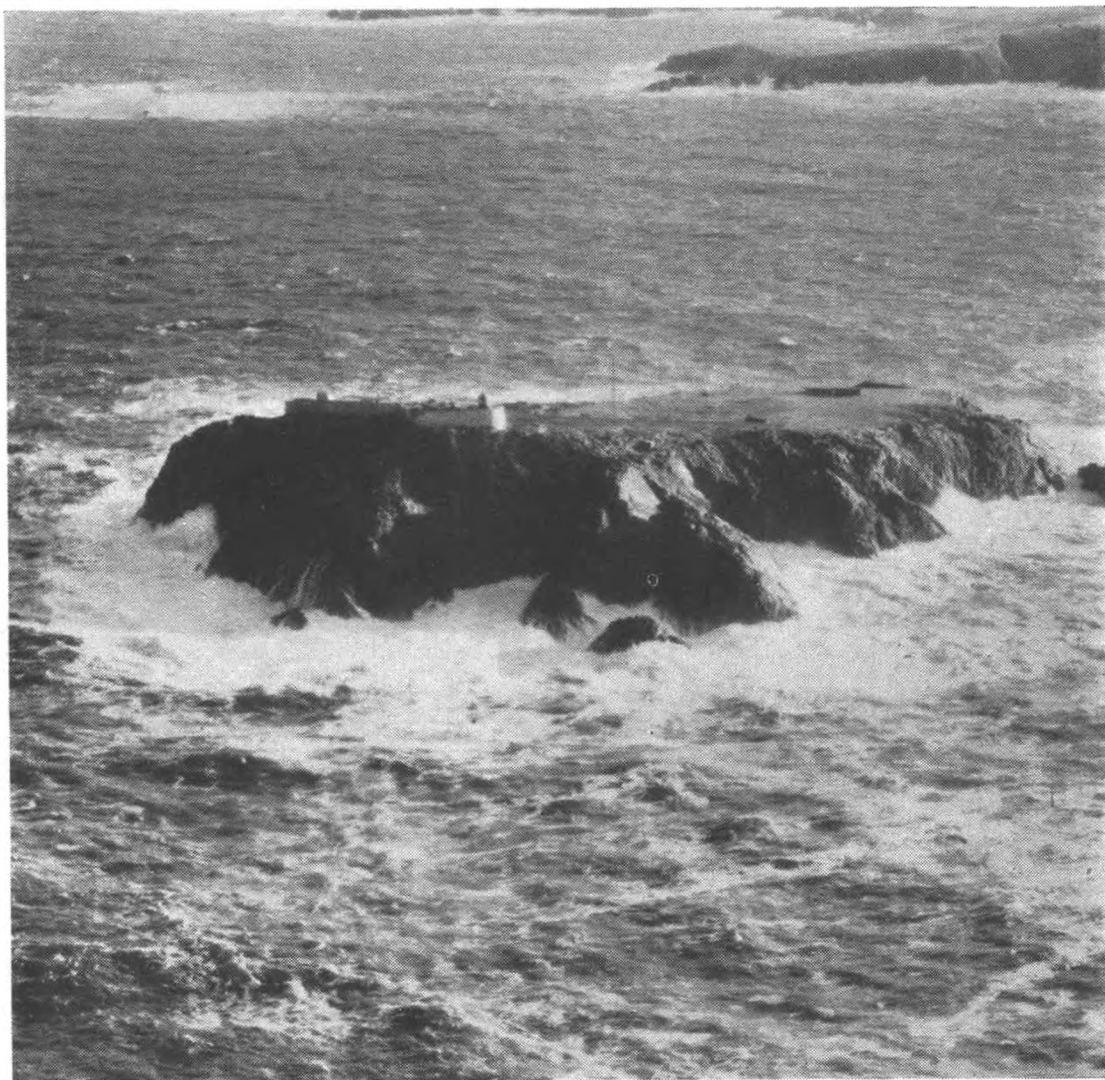
As any deep-water sailorman will realise, however, there are many worse places than the British coast as far as fog is concerned. The chief danger around our coast lies in the swift and variable tidal streams and currents, combined with the relatively narrow waters and dense concentration of shipping. On the Grand Banks, for example, the percentage frequency of days with fog in the worst months is as high as 30 per cent or more, with the added danger of drifting ice and the fact that fog can readily be accompanied by gale in that region. And most of us are familiar with the very high frequency of fog on the northern part of the west coast of North America. In this connection, one is reminded of the skilful use of sound boards and high land, combined with the ship's siren, by the pilots in the Puget Sound district.

"Every vessel shall in fog, mist, falling snow and heavy rainstorms go at a moderate speed" is still—despite all our modern inventions—a very necessary injunction. Low visibility is still probably the greatest enemy of the seaman.

MARINE SUPERINTENDENT.



## LIGHTHOUSES OF THE BRITISH ISLES



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EAGLE ISLAND

Eagle Island ( $54^{\circ} 17' \text{N.}$ ,  $10^{\circ} 05' \text{W.}$ ) is situated off the west coast of Eire, about  $2\frac{1}{4}$  miles NNE of Annagh Head and seven cables offshore. A light is exhibited, at an elevation of 220 ft., from a white tower on the western extremity of the island.

### PRESENTATION OF SPECIAL AWARDS TO VOLUNTARY OBSERVERS

Readers of this magazine will be aware that the Meteorological Office makes an award each year of a book, usually of a scientific nature, to the master, senior observing officer and radio officer of those ships whose work during the year has been classified as "Excellent."

A special award may also be made to a maximum of four masters or officers who have taken part in this voluntary work over fifteen years, and whose work has been particularly outstanding during that period.

Last year, the masters of four British Selected Ships were selected to receive this special award, which took the form of a barograph in a mahogany case. Engraved upon a silver plate read: "Presented by the Director of the Meteorological Office, London, to Captain —— in recognition of his valuable meteorological work at sea, 19 —— to 19 ——."

The recipients of these barographs were Captain J. E. Wilson, O.B.E.,

*Nova Scotia*, Captain W. G. Higgs, O.B.E., *Port Wellington*, Captain R. P. Galer, C.B.E., R.D., R.N.R., *Clan Macdougall*, and Captain W. H. Downing, *Manchester Progress*.

Sir Nelson Johnson hoped to have made all four presentations together in London, but owing to the vicissitudes of the shipping industry this was found impracticable.

The presentation to Captain Wilson took place aboard his ship, the *Nova Scotia*, at Liverpool on 12th October. The ceremony took place in the smokers room of the ship, and among those present were Mr. C. C. Black, Manager, and Captain J. Baird, the Marine Superintendent of the Furness Line. Commander Frankcom, in making the presentation on behalf of the Director, stressed the importance of this voluntary meteorological work at sea to the community in general, and pointed out that Captain Wilson had been a voluntary observer since 1931, his observations being classified as "Excellent" on sixteen occasions. Captain Wilson, in reply, said he felt that meteorological work at sea had been very beneficial to himself and to his owners, and that he had derived considerable pleasure from it.

Mr. Black and Captain Baird warmly congratulated Captain Wilson and stressed the value of meteorological work in training young officers.

The little ceremony was followed by a very pleasant luncheon party, kindly provided by the owners of the ship, Messrs. Furness, Withy & Co.

Captain Higgs and Captain Galer happened to be in London together, and on 12th November the Director made the presentation to them in the Conference Room at Victory House.

This was attended by Captain Martin and Captain Elvish, Marine Superintendents of the Port and Clan Lines respectively, and the senior officers of the Meteorological Office. The Director reminded those present of Darwin's voyage in the *Beagle*, when Fitzroy was in command of her; Fitzroy subsequently becoming the first Director of the Meteorological Office. He also mentioned the pioneer work of Maury. Seaman had thus contributed much to meteorology from very early days, and the work of voluntary observers at sea had been a continuing contribution and had added materially to our knowledge of meteorology. He felt that he was now rewarding them in the persons of Captain Higgs and Captain Galer. He pointed out that Captain Higgs was the doyen of the Voluntary Observing Fleet, having been engaged in this work since 1910, and having during that period had his observations classified as "Excellent" on no less than forty-two occasions. Captain Galer had served since 1933, his work being classified as "Excellent" on eight occasions.

Both Captain Higgs and Captain Galer in their replies stated that they had enjoyed doing meteorological work at sea and were glad it had been of such value. They felt, however, that it was the junior officers who really did the work—but undoubtedly junior officers would be captains one day and then would reap their rewards. Captain Elvish and Captain Martin praised the work of the Meteorological Office from the viewpoint of the shipping industry and gave illustrations of benefits which had been derived.

After the presentations had been made, tea was served.

The presentation to Captain Downing took place at a luncheon aboard the *Manchester Progress* in Manchester Docks, and Commander Frankcom made the presentation on behalf of the Director. The luncheon was provided



by the kind hospitality of Manchester Liners, Ltd., and among those present were Mr. Stoker, Managing Director, the Mayor of Stretford, and senior officers of the ship and of the other Manchester liners which were in port.

Commander Frankcom stressed the long-standing association the Meteorological Office had with Manchester Liners, and the obvious value to this country, from the meteorological viewpoint, of observations from ships on the North Atlantic trade. Captain Downing had been a voluntary observer since 1921, and on thirteen occasions his observations had been classified as "Excellent". Captain Downing, in his reply, emphasised that much of the credit for the work was due to the junior officers of the vessel and that the radio officer also played an important part.

Mr. Stoker and the Mayor of Stretford congratulated Captain Downing and expressed pleasure at the thought that Manchester ships had been doing such valuable work and that the captain of one of them had been selected for this special award. The importance of meteorology had been brought home to them rather forcibly recently, owing to the phenomenal and prolonged fog in which they had been enveloped.



#### APRIL, MAY AND JUNE

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

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

Responsibility for each observation rests with the contributor.

#### WEATHER OBSERVATION AT SEA

The following is an extract from a letter received from Captain J. E. Wilson, O.B.E., of R.M.S. *Nova Scotia*, to whom the Director of the British Meteorological Office recently made a special award for long and meritorious service as a marine observer :

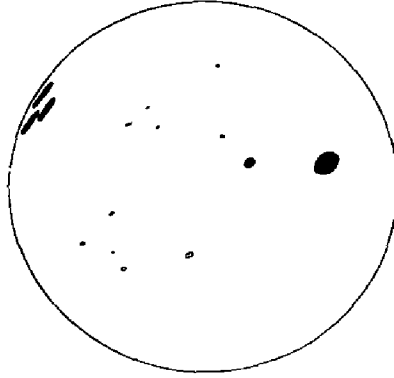
" My association with voluntary observing goes away back to 1920 when I was 3rd Officer on our R.M.S. *Digby*, Captain F. Chambers, D.S.C., on the same run as I am at present, and with the exception of the years 1923-25 have carried it right through, finding it a most useful and necessary accomplishment as well as a very interesting pastime, and I am pleased to say that my officers are every bit as keen on the subject as myself."

## RADIO FADING

### North Atlantic Ocean

The following is an extract from the Meteorological Record of S.S. *Comedian*. Captain R. L. Williams. London to Barbados. Observer, Mr. E. D. Ashdown, 2nd Officer.

20th April, 1948, 1235 G.M.T. A very sudden radio "blackout" was observed. It was so sudden and complete that faults in the receivers were suspected. Sunspots, observed through a telescope, were seen as shown in



the accompanying sketch. The large one on the western side had been visible for several days. At 1255 signals were very faintly heard but steadily increased until at 1310 reception was normal again. By 1600 reception was abnormally good.

Position of Ship : Latitude  $28^{\circ} 11' \text{N.}$ , Longitude  $45^{\circ} 32' \text{W.}$

## UNUSUAL CYCLONE TRACK

### Arabian Sea

An extract from a letter written by Captain J. G. Peters, S.S. *Shwedagon*, has been received from the Government of India, Meteorological Department, and is given below. The vessel's course is not stated, but she was in lat.  $21^{\circ} 36' \text{N.}$ , long.  $63^{\circ} 40' \text{E.}$ , at the time of the lowest barometric reading.

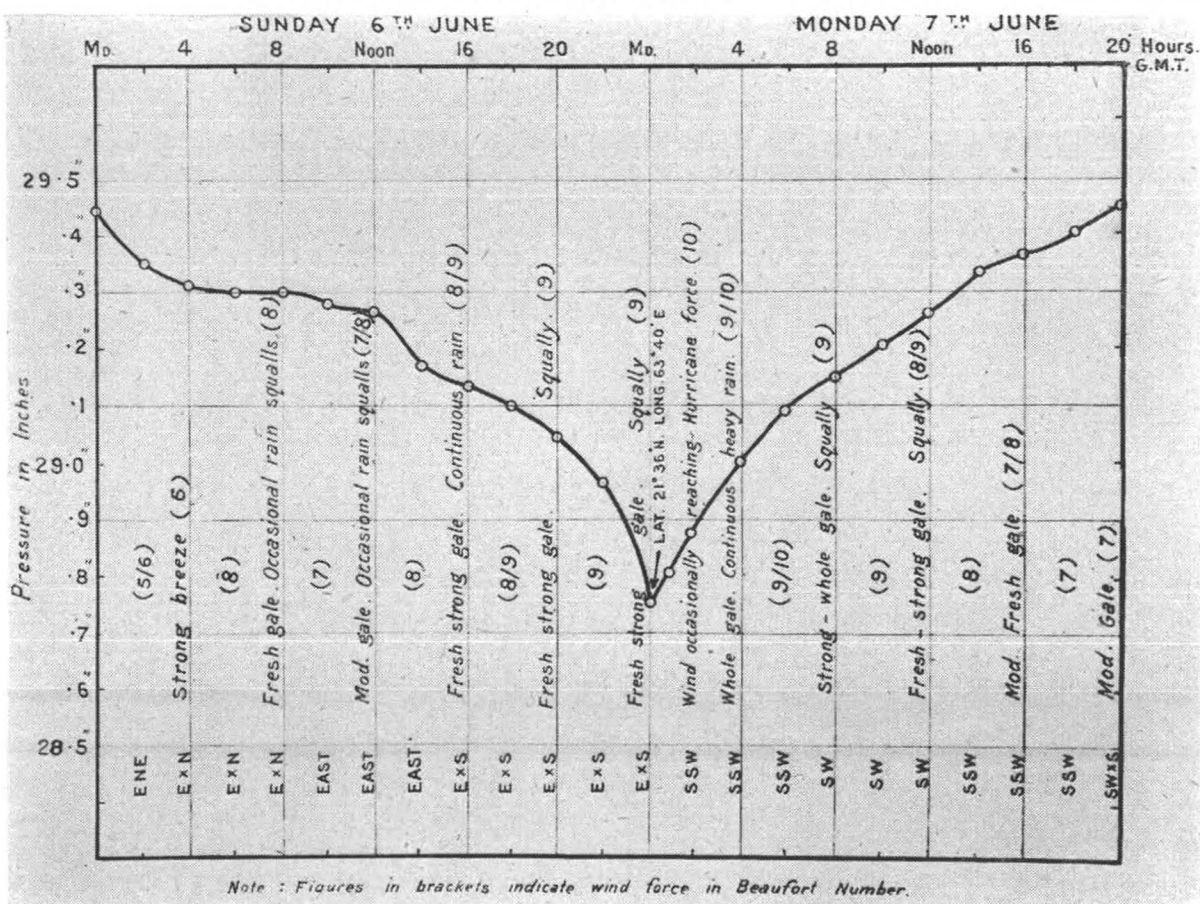
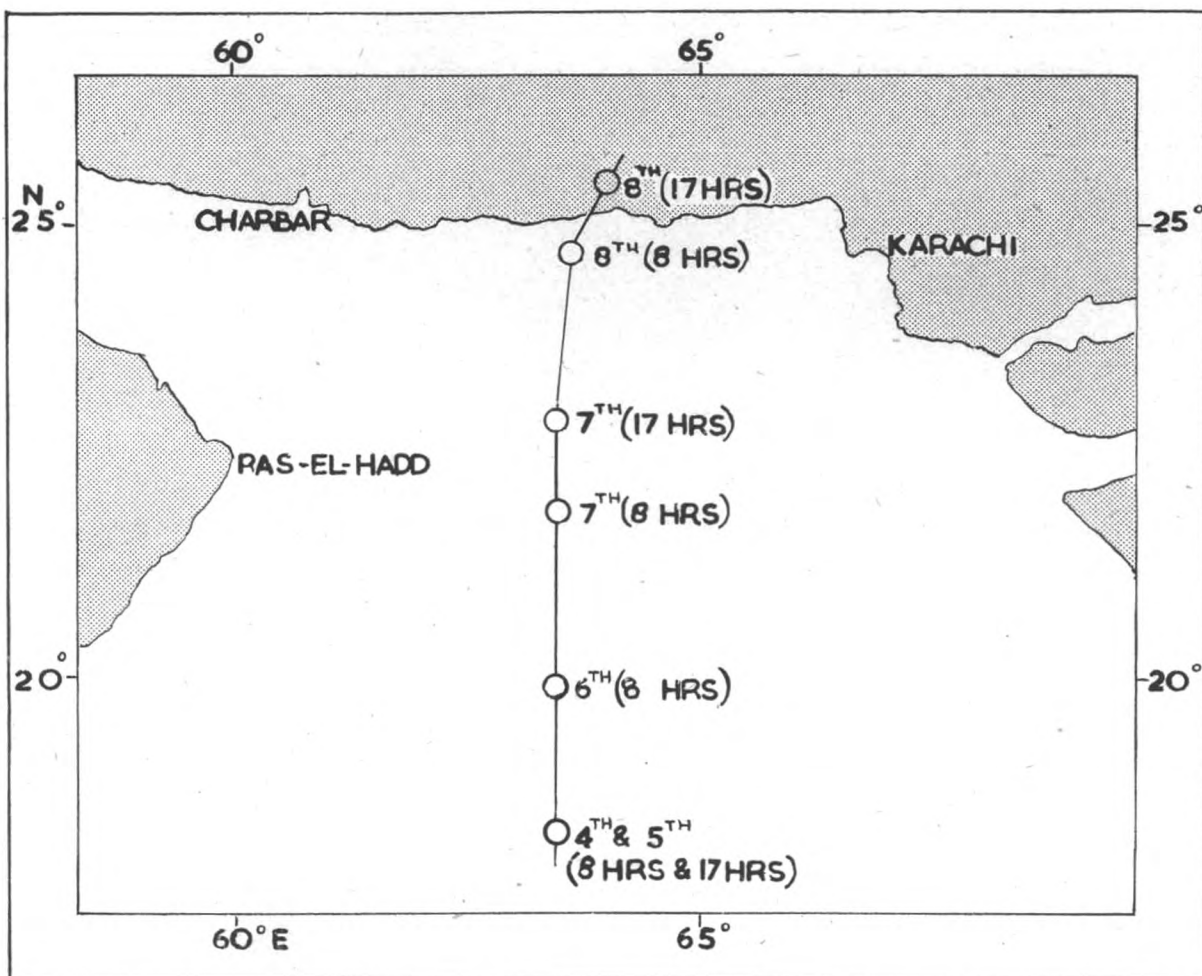
"The graph gives data regarding a violent disturbance experienced in the north-east Arabian sea on 6th-7th June. The barometer readings are by aneroid, uncorrected, but, as far as is known, the index error is nil. The instrument is 25 ft. above sea level and the temperature on attached thermometer was  $77^{\circ}$  at the lowest barometer reading. According to my estimates, the vortex must have been about 10 to 20 miles away at the time of lowest reading.

"We experienced tremendous seas and cross swell, but, strangely enough, the cloud formation did not seem to be of the usual ragged hurricane type, the sky being just overcast, leaden, with some low nimbostratus on the horizon, when visible.

"Damage to the vessel was negligible, amounting to a few canvas screens blown away and some light venetian woodwork displaced."

The following note, accompanied by a chart of the cyclone track, was written by Mr. C. Ramaswamy, Forecasting Officer, Poona.





“ The observations shown in the above graph are of great interest. They were recorded during a cyclonic storm which was very unusual not only with regard to the region where it formed but also its track. The storm developed as a result of a vigorous surge of the south-west monsoon current in the west Arabian Sea and was centred at 0300 G.M.T. on the 6th June near lat.  $20^{\circ}$ N., long.  $63\frac{1}{2}^{\circ}$ E., and at 0300 on the 7th near lat.  $22^{\circ}$ N., long.  $63\frac{1}{2}^{\circ}$ E. Moving almost dead north, it crossed the Mekran coast near Pasni in the afternoon of the 8th.

“ It is seen from the graph that the ship recorded the lowest barometer reading at 0000 of the 7th. In the absence of a complete synoptic chart for this hour, it is not possible to fix accurately the position of the centre of the cyclone at that time. The synoptic charts at 0300, however, indicate that the ship must have been within 30 miles of the centre of the cyclone and to the south-east of it at that hour. It also appears from the ship's observations, that the cyclone was of severe intensity on the 7th, although it weakened during its subsequent northward movement. The pressure readings in the graph show the typical V-shaped variation in the central region of tropical cyclones.”

### **CURRENT RIPS**

#### **Atlantic Equatorial Waters**

The following are extracts from the Meteorological Record of S.S. *San Felix*. Captain J. B. Macarthy, O.B.E. Observer, Mr. G. G. B. Putt, 2nd Officer.

28th July, 1948, between 1730 and 1800 G.M.T. On voyage Curaçao to Rio de Janeiro. A very definite line separating the North Equatorial Current from the Counter-current was observed. This line appeared to be running ENE-WSW, stretching from horizon to horizon and was about  $\frac{1}{2}$  mile wide. The sea on either side of this area was comparatively smooth, whereas inside it was moderate from SSE. Weather conditions: barometer 29.86 in., wind SSE, 3, sky partly cloudy, visibility excellent. Vessel crossed over area at 1800 and the sea temperature on either side remained at  $83^{\circ}$ F.

Position of Ship: Latitude  $05^{\circ} 00'N.$ , Longitude  $43^{\circ} 52'W.$

Course  $118^{\circ}(T)$  Speed  $8\frac{1}{2}$  knots.

8th September, 1948, 1635 G.M.T. approx. On voyage Buenos Aires to Curaçao. Vessel crossed over a marked demarcation current line which was very pronounced and stretched from horizon to horizon NNE to SSW. White froth was all along the line. Barometer 30.07 in. Wind ENE, 3. Temperature: air  $87^{\circ}$ F., sea  $85^{\circ}$ . Partly cloudy.

Position of Ship: Latitude  $08^{\circ} 18'N.$ , Longitude  $54^{\circ} 20'W.$

10th September, 1948, between 1406 and 1436 G.M.T. Numerous tide rips were observed running in all directions.

Position of Ship: Latitude  $11^{\circ} 12'N.$ , Longitude  $61^{\circ} 44'W.$

### **DISTURBED WATER**

#### **West Coast of Africa**

The following is an extract from the Meteorological Record of S.S. *Lacklan*. Captain G. K. Billett. Dakar to Haifa. Observer, Mr. A. P. Watson, 2nd Officer.

7th April, 1948, 1500 A.T.S. Passed through a lane of disturbed water



which extended across vessel's track on an E-W line and looked like the wake of a fast-moving ship. The lane extended for several miles and was about 300 ft. wide. No discoloration of water. Wind NNE, 3. Fine, no cloud. Slight sea and swell from NE.

Position of Ship : Latitude  $22^{\circ} 25' \text{N.}$ , Longitude  $17^{\circ} 39' \text{W.}$

### CHANGE OF TEMPERATURE

#### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Beaver Cove*. Captain B. B. Grant. St. John, N.B., to London. Observer, Mr. G. Palmer, 4th Officer.

12th April, 1948, 1600 G.M.T. approx. While passing from the cold water south of the Great Banks into the Gulf Stream, mainly dense fog had persisted for 6 hours, with the sea temperature at  $34^{\circ} \text{F.}$  and the air temperature rising from  $37^{\circ}$  to  $45^{\circ}$ . At about 1600 the fog cleared and revealed a low-lying mist rising like steam, from between the troughs of the swell. The eastern horizon appeared as a dark line, and as we approached it the clear-cut division between the cold water with the mist rising from it and the perfectly clear warm water was plainly seen. Within 20 minutes the sea temperature had risen from  $34^{\circ}$  to  $51^{\circ}$  and the dry bulb temperature at 1700 was  $59^{\circ}$ , wet bulb  $58^{\circ}$ .

Position of Ship : Latitude  $43^{\circ} 20' \text{N.}$ , Longitude  $46^{\circ} 58' \text{W.}$

*Note.*—The line of convergence between the Labrador Current and the Gulf Stream is often very well defined. Rapid and large changes of sea temperature, up to  $20^{\circ} \text{F.}$  or more, may be observed. In one instance a sea temperature change from  $54^{\circ}$  to  $32^{\circ}$  was recorded in less than a ship's length.

### ARCHED SQUALL

#### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Robert F. Hand*. Captain E. J. Instone, O.B.E. Aruba to Purfleet. Observer, Mr. I. LeCocq, 2nd Officer.

23rd April, 1948, 1640 G.M.T. Very pronounced arched squall bearing in continuous line from  $060^{\circ}$  to  $230^{\circ} (\text{T})$ . Cloud Ns., height of base estimated



Fig. 1



Fig. 2 *Photos by R. Munro*

at 1,500 ft. Passing rain showers of short duration but great intensity were experienced. Barometer 1019.6 mb. Temperature : air 61°F., wet bulb 59°. The photographs were taken by Mr. R. Munro, R.O., Fig. 1 looking forward (ship's head 057°[T]) and Fig. 2 looking aft.

Position of Ship : Latitude 42° 36'N., Longitude 34° 00'W.

## SQUALL

### Australian Waters

The following is an extract from the Meteorological Record of M.V. *Gloucester*. Captain H. D. Horwood, R.N.R. Balbao to Auckland. Observer, Mr. P. Slocombe, 3rd Officer.

13th April, 1948, 0800 to 1120 A.T.S. (1820 to 2140 G.M.T.). At 0800 in lat. 25° 52'S., long. 154° 27'W. Course 247°. Speed 14 knots. Corrected barometer 29.77 in. Wind NE × E, force 6. Overcast, St. cloud. Intermittent drizzle. At 1000, barometer 29.69 in. Wind NNE, force 6. Overcast with heavy intermittent rain. At 1050, in lat. 26° 07'S., long. 155° 02'W. Furious squall, wind backed to S'ly, force 10, with torrential rain, high seas, heavy spindrift and spray. Barometer 29.67 in. Temperature 70°F. Visibility 3. At 1120, wind moderated to force 6 to 7. Rain ceased. Visibility increased. Wind remained uncertain but eventually backed to E'ly, force 3, at 1600.

## SQUALL CLOUD

### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Jessmore*. Captain A. C. Baily. St. John, N.B., to London. Observer, Mr. S. N. Coe, 2nd Officer.

1st May, 1948, 1845 to 2200 G.M.T. At 1845 a curtain of Nb. cloud was observed above the NW horizon moving eastward. At 1900 the barometer was 1007.8 mb., rising slowly. Wind SE, 3. Temperature : air 48°F., wet bulb 46°, sea 42°. Weather fine with some low mist. At 2030, Ns. cloud with precipitation seen below it covered whole horizon from NNE to SW, see Fig. 1. Slight drizzle was felt at this time. Rate of approach was about 20 knots. A few minutes before the squall cloud passed over the vessel,



Fig. 1





Fig. 2



Fig. 3



Fig. 4

Fig. 2 was taken showing the northern extremity of the cloud. The weather was calm, air temperature  $47^{\circ}$ , wet bulb  $46^{\circ}$ . At 2050, position of ship, lat.  $42^{\circ} 32' N.$ , long.  $57^{\circ} 40' W.$  Course  $104^{\circ}(T)$ . On passing over, the lowest scud was observed to spiral, a few heavy drops of rain fell. The wind was

NW  $\times$  W, 2 ; it then backed gradually to S  $\times$  W, 2. Barometer fell slightly and then resumed rising. Fig. 3 was taken just after the cloud curtain passed over. As cloud moved to eastward of vessel the eastward side took something like a saw-edged shape and appeared to stretch in thin, long formation E to W, see Fig. 4. Height after passing was 1,000 ft. or less. At 2130, barometer was 1010.1 mb., rising slowly. Wind SSW, 2 to 3. Air temperature 50°, wet bulb 47°. At 2200, wind SW, 4. Intermittent slight drizzle. Air temperature 53°, wet bulb 52°. Cloud, high Ns. and Cb. to eastward.

*Note.*—In the western North Atlantic the synoptic situation and the position of the fronts were complex at this time. The squall cloud observed was probably associated with the passage of a small shallow depression.

## **WATERSPOUT AND SQUALL**

### **North Atlantic Ocean**

The following is an extract from the Meteorological Record of O.W.S. *Weather Explorer*. Commander H. R. Wilkinson, R.D., R.N.R. On station "Item." Observer, Mr. T. L. A. Waite, B.Sc., Chief Meteorological Officer.

7th April, 1948, 1640 G.M.T. Waterspout observed bearing 060°(T), distance 4 miles approx. It emerged from base of large Cb. which covered 5/10 of the sky. Small troughs in barograph trace and 2°F. drop in temperature at time of observation. Between 1825 and 1945 squall passed over. Barograph started rising rapidly (1.0 mb. per hour) at 1825 and shower of moderate hail started from extensive Cb. Surface wind veered by 30° and increased to 45 knots, with gusts 50 to 55 knots. At 1945 hail stopped, sky overhead cleared and wind assumed its previous direction, speed 40 to 45 knots. Temperature fell by 2°. The rear of a wide belt of Cb. could be seen extending across the horizon.

Position of Ship : Latitude 59° 36'N., Longitude 19° 28'W.

## **WATERSPOUTS**

### **Home Waters**

The following is an extract from the Meteorological Record of S.S. *Consuelo*. Captain F. Barnard, M.B.E. Montreal to Hull. Observer, Mr. R. C. Neesham, 3rd Officer.

23rd May, 1948, 2215 G.M.T. A large waterspout was seen travelling NW beneath a large Cb. The spout gradually reached the cloud and passed astern of the ship disturbing the sea surface. There were heavy hail and snow squalls at the time with wind ENE, 5. Barometer 1009.8 mb., falling slowly. Temperatures : air 41°F., wet bulb 38°, sea 50°. Rough sea and heavy N'ly swell.

Position of Ship : Latitude 58° 39'N., Longitude 7° 21'W.

### **Off Coast of Uruguay**

The following report was received from Captain E. Fox. Master of S.S. *Tower Grange*. Bound for Montevideo. Observer, Mr. R. Clipsham, 2nd Officer.

3rd April, 1948, 1430 G.M.T. A waterspout was observed bearing SW  $\times$  W, and 5 minutes later a larger one developed about a mile to the

south of the original one. The wind, force 5, backed to SW, and later to SSE, increasing temporarily to force 6. Both spouts merged into one for a space of 30 seconds and then diverged on opposite sides, the first subsiding at 1445. The remaining waterspout, previously a straight line connecting Cb. cloud at 4,000 ft. to the sea with a base width estimated at 20 to 30 ft., at 1450 formed a large curve, the base eventually increasing to approx. 30 to 40 ft. Course of ship was altered to avoid passing too near, and the spout passed about half a mile to port of us, travelling in an easterly direction, and cutting a furrow in the sea as it travelled at an estimated speed of 20 knots. This spout subsided at 1505, having lasted 30 minutes. The cloud from which it emerged covered about 3/10 of the sky. The anti-clockwise movement of the spout and the upward movement of its centre column were very clear. On materialisation of second spout, slight rain was experienced for about 2 minutes, the drops being of extraordinary size. At 1510, a typical River Plate line squall was observed, in an E and W direction over the land. Wind remained SSE, force 5. Barometer throughout 1014.7 mb. Air temperature : 67°F., wet bulb 63°.

Position of Ship : Latitude 34° 46½'S., Longitude 53° 45½'W.

*Note.*—Observations and photographs of waterspouts are of considerable interest, as an analysis of information relating to these phenomena, and a collection of photographs, is now being made in the Marine Branch.

The observations of particular scientific value are the diameter of the column and the direction and period of its rotation. The period of rotation is of importance in estimating the probable velocity in the vortex and the pressure decrease in the centre of the column. The period of rotation is difficult to observe, so that very few observations are at present available.

It can be estimated by timing how long it takes for an identifiable spot on the column to make one revolution.

## DISCOLOURED WATER

### Caribbean Sea

The following is an extract from the Meteorological Record of S.S. *Ruahine*. Captain A. E. Lettington, D.F.C. Auckland to London. Observer, Mr. J. Massy, 4th Officer.

30th June, 1948, 2100 G.M.T. A marked and sudden change in the colour of the sea was noticed, forming a distinct line in a NNW to SSE'ly direction as far as the eye could follow. There was no change in the temperature of the water on either side of the division, yet the water changed from very deep blue to dirty green, similar to that associated with shallow soundings. No depth was recorded on echo sounder up to 160 fathoms. It is presumed that the discoloration was water from the Rio Magdalena, which discharges into the Caribbean Sea 28 miles ESE of the point of observation. Weather conditions : barometer 1006.8 mb. Wind NE × E, force 6. Blue sky, cloud 2/10. Temperature : air 82°F., sea 83°. NE'ly swell and sea. Course 068°.

Position of Ship : Latitude 11° 15'N., Longitude 75° 16'W.

## SEAWEED AND FISH SPAWN

### Caribbean Sea

The following is an extract from the Meteorological Record of S.S. *Comedian*.



Captain R. L. Williams. St. Kitts to London. Observer Mr. E. D. Ashdown, 2nd Officer.

2nd June, 1948, 1950 G.M.T. A light brown streak was observed across the sea in a SE to NW direction. It was about 3 miles long and 100 to 500 ft. wide, associated with a large patch which appeared to be gulf weed. The ship avoided the large patch, but when crossing the streak a sample of the water was taken in the canvas bucket. This water revealed a considerable quantity of what appeared to be at least two different types of seaweed. The majority was fine and fibrous-looking, like shreds of very fine cotton, the pieces varying in size from hardly visible to nearly  $\frac{1}{2}$  in. long. The other type rather resembled the "light-star" on Admiralty charts, only more fluffy and about  $\frac{1}{8}$  in. in diameter. The sample of water, about  $\frac{3}{4}$  pint, also contained at least three different types of fish spawn. The first consisted of five individual spherical globules of colourless protoplasm, each generously spotted with minute black dots which may have been regularly arranged, each globule was about  $\frac{3}{16}$  to  $\frac{1}{4}$  in. in diameter. The second type at first appeared to be two small pink blobs about  $\frac{1}{8}$  in. in diameter, but on closer examination were seen to be more globules of colourless protoplasm, embodying numerous pink dots. The third type was similar to the second, but slightly smaller and about the colour of evaporated milk.

Position of Ship : Latitude  $18^{\circ} 27'N.$ , Longitude  $60^{\circ} 10'W.$

*Note.*—A copy of the above extract was sent to the Ministry of Agriculture and Fisheries, Lowestoft, for comment. In the reply it was stated that identification of the fish spawn would be impossible without seeing it. The Deputy Director, Mr. R. S. Wimpenny, reports that "the fine fibrous-looking shreds of very fine cotton were almost certainly the tropical blue-green alga *Trichodesmium*."

## **VOLCANIC ERUPTION**

### **Fanua Lai, Tonga Islands**

The following is an extract from the Meteorological Record of S.S. *Waihemo*. Captain T. White. Suva to Papeete. Observer, Mr. F. Simpson, 2nd Officer.

26th April, 1948, 0211 G.M.T. Passed 2 miles south of Fanua Lai, from which dense clouds of smoke and steam were issuing. Large cumulonimbus clouds hung over the island, with heavy rain and strong wind between the island and 8 miles to leeward. Barometer 29.85 in. Wind E, 4. Air temperature  $78^{\circ}F.$  Weather, partly cloudy, 2/10 small cumulus.

Position of Ship : Latitude  $18^{\circ} 01'S.$ , Longitude  $174^{\circ} 19'W.$

*Note.*—According to the Admiralty Pilot, Pacific Islands, Vol. II, 1943, this island is visited occasionally by natives but the Tongan Government does not permit anyone to reside there on account of its liability to eruption. A great eruption occurred in August, 1847, and a considerable one in June, 1939. On the latter occasion five spouts of water, caused by submarine disturbances, were observed about a mile south-east of the island.

## **GREEN FLASH**

### **North Atlantic Ocean**

The following is an extract from the Meteorological Record of M.V. *Port Wyndham*. Captain H. Steele. Curaçao to London. Observer, Mr. P. R. Lewis, 2nd Officer.

6th May, 1948, 2137 G.M.T. Observed a green tinge on the sun's upper limb just before it set. Weather conditions : temperatures : dry bulb 63°F., wet bulb 55°, dew point 48°, sea 66°. Visibility 9. A few clouds were about the horizon.

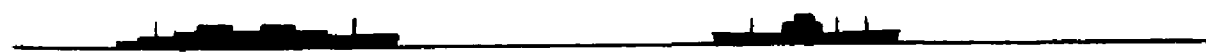
Position of Ship : Latitude 37° 17'N., Longitude 40° 40'W.

### MIRAGE

#### North Atlantic Ocean

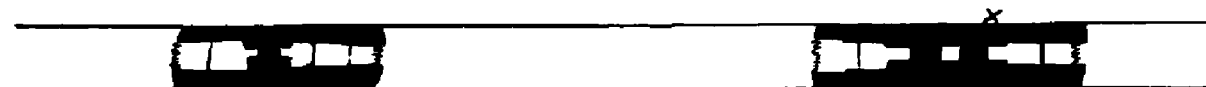
The following is an extract from the Meteorological Record of S.S. *Manchester Commerce*. Captain H. Hancock. Avonmouth to New York. Observer, Mr. J. E. Askew, 2nd Officer.

25th April, 1948, 1600 to 1800 G.M.T. The *Queen Elizabeth* and an American Liberty ship were observed on the southern horizon, both steaming westward. When first seen at 1600 they appeared very long and contracted.



Weather conditions : wind N, 3. Barometer 1012.8 mb., corrected. Temperatures : air 64°F., wet bulb 57°, sea 58°. Swell N, 1. Sea calm and glassy. Cloudless.

At 1630 the horizon appeared raised and both ships appeared upside down.



A light was observed flashing from the *Queen Elizabeth* at position X in the diagram.

At 1800 the temperatures had fallen to air 50°, wet bulb 47°, sea 39°, and the sea had turned to dark green.

Position of Ship at 1600 G.M.T. : Latitude 41° 39'N., Longitude 48° 32'W.

#### Off Coast of Algiers

The following is an extract from the Meteorological Record of S.S. *City of Dieppe*. Captain E. G. Chapman. Port Said to Antwerp. Observer, Mr. A. G. Willa, 2nd Officer.

20th April, 1948, 1200 G.M.T. Barometer 1007.3 mb., falling. Wind S'y, force 1. Temperatures : dry bulb 77°F., wet bulb 63°, sea 65°. At about 1203 a vessel on approx. the same course and about 3 miles distant to the NW, appeared to be horizontally elongated to twice its normal length. The elongation lasted 2 or 3 minutes and was followed by a series of remarkable contractions and magnifications of the vessel's vertical height. At this time there was no perceptible wind. At 1210, wind was NE'y, force 1 to 2. Dry bulb had fallen to 70° and the wet bulb had risen to 64° during the previous 10 minutes. The "looming" and "stooping" of the vessel's image was apparent at intervals until 1230, when the barometer had fallen 0.3 mb. and the dry and wet bulb were 69° and 65° respectively. Wind NE'y, force 2 to 3. No repetition was observed. During the whole time several apparent elevations of the northern horizon were visible and instances of abnormal refraction were observed during the preceeding two watches.

Sky at time was completely obscured by St. and some Sc., base about 3,000 ft. Visibility by scale, 6 to 7. Course 268°. Speed 13.5 knots.

Position of Ship : Latitude 36° 51' N., Longitude 3° 57' E.

### Red Sea

The following is an extract from the Meteorological Record of S.S. *Esso Glasgow*. Captain C. B. Broughton. Rasat Tannura to Suez. Observer, Mr. J. Cooke, 2nd Officer.

15th June, 1948, 1500 to 1630 A.T.S. The Brothers Lighthouse was observed bearing 314°, distant 16 miles and appeared upside down. Later, when bearing 340°, distant 9 miles, it appeared in the form of a cross. Two distinct horizons were visible, one about 15' of arc above the other. Barometer 1005.4 mb. Temperature : air 87°F., sea 80°. Sky cloudless.

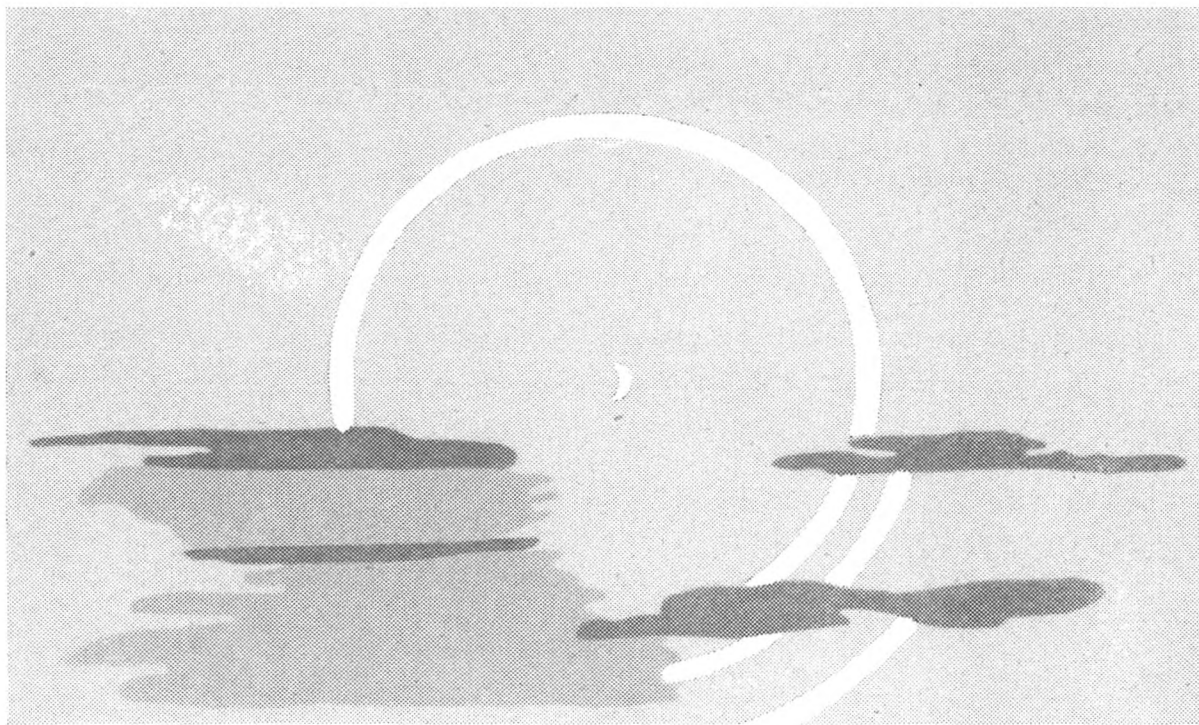
Position of Ship : Latitude 26° 29' N., Longitude 34° 50½' E.

### LUNAR HALOS

#### Atlantic Equatorial Waters

The following is an extract from the Meteorological Record of M.V. *Columbia Star*. Captain C. J. W. Jones. London to Santos. Observer, Mr. A. G. Smith, 3rd Officer.

29th April, 1948. Lunar halo observed (see sketch) with two distinct but faint parallel arcs. The complete circle was 21¾° in radius and the



accompanying arcs tended to merge into the As. and Ci. cloud which was present. The halo faded gradually as altitude increased, and faded completely at 0420 G.M.T.

Position of Ship : Latitude 02° 57' S., Longitude 33° 01' W.

*Note.*—It is very difficult, in certain states of the sky, to distinguish between arcs of halos and bright curved wisps of cirrus cloud. On the assumption



that these were genuine halo arcs it is difficult to identify both of them. One was probably a part of the lower arc of contact to the  $22^\circ$  halo.

### South Atlantic Ocean

The following is an extract from the Meteorological Record of S.S. *Scholar*. Captain D. Wolstenholme. Dakar to Cape Town. Observers, Mr. D. T. English, 2nd Officer, and Mr. J. M. Doran, 3rd Officer.

20th April, 1948, 2350 G.M.T. Observed lunar halos of  $22^\circ$  and  $46^\circ$ , appearing as bright white rings slightly tinted with red at the edges. The entire rings were not visible at any time owing to the passing of about 3/10 Ci. which partially obscured the rings at times. The halos had entirely disappeared by 0135 on 21st.

Position of Ship : Latitude  $10^\circ 00'S$ , Longitude  $01^\circ 38'W$ .

*Note.*—Observations of the halo of  $46^\circ$ , especially of a complete ring, are uncommon. It is rather rare to see any part of this halo with the moon as luminary.

### LUNAR RAINBOWS

#### South Pacific Ocean

The following is an extract from the Meteorological Record of S.S. *Eastern*. Captain M. C. G. Stratford. Balbao to Wellington. Observer, Mr. W. S. Drew, 3rd Officer.

26th June, 1948, 0810 G.M.T. Observed primary and secondary lunar rainbows. Light drizzle was falling and both bows faded when drizzle ceased. Primary bow was bright with colours, easily distinguished; secondary bow was faint but some colours could be seen. Inside the primary bow there was an area of faint white light. Moon's altitude  $14^\circ$ .

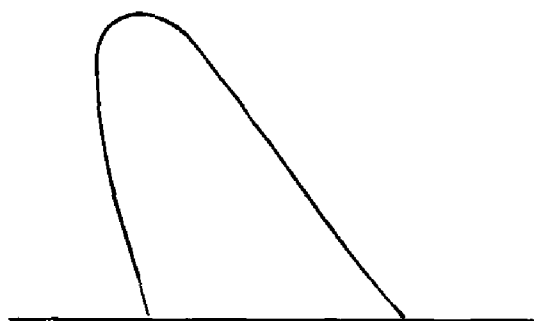
Position of Ship : Latitude  $40^\circ 32'S$ , Longitude  $152^\circ 35'W$ .

*Note.*—This is a very interesting observation, since the secondary lunar rainbow is rarely bright enough to be seen, and the observation of colour in it is very unusual.

### ZODIACAL LIGHT

#### Pacific Ocean

The following is an extract from the Meteorological Record of M.V. *Port Wyndham*. Captain H. Steele. Wellington to Panama. Observer, Mr. P. R. Lewis, 2nd Officer.



19th April, 1948, 1242 G.M.T. and 20th at 1221 G.M.T. The Zodiacal

Light was observed before sunrise. The approx. height was  $10^{\circ}$ , width (at horizon)  $3^{\circ}$ , appearance as in sketch. Intensity of light was the same as that of the Milky Way and the outline was fairly well defined.

Position of Ship : April 19th, Latitude  $23^{\circ} 36'S.$ , Longitude  $117^{\circ} 05'W.$   
April 20th, Latitude  $19^{\circ} 58'S.$ , Longitude  $112^{\circ} 09'W.$

## AURORAE

### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Beaver Cove*. Captain B. B. Grant. St. John, N.B., to London. Observer, Mr. G. Palmer, 4th Officer.

14th April, 1948, 0120 G.M.T. A patch of deep red aurora was observed at an altitude of  $18^{\circ}$ , bearing  $320^{\circ}$ , for a period of 6 minutes. The width of the patch was about  $7^{\circ}$  and it looked like high cloud at sunset. Its brilliancy was slightly less than that of the moon, which was  $4\frac{1}{2}$  days past new and in the vicinity at the time. Further observation was limited by cloud, but no green light was visible at any time. Four sunspots had been seen during the previous 2 days and wireless communication at the time was subject to a good deal of interference. No magnetic disturbance of the compass was experienced. Weather cloudy and clear with very good visibility. Temperatures : dry bulb  $54^{\circ}F.$ , wet bulb  $52^{\circ}$ .

Position of Ship : Latitude  $46^{\circ} 50'N.$ , Longitude  $36^{\circ} 46'W.$

### North Atlantic Ocean

The following is an extract from the Meteorological Record of M.V. *Losada*. Captain P. L. Hockey. Trinidad to Boston. Observer, Mr. G. E. Turner, 2nd Officer.

16th May, 1948, 0345 to 0750 G.M.T. Approaching Cape Cod at 0345, during bright moonlight, aurora appeared as a glow above the northern horizon. Gradually it became more brilliant with white and red rays spread fanwise, some reaching an altitude of  $60^{\circ}$ . At the same time waves or draperies of white light were observed undulating towards the zenith. The NE section of the arc was green with blue and violet above, and only from this section were the red rays seen. This aurora was brightest 5 minutes after the moon set at 0610, then gradually faded and disappeared at 0750. Sky absolutely clear. Wind NW'ly, 2. Barometer 30.11 in. Temperature  $45^{\circ}F.$

Approx. position of Ship : Latitude  $41^{\circ} 00'N.$ , Longitude  $69^{\circ} 00'W.$

*Note.*—M.V. *Napier Star* reported “ 1105 to 1115 G.M.T. Aurora Australis observed bearing SSE ” on 16th May in approx. lat.  $46^{\circ} 10'S.$ , long.  $174^{\circ} 43'E.$

## COMET 1947n

An account of this comet, based on observations sent in by 34 British ships, was published on pages 194–5 of *The Marine Observer* for October, 1948. Full details of the appearance and brightness of the comet, as given by these ships, were sent to the British Astronomical Association. In reply, Dr. G. Merton, the Director of the Comet Section of the Association, said that he was very pleased to have these observations, particularly those of the earlier

dates on which the comet was visible. They confirmed some points about the colour and appearance of the comet, derived from observations from other sources, and also provided a little new information.

Another bright southern comet appeared in November, 1948, known as 1948I. Information about this comet is being received from ships and will be published in *The Marine Observer* for October, 1949. The collected observations will also be forwarded to the British Astronomical Association.

## METEORS

### Australian Waters

The following is an extract from the Meteorological Record of M.V. *Rowallan Castle*. Captain A. C. M. Black, O.B.E. Port Pirie to Port Adelaide. Observer, Mr. H. D. Lawton, 3rd Officer.

6th April, 1948, 1200 G.M.T. Observed a meteor bearing approx. E travelling in a straight line towards NE. It appeared as a large white ball with a long white trail, blue at the extremities (see sketch). Before exploding,



many pieces like small stars could be seen in the trail close to the meteor and it exploded with a white flash. Duration about 4 seconds and height about  $15^{\circ}$  above the horizon throughout.

Position of Ship : Latitude  $38^{\circ} 02'S.$ , Longitude  $140^{\circ} 15'E.$

### China Seas

The following is an extract from the Meteorological Record of M.V. *Chinese Prince*. Captain T. S. Thornton, O.B.E. Manila to Shanghai. Observer, Mr. H. Jennings, 1st Officer.

30th May, 1948, 1130 G.M.T. A very brilliant meteor was observed bearing  $020^{\circ}$ . First seen as a faint white light, about the brightness of Polaris, at altitude  $27^{\circ}$ . It fell vertically, rapidly increasing in brightness and size until head was about three times the diameter of Venus. It was whitish-green with a trail of bright orange sparks. The apparent length from head to tail approx.  $7^{\circ}$  when meteor faded at about  $5^{\circ}$  above the horizon. Duration of flight about 3 seconds.

Position of Ship : Latitude  $25^{\circ} 23'N.$ , Longitude  $122^{\circ} 20'E.$

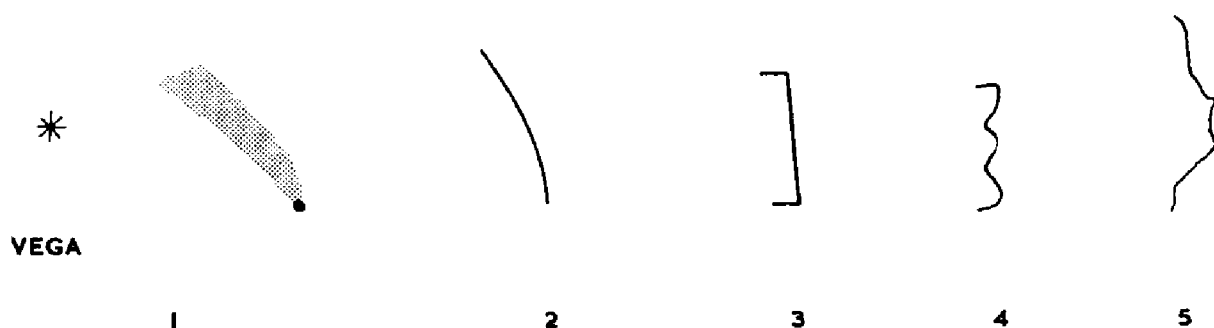
### North Atlantic Ocean

The following is an extract from the Meteorological Record of S.S. *Kent*. Captain E. H. Hopkins. Willamstad to London. Observer, Mr. D. Willmott, 3rd Officer.



22nd April, 1948, 0341 G.M.T. (0030 A.T.S.). A remarkably brilliant meteor was observed, bearing approx.  $070^{\circ}$ (T). It lit up a considerable portion of the sky to the ENE. Cloud was formed of low St. and As. above, total amount 7/10. The meteor was seen very close to Vega, approx. altitude  $40^{\circ}$  in a clear portion of the sky, it had a trail about  $7^{\circ}$  long. Duration was about 2 seconds, during which time it travelled in a direction inclined about  $65^{\circ}$  to the horizon. After the meteor's disappearance the trail remained visible for fully 7 seconds, gradually diminishing in brightness and taking the successive forms shown in sketches 2 to 5.

Position of Ship : Latitude  $30^{\circ} 40' \text{N.}$ , Longitude  $50^{\circ} 24' \text{W.}$



*Note.*—This is an extremely interesting observation. Observations on meteors can be very useful in two respects : (1) the determination of winds at very high levels (unknown at present) ; (2) detection of temperature minima by statistical examination of the “ extinction points ” of observations over a period.

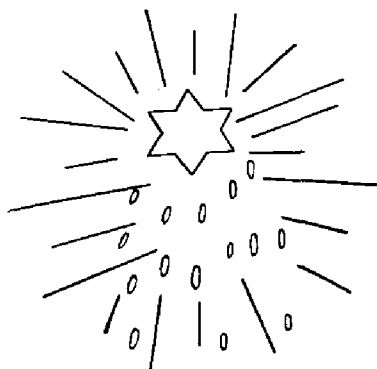
The following should be reported :

- (a) Ship's position.
- (b) Bearing and elevation of points of appearance and disappearance of the meteor (and relation to fixed stars).
- (c) A sketch, against a background of three or four reference stars.

All these items are covered in the above report, except that only one star is shown in the sketch.

#### North Atlantic Ocean

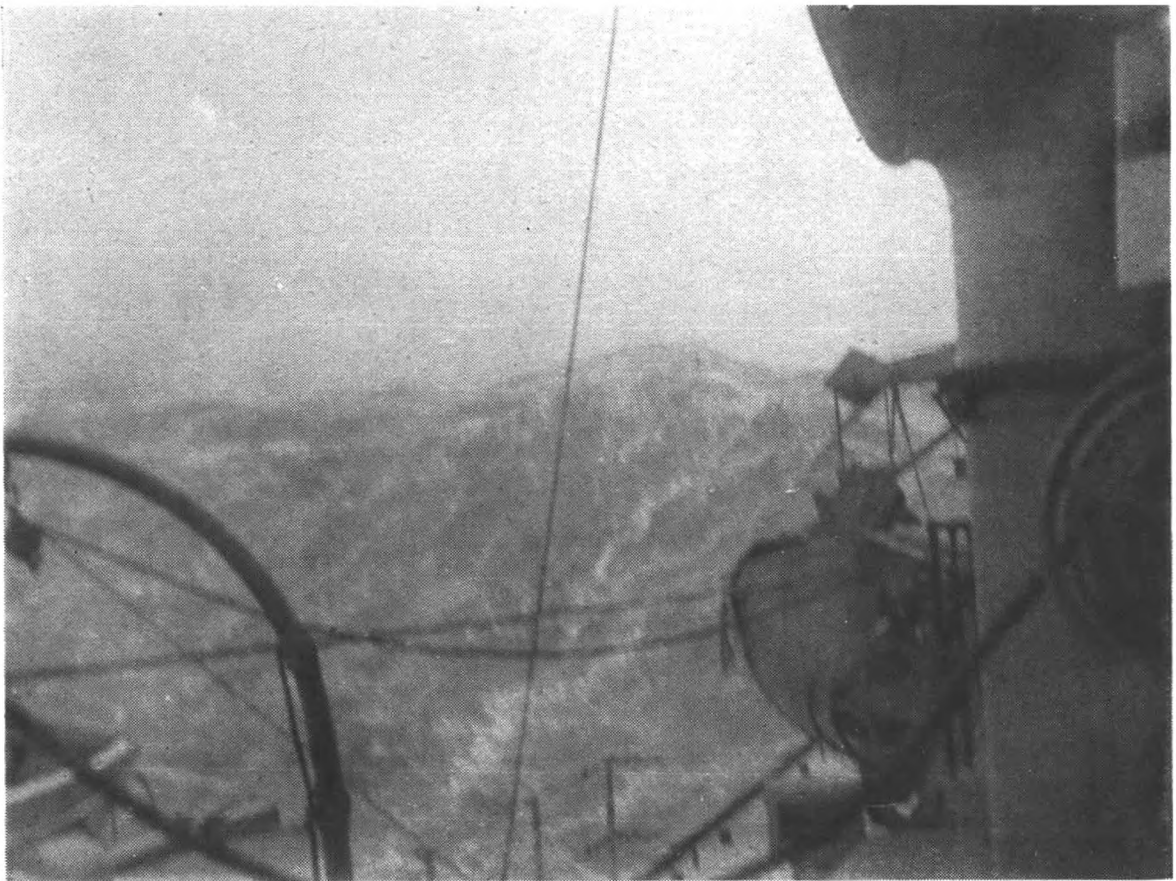
The following is an extract from the Meteorological Record of M.V. *Rowallan Castle*. Captain A. C. M. Black, O.B.E. Las Palmas to London. Observer, Mr. H. D. Lawton, 3rd Officer.



6th June, 1948, 2115 G.M.T. Observed a meteor bearing  $070^{\circ}$ , about  $15^{\circ}$



*Photo by Capt. N. F. Israel*



*Photo by Capt. N. F. Israel*

The above photographs were taken aboard O.W.S. *Weather Observer* while on Station "Jig" ( $53^{\circ} 50' \text{N.}$ ,  $18^{\circ} 40' \text{W.}$ ) on the 31st March, 1948. The weather ship was situated near the centre of an intense depression and reported winds of near hurricane force.

The upper photograph was taken at about the centre of the depression and gives an impression akin to that of the "eye" of a tropical storm with the typical "pyramidal" sea, the wind having eased temporarily.

The lower picture was taken at the height of the storm some little distance from the centre.

above the horizon. It appeared as a brilliant star and exploded with many pieces dropping vertically from it, then disappeared. It gave the impression of a large rocket star, lasted several seconds and did not appear to travel in any direction but remained stationary.

Position of Ship : Latitude  $33^{\circ} 18' \text{N.}$ , Longitude  $13^{\circ} 19' \text{W.}$

*Note.*—Meteors apparently stationary are occasionally seen. This occurs when the line of flight of the meteor through the atmosphere is directly towards the observer.

### **Pacific Ocean**

The following is an extract from the Meteorological Record of M.V. *Leverbank*. Captain D. Gillies. Makatea to New Plymouth, New Zealand. Observer, Mr. C. G. Watterson, 2nd Officer.

20th June, 1948, 0820 G.M.T. A brilliant meteor of magnitude approx.  $-7$  appeared through low cloud above Alphard bearing  $268^{\circ}(\text{T})$ . It broke into 3 large fragments and extinguished at about  $15^{\circ}$  altitude bearing  $268^{\circ}(\text{T})$ . There was no trail left behind after emerging from the clouds, but the cloud showed a faint blue glow for a short time after the disappearance of the meteor. There was no other meteor activity during watch.

Position of Ship : Latitude  $26^{\circ} 31' \text{S.}$ , Longitude  $168^{\circ} 36' \text{W.}$

### **Red Sea**

The following is an extract from the Meteorological Record of S.S. *Makalla*. Captain J. B. Newman. Suez to Aden. Observer, Mr. J. P. Jackson, Chief Officer.

28th April, 1948, 1700 G.M.T. Meteor observed, altitude on appearance approx.  $20^{\circ}$ , decreasing to about  $0^{\circ}$  on disappearance. Arc of sky covered by track, in azimuth about  $20^{\circ}$ , bearing approx.  $90^{\circ}$ . Colour, blue-green with white trail, sky brilliantly illuminated in area concerned. Sky cloudless, air temperature  $84^{\circ}\text{F.}$ , wind NNE, 2.

Position of Ship : Latitude  $15^{\circ} 43' \text{N.}$ , Longitude  $41^{\circ} 36' \text{E.}$

## **OBSERVATION OF OCEAN WAVES**

BY INSTRUCTOR-COMMANDER C. T. SUTHONS, R.N.

### **Introduction**

During the late war the need arose for reasonably precise information concerning the growth, travel and decay of waves on the oceans. Obvious examples will spring to the mind of the reader ; mining and mine-sweeping operations, beach landings and the design of special craft. All these required either day-to-day forecasts of wave dimensions or a knowledge of the average or extreme dimensions likely to be encountered in any given locality. Knowledge of ocean waves is also required in peace-time for investigation into the design of ships and for harbour works ; for forecasts in areas where loading and discharging of cargo is affected by swell and for general oceanographical research.

Any increase in our knowledge of waves on the oceans is dependent entirely on the accumulation of adequate information about the waves that

actually occur on the sea surface. This information can only be provided by observations from ships. The Maritime Commission of the International Meteorological Organisation devoted considerable time at its meetings in Toronto in 1947 to the problem of deciding which observations would be most useful and at the same time require the least expenditure of time and effort on the part of voluntary observers in merchant ships. This article has been written to explain why certain observations are required and to discuss the methods used to obtain them ; it should be regarded as supplementary to any official instructions which have been issued.

### Simple Waves

A train of simple waves consists of a series of equidistant parallel crests, of the same height all along, which move without change of shape at constant speed in a direction perpendicular to their crests. The nearest approach to such an ideal wave actually found at sea is a long low swell from a very distant storm advancing through calm water. Such simple waves have been extensively studied theoretically for many years, and the results obtained verified by producing them artificially in tanks and by observations on low swell waves. Since the most complicated waves, even those produced in a gale area, can be regarded as a combination of such " simple waves," it is useful to give first a summary of the more important results of these investigations.

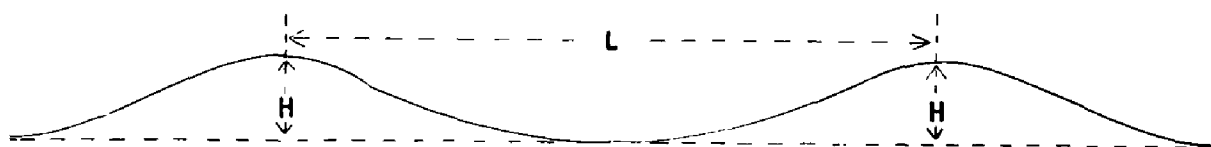


Fig. 1. Profile of a simple wave.

Fig. 1 above is a vertical section through a simple wave ; all the waves being exactly alike, one can define without ambiguity the following :

- (1) The length ( $L$ ) is the distance horizontally from any crest to the next one.
- (2) The height ( $H$ ) is the vertical distance of a crest above the troughs on either side of it.
- (3) The period ( $P$ ) is the interval of time which elapses between the passage of any two successive crests past a *fixed* point.
- (4) The speed ( $C$ ) is the rate at which any crest appears to advance over the water surface.
- (5) The steepness ( $S$ ) is the ratio height/length.

For a train of " simple waves," as defined above, all these quantities are identical whichever part of the train is observed, and they all remain constant with time.

Clearly, after an interval of time equal to one period, every crest will move on into the place previously occupied by the crest before it ; that is, each crest advances one wave-length in a time equal to one period. Hence the speed is equal to length/period. If speed is in knots, length in feet and period in seconds, then speed,  $C = 3/5 L/P \dots \dots (1)$ .

The length of a wave and its period are not independent ; the longer a wave, the greater is its period. In fact, the length of a wave is proportional



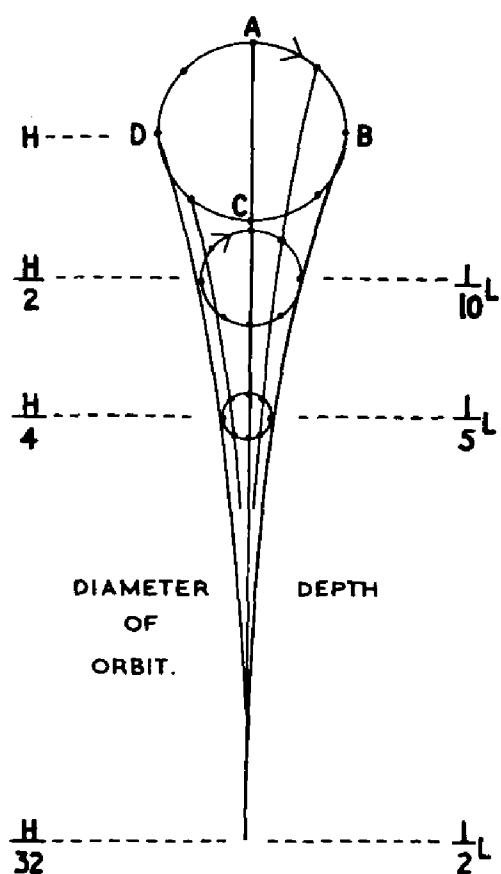


Fig. 2. Circular motion of water at the surface and at depths  $L/10$  and  $L/5$ . The roughly vertical lines are the successive positions taken up by a line of water particles as the wave passes over (compare with Fig. 3).

to the square of its period. If the length is in feet and the period in seconds, then  $L = 5P^2 \dots (2)$ .

Combination of formulae (1) and (2) gives  $C = 3P$ , i.e. the speed of a wave in knots is equal to three times the period in seconds.

To a very close approximation, these formulae apply whatever the *height* of the waves, which is independent of the other elements. It is found that any height can be associated with any length (and with the appropriate speed and period) up to a limiting value of about  $L/7$ . Waves with a steepness ( $H/L$ ) exceeding a value of  $1/7$  cannot be produced; if any process such as the action of the wind tends to steepen waves beyond this limiting value, then they break at the crest, forming the familiar white horses.

Thus a simple wave is completely specified by its height and *one* of the elements above, speed or period. From this one the other two elements can be calculated by the formulae (1) and (2) above.

The water does not itself advance with the waves; a small object floating on the surface, and hence partaking of the motion of the surface water, moves in a vertical circle as each wave passes. When the crest is approaching it moves upwards (D); as the crest passes beneath it, it is moving in the direction of the waves (A); as the crest recedes it moves downwards (B); while in the trough it moves backwards (C) (Fig. 2). The net result is that it ends up practically where it started. The diameter of the circle described by the surface water is equal to the height of the wave; the time taken to go round the circle is one period; hence the actual speed of the water itself is  $\pi H/P$  ft./sec., or  $2H/P$  knots roughly. This speed is always much smaller than the wave speed, but is sufficient to make steering difficult when steaming at slow speed with a high following sea.

Beneath the surface, the water also moves in circles in step with the water above it. But the motion of the water diminishes rapidly with depth; roughly the diameter of the circular orbit described by the water is halved for every tenth of a wave-length that one goes down from the surface: thus, if it is  $H$  at the surface, it is  $H/2$  at depth  $L/10$ ,  $H/4$  at depth  $L/5$ ,  $H/8$  at depth  $3L/10$  and so on. At a depth equal to half a wave-length it is only  $1/32$  of that at the surface, and is usually only a few inches. Hence waves can be regarded as affecting only a layer of water next the surface half a wave-length deep.

The actual motion of the water as a wave passes by may be visualised from Figs. 2 and 3, which show the positions taken up by a line of water particles as the wave moves over it from left to right. When the crest is directly above, the line is stretched out vertically (A). As the crest recedes, the top of the line sways to the right, being farthest to the right when equidistant from the receding crest and the following trough (B). As the trough approaches, the line swings back and contracts, becoming vertical again,

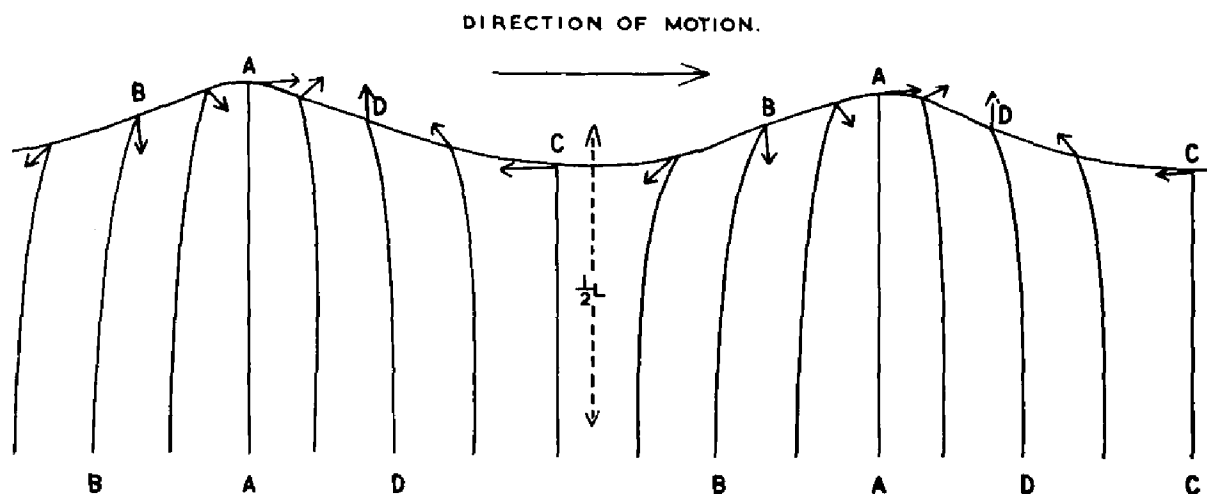


Fig. 3. Underwater and surface movement of water particles in a simple wave.

though shorter, when the trough is directly above (C). Then the line commences to lengthen and to swing to the left towards the next approaching crest; it is farthest to the left when the receding trough and the approaching crest are equidistant from it (D). Finally it swings back while continuing to stretch, until when the crest passes overhead it is vertical and fully extended (A again). It will be noted that the amount of water, represented by the area, between any two lines of particles remains constant; when the two lines swing towards each other the water is squeezed up into a crest, when they swing apart the water level drops to form a trough. The motion can frequently be observed where seaweed, growing up from the bottom, approaches the surface.

To take a definite example, consider a wave of measured period 10 seconds and of height 20 ft.

Its length is  $5P^2 = 500$  ft.

The speed of the crests and troughs over the surface is  $3P = 30$  knots.

Its steepness is  $1/25$  (a normal value).

The actual speed of the water (forward at the crests and backward at the troughs) is  $2H/P = 4$  knots.

### Combinations of Simple Waves

Suppose now that we have two trains of “simple waves”, such as have already been described, present together—the periods, and hence the lengths and speeds, of the two trains being different. Then the shape of the water surface will be the sum of the two waves. If one set of waves is much shorter than the other, then the two separate waves will be apparent on the water surface—the effect will be that of the shorter waves riding on the longer, as in Fig. 4. If, however, the two waves are of almost the same length, the presence of two distinct wave trains will not be so apparent. Where their crests and troughs coincide, there will be waves of a height roughly equal to the sum of the heights of the two component waves and of



Fig. 4. Compound wave composed of two simple waves of greatly different length (ratio 1 : 6). The two waves are separately visible.

a length roughly equal to the mean length of their lengths. As one moves farther from this point, the two component waves will get “out of step,” and the height of the compound wave will diminish until the point is reached where the crests of one component coincide with the troughs of the other—the resultant wave will be small. This is illustrated by Fig. 5, which shows

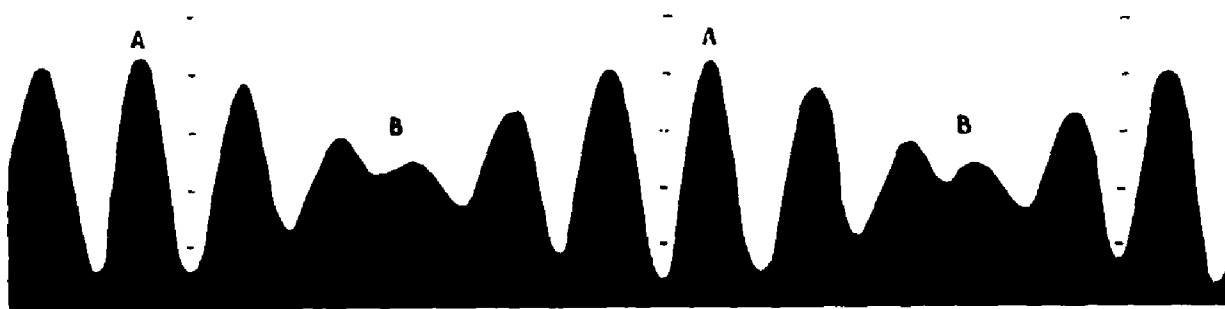


Fig. 5. Compound wave consisting of two simple waves of almost the same length (ratio 5 : 6) and each 10 ft. high. The marks are 5 ft. apart vertically. If the horizontal be regarded as a time scale, the same diagram illustrates the vertical movement of a small floating object among waves derived by compounding two simple waves (length ratio 5 : 6).

the resultant effect of two waves, each 10 ft. high, but 500 and 600 ft. long respectively. It should be noted that, near point A, the compound wave is nearly 20 ft. high ; near point B, the compound wave is very low.

So far, we have only considered waves running in one direction ; further complication is introduced by two or more wave trains running simultaneously in different directions. As before, the compound wave produced is obtained by adding together the effects of the separate components. Fig. 6 shows the

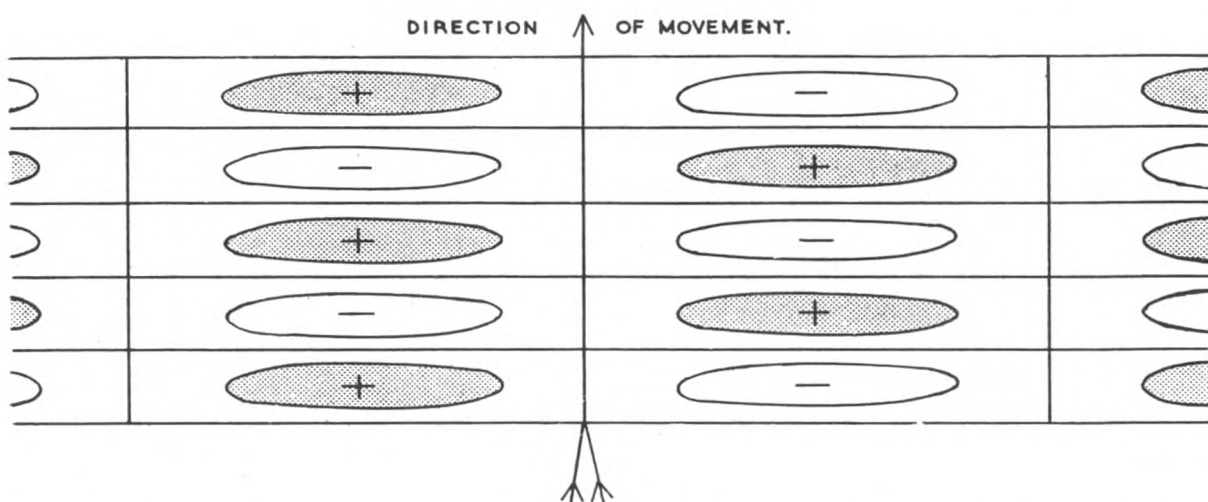


Fig. 6. Compound waves composed of two simple waves each 10 ft. high running in directions  $20^\circ$  apart (see arrows at foot of diagram). Points marked “+” and “-” are all 10 ft. above and below the mean sea level respectively; within the shaded and unshaded ellipses the water level is 5 ft. or more above and below the mean sea level respectively. The straight lines are at the mean sea level.

surface pattern produced by two sets of waves, each 10 ft. high running in directions  $10^\circ$  either side of a mean direction. Where two crests of the component waves coincide, the resultant wave has a height of 20 ft.; the intersection of the two crests appears as an elongated hill and the intersection of two troughs as an elongated hollow. The whole diamond-shaped pattern moves in the mean direction of the two components at the appropriate speed. Such waves are usually described as “short-crested,” as distinct from the “long-crested” simple waves, since the crests appear to be only a wave-length or so long in a direction perpendicular to their direction of motion.

Where the directions of the component waves are greatly different, say  $45^\circ$  or more, then, as in the case of waves of greatly different length running in the same direction (Fig. 4), the two sets of waves do not appear as a compound wave, but are separately distinguishable.

#### Waves actually observed at sea

In the preceding paragraph we have only considered combinations of two or three simple waves, but even with this small number it is apparent that the resultant wave pattern on the water surface is getting complicated and

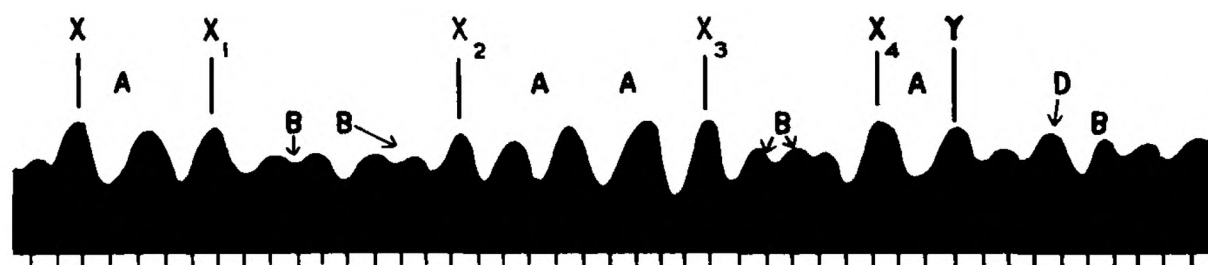


Fig. 7. Section of a trace from an automatic wave recorder giving the height of the surface above a fixed point against time. The time marks along the bottom are 6 seconds apart. This also illustrates the up and down movement of a small floating object.



is beginning to resemble the state of the sea surface as it actually appears. Recorders and analysing machines have been designed which enable the component "simple waves" present on the sea surface to be ascertained. From the results of this work it has been found that the components of importance usually lie within a comparatively narrow band of periods and directions. Fig. 7 shows part of a record taken by one of these wave-recording machines off the west coast of England—the resemblance between it and the synthetic waves of Fig. 5 is clear. Fig. 8 is an aerial photograph of the sea surface taken in the same area; the resemblance between it and the synthetic "short-crested" waves of Fig. 6 is also apparent. In particular, comparison of Fig. 7 with Fig. 5 shows that, in the actual observed waves we get a sequence of a few large well-formed waves A, A, followed by an interval in which only small and badly-formed waves B, B, appear, then another series of large well-formed waves, and so on.



Fig. 8. An aerial photograph of the sea surface taken off the west coast of England.

### **Necessity for ships' wave observations**

Though the recorders referred to above give a complete spectrum of the waves present at the place and time where they are installed, and hence give all the information about the waves which can possibly be required, they are expensive and few in number. Also they can, at present, only be used from the beach or from a stationary ship. The record obtained requires considerable "working up" afterwards before useful results can be obtained from it. Any advance in our knowledge of the formation and subsequent travel and behaviour of waves on the oceans can only be achieved by comparing their characteristics at different times and places with each other and with the synoptic charts. It is far more probable that a ship will be in the right place and time to observe the waves at the interesting stages of their growth than that these stages will occur at the few places where recorders are installed. Hence observations from ships, though not giving the enormous amount of detail possible from the recorders, are invaluable for future study of waves at sea and little progress is likely to be made without them.

### **Observations required from ships**

In an earlier paragraph it was pointed out that the length, speed and period of waves are not independent—if any one of these is measured the other two can be calculated; hence it is only really necessary for one of these elements actually to be observed. In the past, reliable observations have been made of each of them from ships under way, but experience has shown that the period is the element which is most easily and accurately measured without special gear and with only one observer. Except in the very particular case when the waves are moving at the same speed as the ship and in the same direction, measurement of speed requires two observers with stop-watches at either end of the ship, with some method of rapid communication between them. Estimates of length can be made by a single observer, using the length of his ship as a yardstick—but such estimation is very difficult and rarely accurate. This is not surprising when it is considered that the observer, and the two crests whose distance apart he is judging, are all moving at different speeds, and the latter are ill-defined points in addition. In general, estimates of wave-length from ships are much too small—errors of 50 per cent are not uncommon, even by experienced observers. The period can be reliably observed by a single observer with a stop-watch or watch with a seconds hand, or even by "counting" the seconds. Observations of the height, not being dependent on the other elements, are also necessary, and so are observations of the direction in which the waves are moving.

Thus the three elements of which observations are wanted are (*a*) the period, (*b*) the height, and (*c*) the direction of motion of the waves: and the observation should be the *mean* of a sufficiently large number of waves to be representative of the area around the ship.

It has already been noted that the wave characteristics in various parts of the ocean at different times have to be compared one with another in order to find out how waves travel and how they change while doing it. Hence it is essential that the observations taken by different ships shall be observations of exactly the same things and that they shall be taken in exactly the same way, otherwise nothing much can be learned by comparing them. Lack of attention to this point in the past has rendered much more difficult the job of deducing anything useful from the many observations collected.

A glance at Figs. 5 and 7 will bring out the main cause of discrepancy between different ships observing the same waves. Is the observer to count the small and badly formed crests B, B when making his observations or not? If the wind is fairly strong, they may even be completely masked by very short waves. For example, if the observer, in the record of Fig. 7, counts all the small crests occurring between X and Y (sixteen in 198 seconds) he arrives at a mean period of 12.4 seconds; on the other hand, if he counts B, B each as one wave crest, he has only twelve waves in 198 seconds, or a mean period of 16.5 seconds. A 12-second wave is about 700 ft. long, while a 16½-second wave is over 1,300 ft. long—a considerable difference. Similar difficulty applies to the observation of height; it is very difficult for the observer to say what the height of a wave such as D is—a different answer is arrived at depending on whether one measures the height of the crest above the trough following or the trough preceding it. This difficulty can be resolved and ambiguity avoided if all observers record only the larger well-formed waves which occur in groups of two or more, and omit entirely the intervals where the low and badly-formed waves occur. For example, the observer would record:

X to X <sub>1</sub>	= 2 waves	= 30 seconds
X <sub>2</sub> to X <sub>3</sub>	= 4 waves	= 57 seconds
X <sub>4</sub> to Y	= 1 wave	= 17 seconds
<hr/>		
Total	7 waves	104 seconds
<hr/>		

Mean period  $104/7 = 14.9$  seconds

(The mean of 15 to 20 waves should strictly be taken—the record reproduced is not long enough.)

This way of doing it means that the fifteen to twenty waves whose average height and period are measured will not be consecutive ones; but, owing to the ship's speed, the period of more than a few consecutive waves cannot be measured anyhow, since the floating object on which the observations are taken will be left astern in quite a short time.



Fig. 9. Measurement of the height of large waves from a ship. The height is equal to the height of eye at which the oncoming or departing wave just appears to touch the horizon when the ship is in the trough and vertical.

### Method of measuring the mean period

To measure the period of the waves, use is made of the fact pointed out earlier that a small object floating on the water describes a circle as each wave passes in a time equal to a period. For the reasons given in the preceding paragraph, only the larger waves in the centre of each wave group are observed. When a group of such larger waves is seen to be approaching, attention is focused on something floating on the water ahead of them. In general, this will be a distinguishable patch of foam. When this is on the crest of the first larger wave, a stop-watch is started (or the time is noted to

a second). The watch is stopped (or the time is noted again) when the last well-formed crest passes beneath the patch of foam—or when this latter becomes difficult to see due to its falling too far astern—whichever first occurs. Note is also taken of the number of crests which have passed beneath the patch of foam during this interval of time. The process is repeated for further groups of well-formed waves until a total of at least fifteen waves have been observed. The total time divided by the total number of waves observed gives the mean period required.

#### **Methods of measuring the mean height**

As in the case of the period, the mean height of fifteen to twenty well-formed waves chosen from the centre of the wave groups is required. The simplest method of doing this varies according to whether the waves are large compared with the ship or not. If the waves are so large that they obscure the horizon when the ship is in the trough, as seen from some point in the ship, then their height may be estimated by moving up or down until the oncoming wave just touches the horizon when the ship is in the trough and vertical. As seen from Fig. 9, the wave height is then equal to the height of eye. This method is clearly most accurate when the waves are coming from the beam, provided that care is taken to see that the observation is made with the ship vertical, otherwise the height observed will be too large.

When the waves are short compared with the ship's length, their height is most easily observed by noting the height of the crest and troughs against the ship's side during an interval when the ship is not rolling. The method is most accurate when the ship is head or stern on to the waves and when the observer is amidships where the effect of any pitching is a minimum. The actual height is estimated from the known positions of marks or projections on the ship's side.

Neither of these methods apply when the waves are low and much longer than the ship, since the ship rises and falls with them and one cannot get down low enough for the horizon to be obscured by them. An estimate from as low down in the ship as possible must be made.

#### **Method of measuring direction in which the waves move**

This is most easily observed by sighting along the crests from the compass to get the mean direction in which the crests lie and then adding or subtracting  $90^\circ$ . The observation should be noted as a True direction, correction being made for deviation and variation if necessary.

#### **Sea and swell**

It will doubtless have been noticed that nowhere here have the old familiar terms "sea" and "swell" been used in connection with the making of observations. In the past, separate observations of sea and swell have been asked for by meteorological services, but experience has shown that this is unnecessary for this purpose and at times difficult for the observer. But the terms still remain in use for other practical purposes, and it is of some importance that the precise meaning to be attached to them should be clearly understood.

"Sea" is the waves produced by the local wind, i.e. waves raised in an area of ocean surrounding the ship over which the wind is blowing at the time of observation.

"Swell" is waves which have been raised by wind elsewhere at some





Swell proceeding ahead of a tropical storm (actually approaching Bahamas from West Indian hurricane). Note that the swell waves are long, low and long-crested. The wind is blowing almost at right-angles to the direction of motion of the swell (i.e. parallel to the crests), as is made clear by the breaking of sea waves in the foreground.

previous time and which happen to be passing at the time the observations are made.

Waves raised by wind always run within a point or so of the wind direction, the "sea" waves running roughly in the direction of the local wind, whereas "swell" waves may run in any direction relative to the local wind. Further, "sea" waves with winds of over force 3 break, whereas "swell" waves do not break except when they impinge upon shallow water. The two should thus usually be distinguished. But this can be done even more easily by the man ashore analysing the observations, who will have available synoptic charts of the ocean, showing the storm areas whence "swell" might originate. Hence, for meteorological purposes, observers are asked to note only the "waves" that they actually see.

There has been a marked tendency in past observations to describe as swell any long waves, even if they are obviously due to a local gale. Waves running in the direction of the wind, unless the latter has dropped considerably in the immediate past, are almost certainly sea waves, however long they may be.

If there are two clearly distinguishable sets of waves running in different directions at least  $45^{\circ}$  apart ("swell" running across the "sea") then the observer should endeavour to measure the period, height and direction of each set of waves separately.

#### THE MASTER MARINERS' HEADQUARTERS SHIP

On Thursday, 9th December, 1948, London River received an addition to its permanent ships when the *Wellington*, ex-H.M. sloop, was berthed alongside a floating pontoon off Temple Stairs, in Kings Reach. She is moored between H.M.S. *Chrysanthemum* and Captain Scott's Antarctic research ship *Discovery*. In the same reach of the river, astern of the *Chrysanthemum*, is H.M.S. *President*; these two ships are the headquarters of the London Division of the Royal Naval Volunteer Reserve.

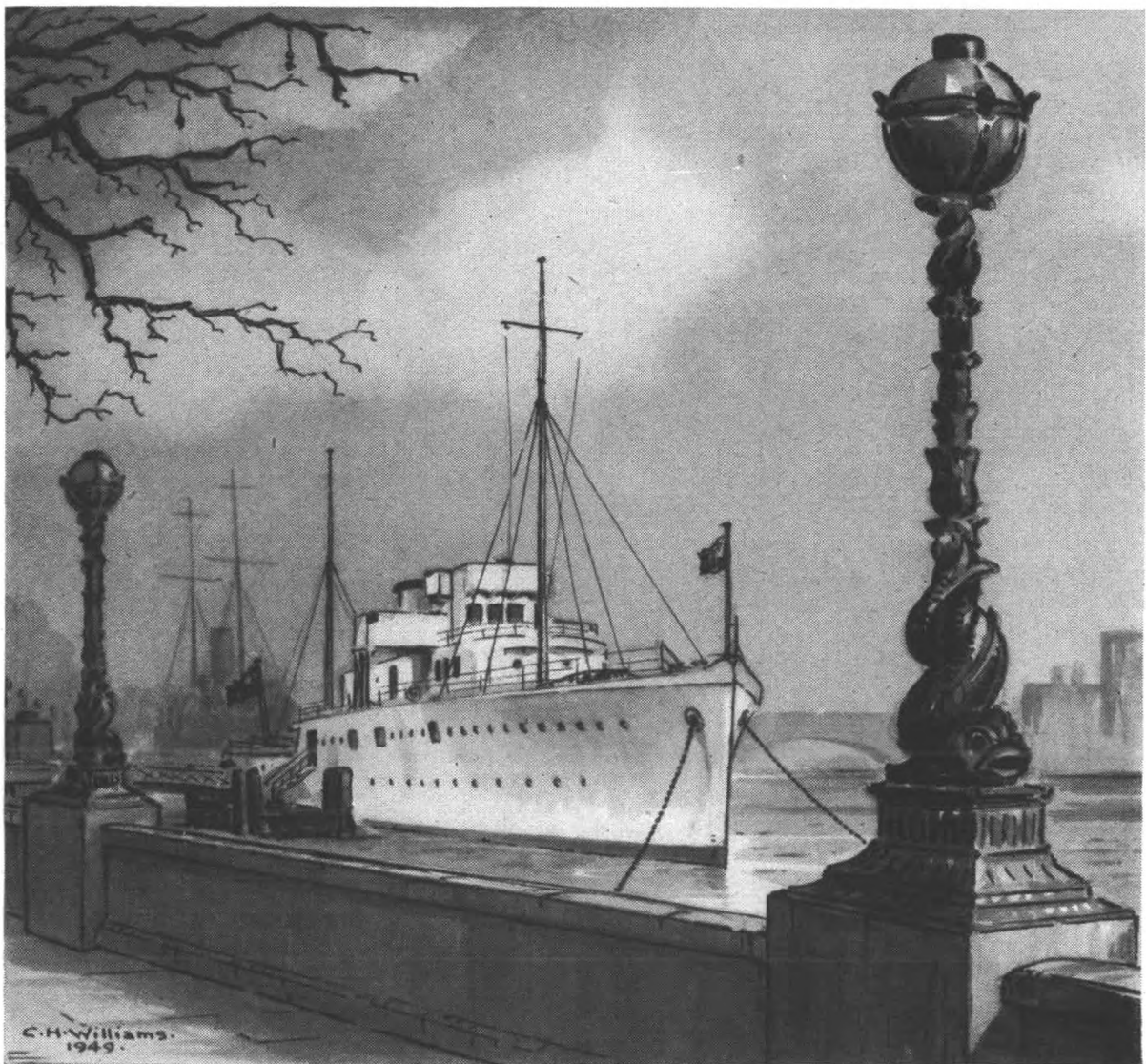
Now in Kings Reach, in the heart of London, are these four ships to remind her citizens of the sea and ships, and the importance of the sea-borne trade upon which has been founded so much of the history of England.

The *Wellington* is now the headquarters of the Honourable Company of Master Mariners, which was founded in 1926 and is the youngest of the City of London Livery Companies. The suggestion that the Company should be housed in a ship, instead of in a hall ashore, was made some years before the war, and has at last been done.

Purchased from the Admiralty, the *Wellington* has been altered and fitted out by H.M. Dockyard, Chatham. There a remarkable transformation of the ship's internal arrangement was brought about. A handsome main companionway has been built into the ship. This had originally been in the S.S. *Viper*, a passenger steamer in the Clyde-Isle of Man service for many years.

The *Wellington's* entire engine-room space has been converted into the court room; a spacious and tastefully equipped compartment.

Suitable office accommodation has been arranged and at the after end of the deckhouse on the upper deck there is a smoking and writing room. In the ship the Company has ample space for its growing collection of books, pictures and ship models.



The Master Mariners headquarters ship *Wellington*, berthed off Temple Stairs, London

The present *Wellington* is the fourth H.M. ship to bear the name. Number one was a sixteen-gun sloop of 312 tons captured from the French in 1810 and renamed *Wellington*. The second of the name was a cutter of 136 tons built at Cowes in 1815. She served as a revenue cutter and as a coastguard tender. Third in the list was a seventy-four gun ship of 1,757 tons, launched at Deptford in September, 1816, as the *Hero*. Her name was changed to *Wellington* later that same year. She remained in existence until 1908, when she was sold at Chatham for breaking up.

Finally the present *Wellington*, a sloop of 990 tons, was built at Devonport in 1934. She was commissioned in 1935 for service on the New Zealand station. On the outbreak of war in 1939 she was temporarily attached to the China station, but in November that year was transferred to Freetown for ocean convoy duty in the North Atlantic. Later she served as escort with coastal convoys around the United Kingdom, and was also in Operation "Torch" at the North Africa landings. During the war she steamed 240,000 miles, mainly on mercantile convoy duty, and she had her share of the many unpleasant happenings of those war-time days.

A few words about the Honourable Company of Master Mariners may be

of interest to readers of this journal. We cannot do better than quote from a pamphlet issued recently by the Company :

“ One would naturally expect to find the professional status of the Master Mariner recognised in the public life of a nation so beholden to its Merchant Navy. It is, however, a curious reflection that in Britain, where craft tradition has been enshrined for centuries in our ancient Guilds and Companies, the claims to recognition of the oldest of crafts—Sea-craft—should have been unrecognised until the formation of the Company of Master Mariners in 1926. . . . Throughout the centuries he (the mariner) had seen the rise to fame and fortune of the great Livery Companies of London, the foundation and growth of Institutions representative of the Architect, the Engineer, the Doctor—of every other profession—while he, whose calling was steeped in traditions older than any other, remained with neither Guild nor House. . . .

“ In March, 1928, His Royal Highness the Prince of Wales became the first Master of the Company. In June of that year His Majesty King George V bestowed the title of “ Honourable ” upon the Company, and in August, 1930, the Company was so firmly established that His Majesty granted it his Royal Charter. In 1932, through the Court of Aldermen, the City of London conferred upon the Company the honour of Livery. It was the first time in over two hundred years that the ancient doors of the Guildry of London had been opened to admit a new Company. . . .

“ The Company commenced its career at a time when other City Companies were in their fourth, fifth and sixth centuries.”

Many of these ancient City Companies, among which that of the Master Mariners has so recently taken its place, are by comparison wealthy and firmly established. The passing of the centuries has strengthened and enriched them.

In order to place itself on as firm a footing as the old City Livery Companies, and to provide for the endowment of the *Wellington*, the Honourable Company is launching an appeal for financial support. The sum aimed at is naturally a large one. There are high hopes of its being realised, however, for surely the people of these islands have had more cause in this twentieth century than ever before to know the value of our ships and seamen in maintaining our continued existence as a nation.

The primary object of the Company is “ to provide for the senior officers of the British Merchant Navy a central body qualified to represent them in all matters relating to their professional status and wellbeing.” The *Wellington* will serve as a central rendezvous in London for the master mariners of all nations.

The Honourable Company has, through its Technical Committee, always shown considerable interest in maritime meteorology and in the work of the Voluntary Observing Fleet. In recognition of the function which the Honourable Company performs, representing all the master mariners of the United Kingdom, and of the relationship between the Meteorological Office and the Merchant Navy, the Director of the Meteorological Office has recently loaned to the *Wellington* a full set of instruments as supplied to a Selected Ship.

C. H. W.





“Misty morning on the Dogger”, by W. Howard Jarvis

(By no means an unusual state of visibility in the North Sea in anticyclonic weather. Flat calm with the sun breaking through a thin layer of low stratus cloud.—Ed.)

## SHIPS' OBSERVATIONS AND THE CLIMATOLOGIST

### Part IV. The Representation of High and Low Values

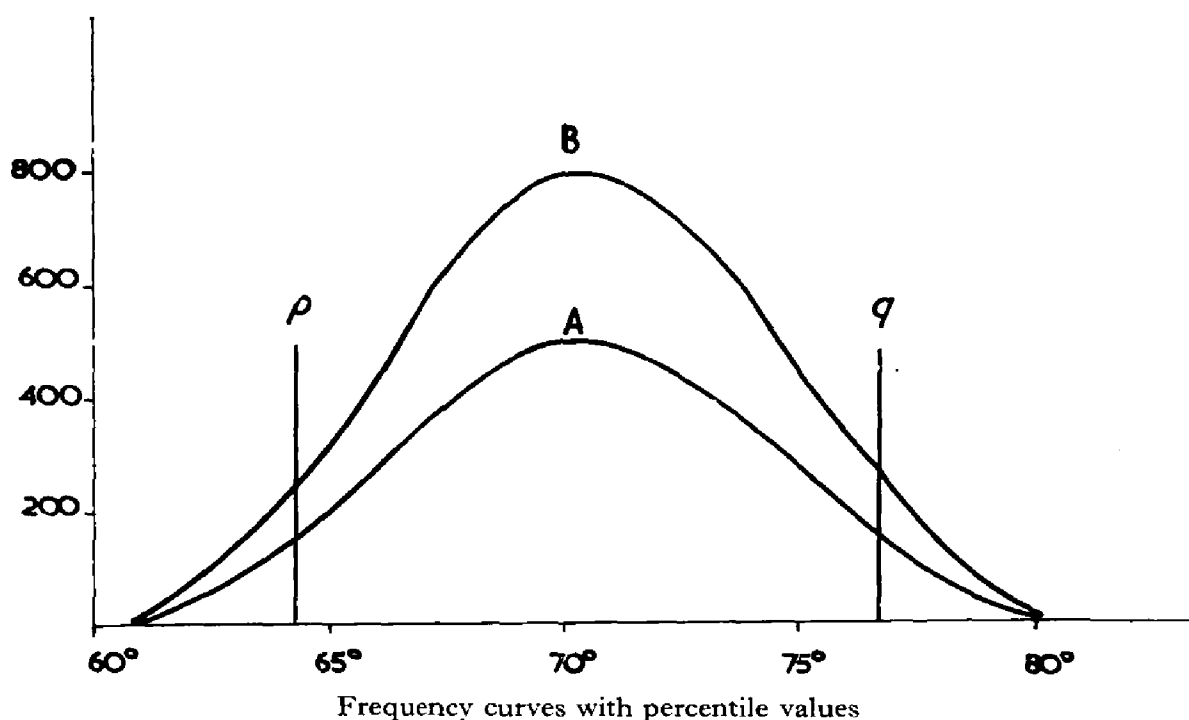
BY H. JAMESON, D.SC.

When mean values, e.g. mean temperatures, are computed, it is unlikely that an occasional erroneous observation will make much difference to the mean, unless the number of observations is very small. If, however, it is desired to draw isopleths of extreme values, e.g. maximum and minimum temperatures, erroneous or abnormal observations may affect the shapes of these curves. Moreover, the greater the number of observations available from any square, the higher is likely to be the maximum temperature observed, or the lower the minimum. The extremes actually recorded will be functions, not only of the climate of the square, but also of the number of observations recorded from it. In marine climatology, the number of observations generally varies very much from square to square, and this variation will markedly affect the shapes of any isopleths drawn to show extreme values.

For these reasons it was decided to include in the British marine climatological charts, published during the war, not the isotherms of the absolute maximum and minimum temperatures recorded in each  $2^{\circ}$  Marsden square, but those for the *upper and lower five percentile temperatures*.

The *upper five percentile temperature* in any square is a temperature which is lower than the highest 5 per cent of all the recorded observations and higher than the remaining 95 per cent. Similarly, the *lower five percentile temperature* is higher than the lowest 5 per cent of all the recorded observations and lower than the remaining 95 per cent.

This definition as it stands is not very precise. Take the simple case in which there are exactly 100 observations and suppose that the highest six observations are  $73^{\circ}$ ,  $73^{\circ}$ ,  $72^{\circ}$ ,  $70^{\circ}$ ,  $69^{\circ}$ ,  $64^{\circ}$ . Then any value of temperature that we care to choose between  $68.9^{\circ}$  and  $64.1^{\circ}$  could be accepted as the upper five percentile on the definition given above. The correct value in



this or any other ambiguous case is chosen from theoretical considerations ; in this case the upper five percentile would be the mean of  $69^{\circ}$  and  $64^{\circ}$ , i.e.  $66.5^{\circ}$ .

When such percentile temperatures are used, not only are erroneous or abnormal maximum and minimum values deleted, but the figures obtained are independent of the number of observations, an even more important advantage. Suppose, for example, that there are 5,000 temperature observations available in a square. The frequency curve "A" is plotted, showing the number of observations recorded for each temperature. The lower five percentile is found to be at "p" and the upper at "q." Now suppose another 3,000 observations become available and are added to the data already used. A second frequency curve "B" is drawn. It will be found that, for any given temperature for which there is a reasonable number of observations, the length of the ordinate of curve "B" will be very nearly  $8/5$  times the length of the corresponding ordinate of curve "A" and the new percentile values will differ very little from the old. For smaller numbers of observations, added observations may cause appreciable changes in percentile values, but these changes are as likely to be up as down ; in other words, there is no systematic change in the values of the percentiles as the number of observations increases.

Although five out of every 100 observations of temperature will exceed the five percentile maximum, the excess will not usually be very great and the following working definition of this percentile maximum temperature may be adopted : for any given area and in any given month, the five percentile maximum temperature is a temperature that will rarely be exceeded by any amount that matters for practical purposes. A similar definition may be used for the five percentile minimum.

The five percentile range is the difference between the five percentile maximum and minimum temperatures and includes 90 per cent of all recorded observations.

### **" NAVIGATION THROUGH THE AGES "**

On 17th December, 1948, His Royal Highness the Duke of Edinburgh, in the presence of a distinguished company of scientists, seamen, airmen and others interested in the art of navigation, performed the opening ceremony of an exhibition entitled " Navigation through the Ages." The exhibition was jointly organised by the Institute of Navigation and the Royal Geographical Society and His Royal Highness was welcomed by Sir Harry Lindsay, President of the Royal Geographical Society, and introduced by Sir A. Spencer Jones, the Astronomer Royal and President of the Institute of Navigation.

The title of the exhibition admirably described its scope, and great credit is due to the organisers for having gathered together such a wealth of historical and modern navigational equipment. In addition to the number of private and commercial exhibitors, the Admiralty, Air Ministry, National Maritime Museum, H.M. Nautical Almanac Office and the Meteorological Office were amongst those who had provided exhibits.

The early navigational exhibits emphasised the adventure and romance that attended a sea career in the days when so much was unknown and instruments so few and so crude. A study of the portulan charts (dating



“Grand Bankers”, by Stanley Rogers  
(Suggests squally weather with occasional glimpses of the sun, often experienced in the rear of a depression on  
the Newfoundland Banks.—Ed.)



from 1311), the earliest being drawn on sheepskins, revealed, however, surprising accuracy in cartography and exquisite workmanship. The network of "loxodromes" (rhumb lines) drawn upon these charts are reminiscent of the modern Consol chart. Early instruments on exhibit included astrolabes, backstaffs, ring dials and quadrants, many of them in excellent preservation. The earliest form of compass exhibited was one dated 1750—little is known of the appearance of compasses in use before about 1600. Early sextants and chronometers reminded us that both these instruments came into use at sea at about the same time (circa 1770).

Among the ancient navigational books was one by Copernicus, dated 1543, concerning the Copernican theory of the solar system. A book by John Davis, dated 1657, carried the entertaining title of *The Seaman's Secrets*.

The modern portion of the maritime exhibition included gyro compasses and automatic helmsmen, modern sextants, echo-sounding machines and chronometers. Electronic exhibits included modern ship-borne radio transmitters and receivers, D/F apparatus, Loran, Decca, Consol and various types of ship-borne radar. This formidable array of modern navigational aids carries conviction as to the enormous improvements that have been provided for the navigator in recent years, but carries a warning at the same time that they are all "aids" and the navigator must still use his skill and his seamanship.

The aircraft section of the exhibition readily emphasised the enormous progress that has been made during the short history of aviation. The exhibits included an impressive array of aircraft instruments, including altimeters, precision barometers, air-speed, rate of turn, side-slip and rate of climb indicators, and compasses. The automatic dead-reckoning equipment was perhaps the most spectacular. Viewing these instruments brought home to the visitor the difficult problems connected with air navigation and the remarkable scientific skill that had been used in solving these problems. Air navigational instruments and publications emphasised the need of a quick solution of navigational problems as far as the airman is concerned. A lot of space was given over to the important question of electronic aids to the air navigator—Gee, Decca, Loran, Consol and other systems being comprehensively displayed. The use of primary radar aboard aircraft for cloud and collision warning was well illustrated, as was also the use of the radar altimeter. Among the secondary uses of electronics to the air navigator, the employment of Rebecca air-borne interrogator associated with the Eureka responder beacon, as fitted in British Ocean Weather Ships, was on view, together with a very graphic display of the G.C.A. (Ground Control Approach) system for "blind landings" at airfields. An interesting panoramic exhibit was one showing the operation of the Berlin air-lift.

It is interesting to reflect upon the manner whereby navigators at sea and in the air have mutually assisted each other. The gradual evolution of navigational practice at sea provided the airman in his early days with a ready-made science of navigation, which he modified to his special needs. Now the airman's particular problems have assisted materially in bringing about inventions which are of great value to the seaman.

The meteorological exhibits included a model of an Ocean Weather Ship, together with some excellent photographs showing various activities aboard those ships and illustrating the general purposes of the Ocean Weather Ship



scheme. A meteorological logbook kept by Captain Toynbee (a former Marine Superintendent of the Meteorological Office) in 1857, and a modern synoptic logbook, kept aboard a British Selected Ship, emphasised the seaman's voluntary contribution to our meteorological knowledge. The importance of meteorology to the navigator, and particularly to the airman, was directly illustrated by a specimen flight forecast for a transoceanic flight and indirectly by the very existence of the numerous navigational aids on exhibit.

In a talk to the Institute that evening, Sir Robert Watson Watt emphasised the malevolent effect which the vicissitudes of the weather have upon the efficiency of astro-navigation, thus being one of the main reasons for the introduction of electronic aids.

C. E. N. F.

## A NEW BUCKET FOR MEASUREMENT OF SEA SURFACE TEMPERATURE

BY O. M. ASHFORD, B.SC.

(Reprinted from the Quarterly Journal of the Royal Meteorological Society)

### Introduction

It has been known for many years that the standard method of measuring sea surface temperatures by taking a sample with a canvas bucket is liable to serious errors. This report deals with the development of an improved form of bucket and thermometer which should be capable of giving sea surface temperature to an accuracy of  $\pm 0.1^\circ\text{F.}$ , neglecting errors due to temperature gradients in the top few inches of the sea. This latter source of error is inherent in the bucket method of obtaining a sample, but can only be appreciable under calm conditions.

### Sources of error

The chief sources of error in the bucket method are : ( $E_n$ ) The initial temperature of the bucket is generally different from that of the sea. ( $E_c$ ) The water in the bucket may change its temperature before the reading is taken owing to the processes of heat exchange and evaporation. ( $E_t$ ) The initial temperature of the thermometer is generally different from that of the sample. ( $E_s$ ) The thermometer is liable to scale errors. ( $E_l$ ) Owing to thermal lag, the thermometer may take an appreciable time to indicate the true temperature of the sample. ( $E_x$ ) If the thermometer is removed from the bucket when taking the reading, it may no longer indicate the true water temperature. ( $E_r$ ) The thermometer may be read incorrectly.

### Existing buckets

The standard British equipment is the M.O. canvas bucket Mk. II with a porcelain-mounted thermometer in a sea protector (see *Marine Observer's Handbook*, page 38). The most recent improvement is the introduction of a spring lid, as suggested by Commander C. H. Williams, R.D., R.N.R., which eliminates the loss of water formerly caused by the bucket swinging and hitting the top of a wave or the side of the ship. The most serious error is  $E_c$ , but  $E_t$  and  $E_l$  may also be large. While the reservoir of the sea protector is good from the point of view of  $E_x$ , it introduces an additional term into  $E_l$ , for with normal stirring there is little interchange of water inside and outside the reservoir. The Lumby sampler (Lumby 1927 and 1928) has not been used widely on account of its excessive weight and

inconvenience in use. In this equipment  $E_b$ ,  $E_r$  and  $E_l$  are eliminated by towing through the water for several minutes, and  $E_c$  is small on account of the celluloid insulating cylinder.

The German rubber pail designed by Dr. J. Georgi consists of a double-walled rubber bucket, an accurate open-scale thermometer and a heat-stirring device.  $E_c$  is very small and  $E_b$ ,  $E_r$  and  $E_l$  are supposed to be eliminated by hauling two samples of water. One technique involves the use of two buckets; a sample of water is collected in one bucket and immediately poured into the second. While the thermometer is immersed in this sample, a second sample is collected in the first bucket. The thermometer is quickly transferred to the second sample and the reading taken. The very delicate nature of the thermometer is a disadvantage. In the German naval "scoop thermometer" the thermometer is permanently mounted in the bucket, and  $E_b$ ,  $E_r$  and  $E_l$  are eliminated by towing. Unfortunately, owing to the very small size of the water container,  $E_c$  is very large.

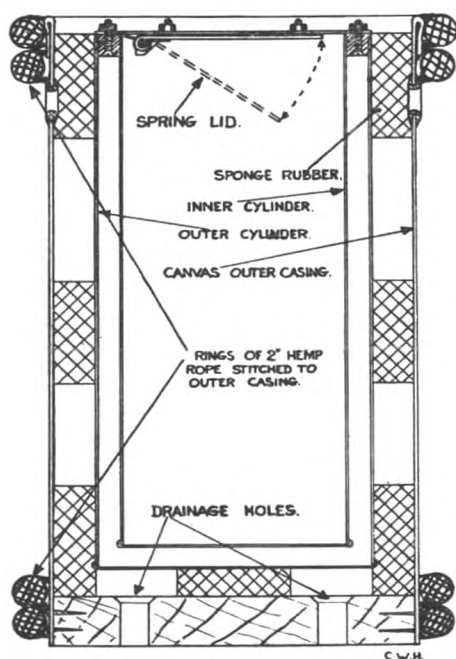


Fig. 1a. First model of new bucket.

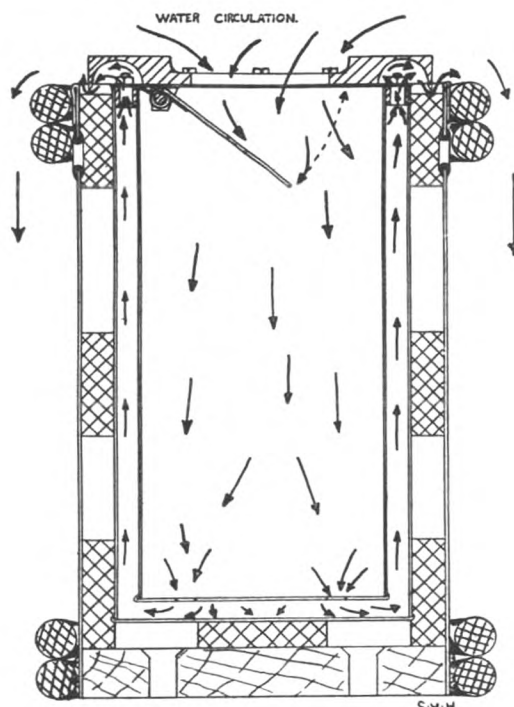


Fig. 1b. Final model of new bucket

### New buckets

Attempts were first made to redesign the canvas bucket so that  $E_c$  would be greatly reduced. Tests showed that with the existing bucket  $E_c$  was equally great when the outside of the bucket was dry or wet and that the presence of the lid did not result in any appreciable reduction. The bucket was therefore remade as shown in Fig. 1a with a double-walled copper vessel inside, the space between the walls being filled with air. The brass spacer ring which supports the two cylindrical walls is watertight and is the only effective channel for the conduction of heat from the inside to the outside. The copper vessel is protected externally by sorbo rubber pads. With this bucket it was found that  $E_c$  was very small, especially when a lid was provided.

The good thermal insulation between the inside and outside of the bucket, and the action of the spring lid in reducing circulation of water through the

bucket when it was full, resulted in a serious increase in  $E_b$ . The top of the bucket was therefore altered on the lines of the Lumby sampler, so that the water entered the bucket through a funnel (the spring lid having been removed) and passed out again through holes in the side immediately under the top of the funnel. With this model, however,  $E_c$  was greatly increased. Later it was discovered that  $E_c$  was not significantly larger if the space between the walls were filled with water instead of air, and the final design shown in Fig. 1b was produced. As this bucket is towed along, water passes through the spring lid (held open by the water pressure) into the bucket, through the holes in the bottom of the inner container, back up between the walls and out through the annular space under the lid. With this model

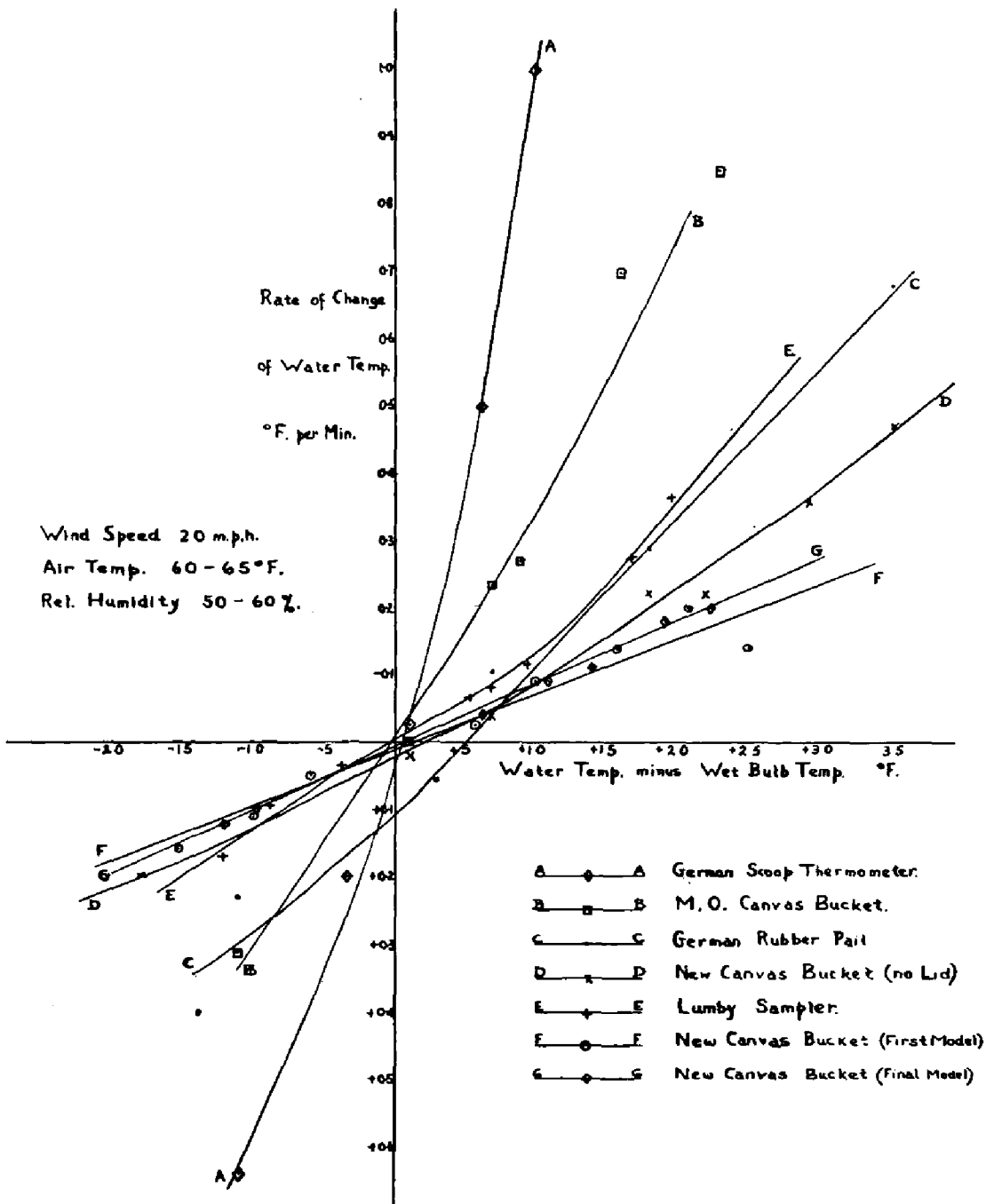


Fig. 2. Rate of change of water temperature in bucket as a function of the difference between the water temperature and the wet bulb temperature.

$E_c$  is quite small and  $E_s$  can be eliminated by towing for about thirty seconds.

### Experimental results

So far we have only made qualitative statements about the various errors. A series of tests was carried out in a wind tunnel to determine the actual value of  $E_c$  under controlled conditions. The procedure was to dip the bucket in a large bath of water long enough to ensure that its temperature was steady and to suspend it in the wind tunnel with a wind speed of 20 m.p.h. taking readings of the thermometer at minute intervals. By starting off with water at different temperatures it is possible to simulate conditions in which the sea temperature is both lower and higher than the air temperature. The results are plotted in Fig. 2, from which it will be seen that the new bucket is superior to any of the other buckets tested. The observations with the Lumby sampler were made with the funnel-shaped head removed, which corresponds to the conditions when a reading is being taken on board ship. With the head in position, the curve is approximately the same as that of the new circulating bucket.

The effect of the lid with the new bucket is interesting, as earlier tests with the old canvas bucket showed that having a lid made no appreciable difference to the rate. The probable explanation is that the rate is so rapid with the old bucket that the improvement effected by having a lid is swamped by experimental errors. It should be explained that this lid was a flat disc which covered the top of the bucket; there was a small hole in the centre of the disc to admit a thermometer. The German rubber pail has such a lid in normal use, and when tested without the lid it showed a considerably increased rate of change of temperature.

A few tests were made with a view to distinguishing between cooling due to evaporation and cooling due to heat exchange. Each bucket was tested with its outside wet and dry in succession, but in no case was there any significant difference in the rate of cooling.

A further test was carried out with Commander C. H. Williams on board the M.V. *Trepassey* sailing down the Thames. The conditions at the time were cloudy, dry bulb  $50.5^{\circ}\text{F.}$ , wet bulb  $48.0^{\circ}\text{F.}$ , mean water temperature  $54.5^{\circ}\text{F.}$ , wind force 4. Samples of water were collected in the various buckets and readings of the temperature of the samples were taken at minute intervals. Even under these moderate conditions the superiority of the rubber pail and the new canvas bucket was apparent. The mean rates of fall of temperature in  $^{\circ}\text{F.}$  per minute were: German scoop thermometer 0.135, M.O. canvas bucket Mk. II 0.12, German rubber pail 0.025, new canvas bucket (first model) 0.015.

Tests were made on board H.M.S. *Blythe* in the English Channel to determine the relationship between  $E_s$  and the time the bucket was left in the sea. The procedure was to fill the bucket with water about  $25^{\circ}\text{F.}$  warmer than the sea, and to empty it after several minutes. It was then thrown quickly into the sea, and left trailing for the required length of time with the ship steaming at about 8 knots. After the temperature of the sample had been measured, a second sample was collected as a check on the true sea temperature. The results given in Fig. 3 show the remarkable difference between the first and final models of the new bucket. During these trials, which were made on three separate outings, the true sea temperature observations were consistent in each case to within  $\pm 0.1^{\circ}\text{F.}$ ,

which illustrates both the accuracy which can be achieved with the new bucket and the uniformity of sea surface temperatures on certain occasions.

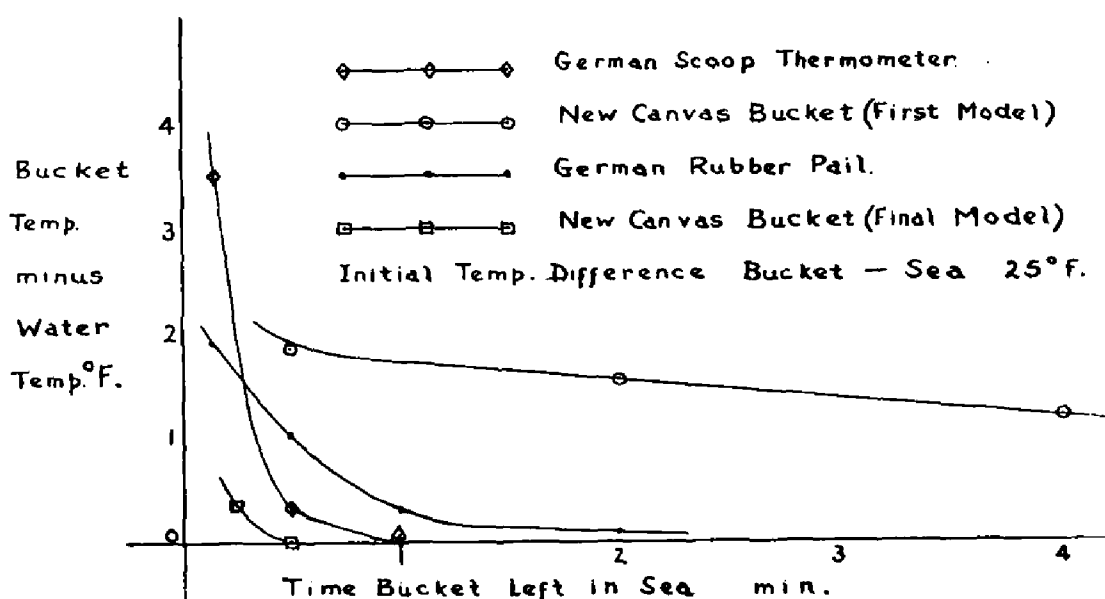


Fig. 3. Error due to bucket having different initial temperature ( $E_B$ ) as a function of the time the bucket is left in the sea.

### Design of thermometer

As pointed out above, the standard Meteorological Office thermometer mounted in a sea protector is unsatisfactory on account of the large thermal capacity of the mount, and the lack of interchange of water inside the protector with that outside when stirred in the usual way. The water equivalent of the thermometer and mount is about 35 gm., so that if its temperature differed from that of the sea by  $20^{\circ}\text{F.}$  and the water sample weighed 2,500 gm. (an average value),  $E_s$  would be  $0.3^{\circ}\text{F.}$  For the purposes of the above tests a German "powder" thermometer was used with the new canvas bucket. It consists of a mercury in glass thermometer with a cylindrical bulb, spring-mounted in a duralumin tube. Holes at the bulb end of the tube allow free access of water to the bulb. This thermometer is very satisfactory apart from  $E_s$ —it has no reservoir, and the temperature may change rapidly if the bulb is lifted out of the water. A new thermometer for use with the new canvas bucket is at present being designed. This thermometer will probably be mounted in a duralumin tube and provided with a 4 in. length of stem between the bulb and the lowest graduation mark, thus enabling the readings to be taken without removing the bulb of the thermometer from the water in the bucket.

### Conclusion

It is considered that the introduction into general use of the final model of the new bucket, in conjunction with an improved thermometer on the lines indicated, will result in a big improvement in the accuracy of reported sea temperatures. For routine purposes the bucket ought to be left trailing for about thirty seconds, although in many cases a shorter time would suffice. The alternative of using the first model of the bucket and relying on two samples being collected at each observation would not be so satisfactory. Hauling a water sample is quite a strenuous job, especially on



fast-moving ships, and the temptation to report the temperature of the first sample would often be hard to resist.

It would be interesting to follow up the experiments to distinguish between errors due to evaporation and heat exchange, although the combined effect is so small with the new bucket that the question is largely of academic interest. It is suggested that tests under controlled humidity conditions (as well as controlled wind speed) would be a profitable line of attack.

The work described above was carried out in the Instruments Branch of the Meteorological Office, Air Ministry. The writer would like to thank Mr. N. E. Rider, Commander C. H. Williams, R.D., R.N.R., Port Meteorological Officer, London, and Lieutenant P. G. Satow, D.S.C., R.N., H.M.S. *Dryad*, for their valuable assistance.

*Note.*—With reference to Mr. Ashford's interesting article, a large number of observations were made in certain voluntary observing ships in the North Atlantic during the war with the object of investigating the problem of sea temperature measurements. Simultaneous readings of sea temperature by the "bucket" and intake were made at regular intervals during many voyages, and at the same time the wind force and direction, weather and wet and dry temperatures were recorded. Owing to security regulations during the war it was impossible to record the ship's position.

A thorough analysis of these observations was made in the Marine Branch in consultation with the Instrument Branches, and the results clearly showed the liability to inaccuracy with the canvas bucket when the wind was strong, the air temperature much lower than the sea and when humidity was low. Under such conditions it was noteworthy that the intake temperature was very frequently higher than that of the "bucket." On other occasions the intake temperature was found to be lower than that obtained by the bucket method.

The general conclusions that were reached as the result of these investigations were :

(1) Intake temperatures tended to be unreliable, owing to uncertainty as to the accuracy of the thermometers used and the position in the engine-room at which they were located, and also owing to lack of knowledge concerning temperature gradients between the surface and the intake at varying draughts.

(2) Although the thermometers used for surface temperatures were accurate, these needed redesigning and the canvas bucket itself was very unreliable under certain conditions. It was decided that the "bucket" method was in general preferable to the intake method as it was more likely to indicate the true temperature of the surface water, but that it was necessary to design and improve the bucket to attain real accuracy.

It was largely as a result of these investigations made in voluntary observing ships during the war, and consequent consultation between the Marine and Instruments Branches, that the insulated bucket discussed by Mr. Ashford was produced.—ED.

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# STORMINESS NEAR SOCOTRA AT THE BEGINNING OF THE SOUTH-WEST MONSOON

BY H. JAMESON, D.SC.

Monthly isopleths of gale frequency for the north-west of the Arabian Sea<sup>1</sup> show a great increase in this frequency for June, at the beginning of the south-west monsoon. This is particularly marked in a comparatively small area to the south-east of Socotra, where the percentage frequency of winds of Beaufort force 7 or more rises from under five in May to over forty in June. The frequency rises to a maximum in July, over 50 per cent, but drops to between thirty and forty in August, and to between five and ten in September.

This jump in the frequencies for June, and the small size of the area showing such high frequencies between July and August, suggested that these phenomena were worth examining in greater detail than monthly frequencies over 5° Marsden squares permitted.

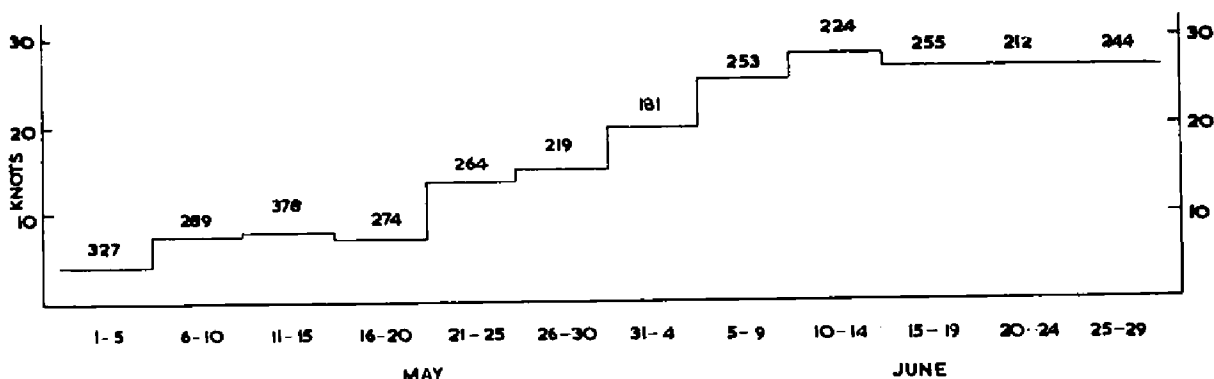


Fig. 1. Average wind in an area near Socotra.

The data available were in two groups; those observations, mainly between 1910 and 1940, that were punched on Hollerith cards, and those, mainly between 1855 and 1905, that were contained in older summaries. The newer data are chiefly from steam or motor vessels, while a large proportion of the older data is from sailing ships.

The first step was to determine more precisely the period over which the probability of heavy winds increased, from the comparatively low values

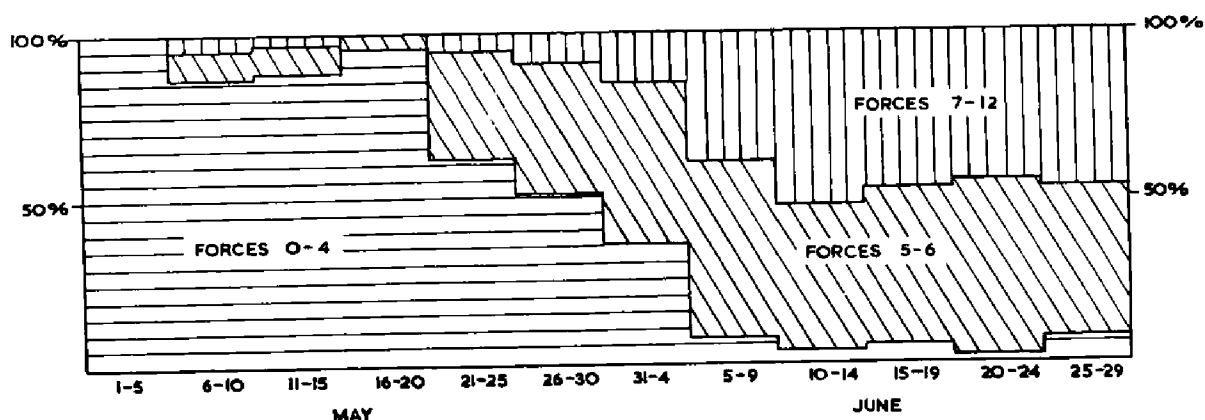


Fig. 2. Percentage frequency of various groups of wind forces in an area near Socotra.

that must have applied to the early part of May to the high values of the south-west monsoon. The area selected for examination comprised the two 5° Marsden squares showing the highest percentage frequencies of winds of Beaufort force 7 and over in June. These were the squares 031C (lat. 5° to 10°N., long. 50° to 55°E.) and 067B (lat. 10° to 15°N., long. 55° to 60°E.).

For each five-day period, from 1st May to 29th June, the number of observations of wind was tabulated for each Beaufort force. As a preliminary step, three separate tabulations were made, two for square 067B, for the Hollerith cards and for the older data respectively, and one for all data in square 031C, for which square the number of observations was much smaller than for 067B.

The average wind in knots over each five-day interval was then computed for each tabulation, using the conversion table, Beaufort force to knots, given in the *Marine Observer's Handbook*, page 64, and graphs were drawn showing, for each set of data, these averages.

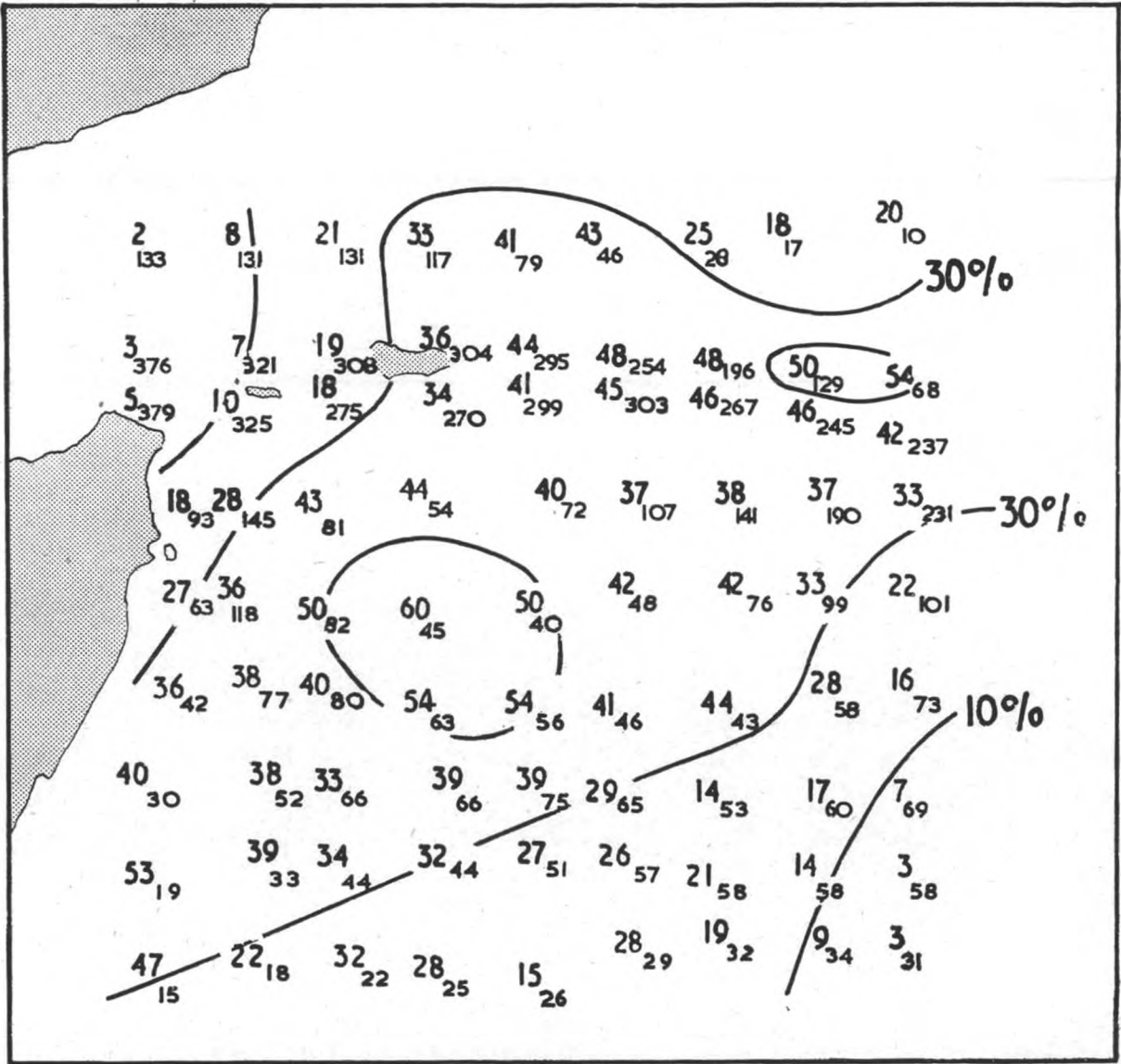


Fig. 3. Percentage frequencies of force 7 or over from Hollerith card data. The number of observations is shown by small figures.

The three graphs agreed fairly well, the data were therefore combined, and the average wind over each five days computed and plotted for the

combined data (see Fig. 1). In this diagram, the number of observations on which each average is based is shown just above it.

There is practically no increase in the average wind between 1st and 20th May. It increases fairly steadily from 21st May to 5th June, and from 5th to 29th June remains fairly constant at about 27 knots.

Fig. 2 shows, for the combined data, the percentage frequency of winds of forces 0-4, 5-6, 7-12 in each five-day group. Up to 20th May, there is very small chance of winds of force 7 or more, or even of force 5 or 6, but during the next fifteen days the probability of fresh or strong winds steadily increases, and from 5th June remains fairly constant at a high level.

To determine more precisely the distribution of storminess near Socotra, the June percentage frequencies of winds of force 7 and over were extracted for each  $1^\circ$  square over the area  $50^\circ$  to  $60^\circ$ E.,  $5^\circ$  to  $15^\circ$ N. The data were computed separately for the Hollerith cards and for the old data. The values obtained were then smoothed by computing the frequencies for overlapping  $2^\circ$  squares, i.e. each  $1^\circ$  square formed part of four  $2^\circ$  squares, except in a few cases near the coast.

These frequencies are plotted in Fig. 3 (Hollerith cards) and Fig. 4 (old

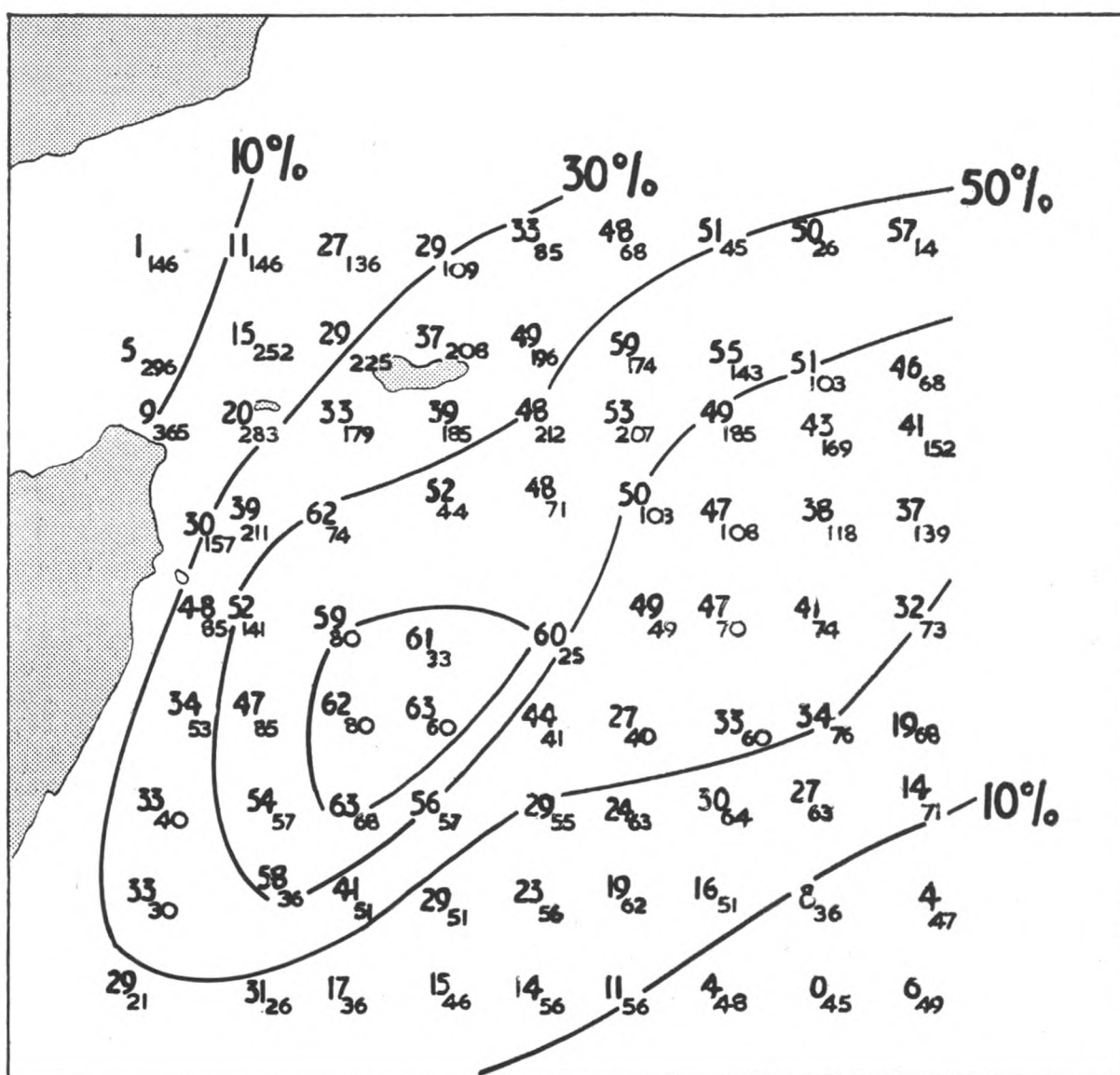


Fig. 4. Percentage frequencies of force 7 or over from old data. The number of observations is shown by small figures.

data). Each frequency is plotted at approximately the centre of position of the observations on which it is based. The isopleths of equal frequency are roughly oval, running SW to NE. There is an area of maximum frequency, well marked in both charts, centred about  $3^{\circ}$  south of Socotra, and another, not so definite, a few degrees to the east of Socotra.

In the stormiest areas, the percentage frequency of winds of force 7 or over is appreciably higher for the old data than for the Hollerith cards. Note the difference in the areas comprised within the isopleth for 50 per cent. This may be due to a real decrease in storminess in the second period considered, or it may be a spurious effect, due either to a tendency to give a higher value to the wind when the observer is on a smaller ship, or to the fact that sailing ships and other ships of small tonnage are more likely to be slowed down in stormy weather than ships of a larger tonnage. The average tonnage of ocean-going ships must have been appreciably smaller between 1855 and 1905 than between 1910 and 1940.

It is of interest to compare the dates over which the mean storminess near Socotra increases, from pre-monsoon to monsoon values, with the corresponding dates for two other areas. An investigation similar to the one above, but on winds observed at a lighthouse off the Ceylon coast, was published in *The Marine Observer* in 1937.<sup>2</sup>

In 1922 a Robinson cup anemometer was installed at the Little Basses Lighthouse, on a reef about six miles from the south-east coast of Ceylon. The average daily wind mileage recorded by this instrument, for each group of five days, from 1st April to 9th June, over the fourteen years 1923-36, was computed.

The average daily mileage showed a very slight increase through April, but rose steadily from 6th to 21st May, approximately, finally reaching a steady figure which was practically the same as the June average.

The mid-date of the change in average wind near Socotra, 28th May, which may be taken as the date for  $11^{\circ}\text{N.}$ ,  $56^{\circ}\text{E.}$  (the centre of position of the June observations) is fifteen days later than the mid-date of the change at the Little Basses Lighthouse, 13th May.

The time over which the sharp rise in average wind strength takes place is about the same (fifteen days) in each case, though the two sets of data are not quite comparable; the Ceylon data refer to a fixed point, while the Socotra data are spread over a considerable area, which would tend to lengthen the time of change.

Data of this type, from Hollerith cards, have also been extracted for the area bounded by the parallels  $15^{\circ}$  and  $20^{\circ}\text{N.}$ , the meridian  $65^{\circ}\text{E.}$ , and the

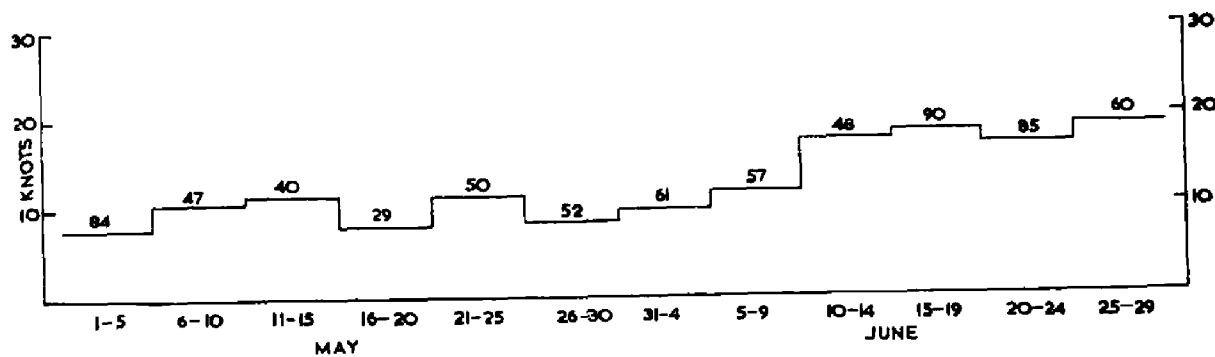


Fig. 5. Average wind in an area off the west coast of India



north-west coast of India. Fig. 5 shows the average wind for each five days from 1st May to 29th June. The number of observations is comparatively small, and the diagram somewhat irregular. The observations, however, are spread over a reasonable number of years, and the graph should give a

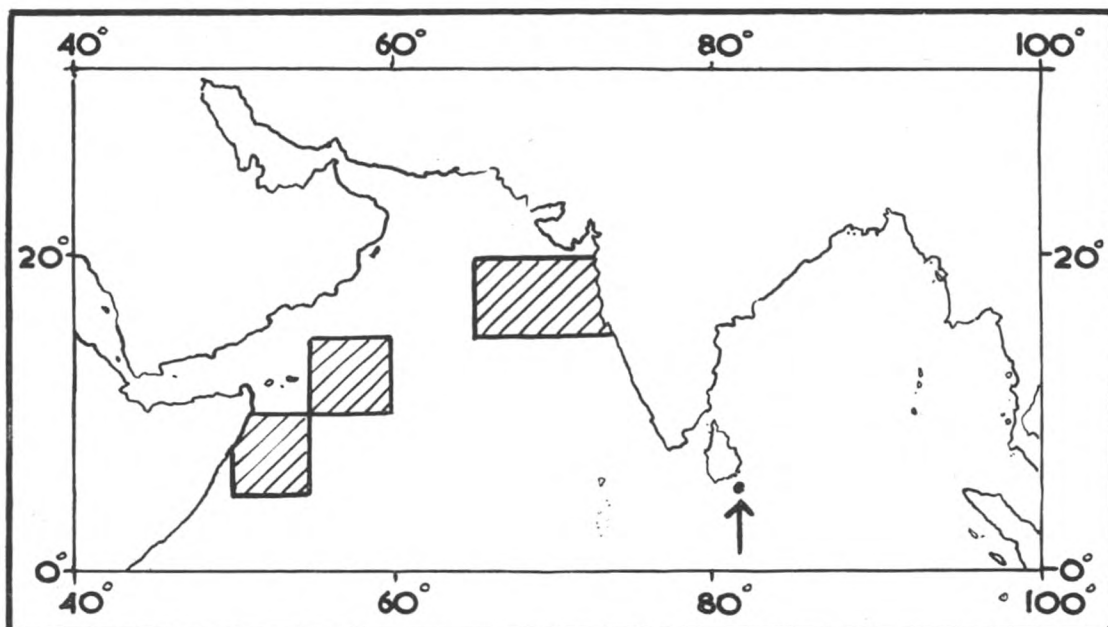


Fig. 6. The situation of the areas discussed.

fair idea of average conditions. It suggests that the average wind increases rather suddenly about 9th June, some twelve days later than the mid-date of the change in average wind near Socotra. This date agrees fairly well with the mean dates for the establishment of the monsoon at Ratnagiri ( $17^{\circ}\text{N.}$ ,  $73^{\circ}\text{E.}$ ), 7th June, and Kolaba ( $19^{\circ}\text{N.}$ ,  $73^{\circ}\text{E.}$ ), 8th June, given by Ramdas in a paper, "Rainfall of India: a Brief Review,"<sup>3</sup> and apparently based on rainfall data.

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### APPOINTMENT OF NEW PORT METEOROLOGICAL OFFICERS (Great Britain)

Port Meteorological Officers have been recently appointed to the ports of Cardiff, Southampton and Glasgow, and an additional nautical officer has been appointed for duty at Harrow. The appointment of these new Port Meteorological Officers is not in any way a reflection upon the admirable work which has been done by the Merchant Navy agents at the ports concerned, but merely a result of our desire to build up the Voluntary Observing Fleet, and to have a permanent officer there who can devote his whole time to the needs of voluntary observing ships and of the maritime interests in the port generally. Sir Benjamin Chave at Southampton, Captain Hall at Cardiff and Captain Elliott at Glasgow have all done a grand

job of work, and the fact that they will cease being our Merchant Navy agents is a matter of regret. Sir Benjamin has been anxious to retire for some time, and Captain Hall, with his many other activities, finds it difficult to cover adequately the rather scattered Bristol Channel area. Captain Elliott was only engaged temporarily, pending the appointment of a Port Meteorological Officer. We feel sure that the many friends these gentlemen have made in voluntary observing ships will join us in wishing them health and happiness in the future.

Mr. K. Milburn, extra master, has been appointed the additional nautical officer at Harrow. He was recently 1st Officer of the *Queen Elizabeth*, and was for some time assisting the Marine Superintendent of the Cunard Company in New York. Mr. Milburn was in the Cunard Company's ships during much of the war, notably the *Queen Mary* and the *Queen Elizabeth*.

Captain J. R. Radley will take over Port Meteorological Officer's duties from Sir Benjamin Chave at Southampton. Captain Radley served as a Lieut.-Commander, R.N.R., during the war, during which he had command of various H.M. ships and was latterly a boom defence officer at Trincomalee. Before the war he was in command of preventive cruisers of the Chinese maritime customs. He has recently been master of a Royal Fleet auxiliary vessel.

The new Port Meteorological Officer at Glasgow will be Captain R. Reid, who has spent a considerable amount of his sea-going career in tankers and was latterly in command of a vessel of the Bulk Oil Steamship Co., Ltd. Captain Reid was at sea in merchant vessels throughout the war, most of his time being spent as Chief Officer.

We are unable to announce at the moment the name of the officer appointed as Port Meteorological Officer at Cardiff, as he is still at sea at the time of going to press and we have not heard yet that he is accepting the post. Captain Reid has in the meantime been temporarily appointed to Cardiff as office accommodation has so far been difficult to find at Glasgow.

All these officers did considerable voluntary meteorological work during their sea careers.

## PERSONNEL

**RETIREMENT.**—CAPTAIN JOHN WAITE CARR, Master of R.M.S. *Asturias*, has retired from the sea after serving over forty-three years afloat. Captain Carr commenced his sea career in 1905, serving his apprenticeship in the barques *Wychwood* and *Windrush*, voyaging to Australia and the west coast of South America. On obtaining his extra-masters' certificate he joined the Royal Mail Company as a junior officer in 1913, and has remained in their employ ever since. Rising through the different grades, Captain Carr obtained his first command, the *Culebra*, in 1937. In October, 1940, when in command of the *Natia*, outward bound to the Plate, his ship was sunk by a German raider. Captain Carr was made a prisoner of war, taken to Germany and kept in captivity until August, 1943, when he returned, on exchange, to England. Since his release he has commanded several of the Royal Mail Company's fleet, including the *Highland Princess*, *Alcantara*, *Almanzora* and *Asturias*.

Marine observers will join with the Marine Branch in wishing Captain Carr long life and happiness in his well-earned retirement.

J. H.



Commander H. Keyser

**RETIREMENT.**—In the retirement of **COMMANDER H. KEYSER**, Director of the Oceanography and Maritime Meteorological Section of the Royal Netherlands Meteorological Institute at De Bilt, international meteorology has lost the services of a valued adviser and a good friend. His knowledge and practical experience of maritime meteorology is unrivalled, and he has always tackled all problems with typical Dutch thoroughness and efficiency.

Commander Keyser was born in Batavia in 1883. In 1900 he entered the Royal Naval Institute at Den Helder (naval cadet-midshipman), and in 1904 was promoted sub-lieutenant. In 1921 he retired as a lieutenant-commander on account of bodily infirmities.

At the time he served in the navy, the general rule was to spend alternately three years in the Indies and three or four years in European waters. Most of his time he served alternately in torpedo-boats and in the Hydrographical Service (surveying in the Indies and in Holland). But he spent also three years in the Navy Department at Batavia and about the same time at the end of World War I in the coastguard in Holland. In 1924 he entered the Meteorological Institute at De Bilt as Assistant Director of the Section on Oceanography and Maritime Meteorology, of which he became Director in 1934.

Commander Keyser, throughout his tenure of office at De Bilt, maintained close contact and had frequent consultations with the Marine Branch of the Meteorological Office—a shining example of international co-operation—to the mutual benefit of both our countries. In his farewell letter, he writes :

“ I think that the background of this so extensive assistance our Section received from your Marine Division must be found in the fact that we all have been sailors and that we were aware that all our work is principally done for the benefit of shipping which, although showing national colours, feels internationally.

“ I wonder whether a better understanding than that between our divisions will ever be found. I hope and trust that this co-operation, which has always been the greatest pleasure to me, will last in the future.”

We wish him every happiness in his retirement and a long life in which to enjoy it.

C. E. N. F.

**SOUTHERN ICE REPORTS**  
**During the Year 1948**  
**April**

YEAR	DAY	POSITION		DESCRIPTION	REMARKS	NAME OF SHIP REPORTING
		LATITUDE	LONGITUDE			
1948	7	43 57S	33 12W	Berg.	Estimated dimensions : height 40 ft., length 100 ft. A very large single iceberg, observed from a distance of approximately 8 to 10 miles. Estimated dimensions of berg were : length 2 or possibly 2 to 3 miles ; breadth uncertain, possibly 1 to 1 1/2 mile ; height 300 ft.	Myrtlebank
	14	44 00S	55 33E	Berg.		

Reports of ice previous to April, May and June, 1948, will be found in *The Marine Observer*, Vol. XVIII, No. 140, pages 114, 115.

May and June, no reports received.

# FLEET LIST (Great Britain)

## VOLUNTARY OBSERVING SHIPS

The following is a list of British ships, voluntarily co-operating with the Marine Branch of the Meteorological Office. The names of the Captains, Observing Officers, and Senior Radio Officers are given as ascertained from the last written return received. The date of receipt of the last return received is given in the 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 are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published in a special list in the *Marine Observer*.

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

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

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Accra</i>	L. C. Cave	J. R. Smith, L. Austin, C. Morrison	J. A. Stuart	Elder Dempster Lines, Ltd.	18.1.49
<i>Admiral Sir John Lawford</i>	W. B. Hicks	R. L. Cain, J. Linton, W. J. Evans	T. D. Sullivan	Iago Steam Trawler Co., Ltd.	3.1.49
<i>Afghanistan</i>	W. A. Chappell	E. W. Strudley, E. B. Bertelsen, C. M. Best, A. S. Cuny	C. Calvey	Strick Lines, Ltd.	28.1.49
<i>Ajax</i>	W. T. Spencer	J. Tierney, J. Scott, D. A. C. Adams	J. A. Soulsby	Shaw, Savill & Albion Co., Ltd.	4.5.48
<i>Akaroa</i>	J. Steele	D. J. Roberts, R. Pangelly, C. Eastwood	A. Attlewell	Anglo-Saxon Petroleum Co., Ltd.	6.8.48
<i>Anastra</i>	N. A. Neeves				
<i>Andes</i>	D. A. Casey, C.B.E., D.S.O., D.S.C., R.D., R.N.R.				
<i>Apapa</i>	J. J. Smith	F. M. Dickinson, R. Box, J. Ashworth	W. Smith	Royal Mail Lines, Ltd.	4.1.48
<i>Aquitania</i>	R. B. G. Woollatt, R.D., R.N.R.	J. A. Jackson, F. P. Garbett, J. A. Nicholson	R. F. Barrett	Elder Dempster Lines, Ltd.	7.12.48
<i>Arabia</i>	G. H. Morris	E. Willis, G. H. Griffiths, J. Mills	S. W. Brown	Cunard White Star, Ltd.	28.10.48
<i>Arabistan</i>	J. H. Metcalfe	R. Jones, D. H. Shinnin, E. E. Wilks	B. H. Long	Cunard White Star, Ltd.	6.1.49
<i>Araby</i>	G. H. Taggart	H. B. Watkins, R. P. Ashe	A. Hitchin	Strick Lines, Ltd.	18.3.48
<i>Arakaka</i>	J. A. Carter	J. A. Phillips, G. G. Chatterley, G. A. Keek, P. J. Robinson	P. Carbisley	Royal Mail Lines, Ltd.	13.10.48
<i>Argentina Star</i>	D. R. MacFarlande, O.B.E., D.S.O.	W. Boyle, S. Armitage, E. J. Price	T. McBride	Arakaka S.S. Co., Ltd.	10.11.48
<i>Argyll</i>	J. Dodds	K. White, D. G. Hastie, J. Allen	D. K. Murdock	F. Leyland & Co., Ltd.	7.9.48
<i>Arquani</i>	R. A. Thorburn	A. Fielding, T. Rowe, F. Johnson	J. Downey	B. J. Sutherland & Co., Ltd.	20.1.49
<i>Artisan</i>	W. Moore	L. Scott	A. N. Taylor	Elder & Fyffes, Ltd.	4.1.49
<i>Arundel Castle</i>	H. A. Dellar	C. A. V. Daly, J. Cubbin, J. Wright	C. Clancy	Charente S.S. Co., Ltd.	7.1.48
<i>Ascania</i>	J. Quayle, R.D., R.N.R.	K. A. Trowbridge	— Pitt	Union Castle Mail S.S. Co., Ltd.	17.9.48
<i>Asia</i>	J. L. Croasdaile	J. B. Clementson, J. Boyce, G. H. Drinkwater	M. A. Kempe	Cunard White Star, Ltd.	17.10.47
<i>Asturias</i>	J. W. Carr	C. A. Roy, D. S. Lomax, D. J. Steff	W. J. Rainey	Cunard White Star, Ltd.	18.3.48
		F. Williams, G. H. Emerton, K. J. Colombo	A. Banberry	Royal Mail Lines, Ltd. (Managers)	



NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Athelchief</i> ..	A. W. Pegg ..	G. W. Williams, W. Roberts, B. Jarrett ..	W. Bradbury ..	Tankers, Ltd. ..	3.9.48
<i>Athelregent</i> ..	C. Ray ..	A. Sugden, C. Ferguson, D. W. Waite, E. Peers ..	R. W. Evans ..	Athel Lines, Ltd. ..	28.8.48
<i>Athletic</i> ..	D. Achison ..	A. E. Smith, J. W. Webster, J. W. Wood, W. S. Allen ..	D. Haggart ..	Shaw, Savill & Albion Co., Ltd. ..	13.10.48
<i>Athlone Castle</i> ..	R. Wren, D.S.O. ..	W. D. Fletcher, A. Peers-Jones, M. W. Williams ..	J. H. Summers ..	Union Castle Mail S.S. Co., Ltd. ..	8.1.49
<i>Auricula</i> ..	H. Sangster ..	N. Douglas, R. R. Stonehouse, A. Phillips ..	J. Sanderson ..	Anglo-Saxon Petroleum Co., Ltd. ..	10.9.48
<i>Australind</i> ..	J. F. Wood ..	J. Stevenson, J. B. McGowan, N. M. Johnson ..	K. Morris ..	Australind S.S. Co., Ltd. ..	25.2.48
<i>Balanitia</i> ..	F. A. C. Thacker ..	J. Mitchell, W. Sturrock, G. L. Fraser ..	P. E. Goggin ..	Royal Mail Lines, Ltd. ..	4.1.49
<i>Baltara</i> ..	G. E. Thomas ..	E. E. R. Roberts, R. E. G. Simmons, — Davies ..	G. James ..	United Baltic Co., Ltd. ..	4.1.49
<i>Bariff Park</i> ..	E. Bursby ..	T. Burke, G. Dunn, R. Rutherford ..	J. Spicer ..	Sir Eric Ohlson (Managers) ..	20.5.48
<i>Barjama</i> ..	M. Fraser ..	W. Flett, T. L. Harcus ..	J. Peacock ..	Barline Transport, Ltd. ..	20.10.47
<i>Baron Macaulay</i> ..	A. Campbell ..	G. Baxter, J. R. Foster ..	W. McLaren ..	Hogarth S.S. Co., Ltd. ..	12.1.47
<i>Basinghall</i> ..	J. Hall ..	R. J. Lungley, J. F. Thompson, P. T. Dermison ..	W. R. Benyon ..	Barberrys S.S. Co., Ltd. ..	9.9.48
<i>Batherville</i> ..	E. Pugh, O.B.E. ..	F. Smith, J. Peck, E. J. Beaumont ..	A. D. Gardner ..	Britain's S.S. Co., Ltd. ..	4.1.49
<i>Bassano</i> ..	G. Hodgson ..	A. Cox, A. Ferguson, N. G. King ..	T. Ainsworth ..	Canadian Pacific Railway Co. ..	26.1.49
<i>Beaconsfield</i> ..	A. E. W. Woodcock ..	S. Fieldhouse, J. F. Hercus, A. Aikman ..	J. A. McAskill ..	Canadian Pacific Railway Co. ..	5.1.49
<i>Beaverburn</i> ..	C. E. Duggan, R.D., R.N.R., J. P. Dobson, R.D., R.N.R. ..	P. F. Williams, R. D. P. Gillett, R. A. Jones ..	L. Norton ..	Canadian Pacific Railway Co. ..	11.1.49
<i>Beavercore</i> ..	S. W. Keay, O.B.E., L.W.M. ..	R. W. Savage, W. Williams, J. Jayling ..	R. Burch ..	Canadian Pacific Railway Co. ..	7.12.48
<i>Beaverdel</i> ..	J. Soam ..	L. Kinsas, D. Bryce, J. Mackay ..	A. R. Humphries ..	Canadian Pacific Railway Co. ..	19.7.48
<i>Beaverglan</i> ..	C. L. de H. Bell, D.S.C. ..	G. W. Bateman, G. Palmer, J. L. Kirby ..	J. Brennan ..	Ben Line Steamers, Ltd. ..	19.1.49
<i>Beaverlake</i> ..	D. G. Martin ..	J. W. Gardiner, E. Peirce, J. L. Kirby ..	J. E. Kemp ..	Ben Line Steamers, Ltd. ..	11.9.48
<i>Bekentham</i> ..	E. Massarella ..	A. King, R. D. Robb, J. Amos ..	B. J. Saltwell ..	Ben Line Steamers, Ltd. ..	6.8.47
<i>Benarty</i> ..	J. Cringle ..	R. Winn ..	I. M. Fraser ..	Ben Line Steamers, Ltd. ..	4.11.48
<i>Bencladi</i> ..	A. P. Paterson ..	R. M. Drummond, T. P. Barr, J. Scott ..	J. L. Wells ..	Ben Line Steamers, Ltd. ..	13.10.48
<i>Benloch</i> ..	J. B. Hastie ..	G. Pirie, C. Donnelly, K. R. Wilson ..	R. G. Thomson ..	Alexander S.S. Co., Ltd. ..	7.12.48
<i>Benrachie</i> ..	W. C. Wilson ..	W. O. Atkinson, M. J. Peyton-Bruhl, A. Wallace, A. King ..	H. MacLennan ..	Rio Cape Lines, Ltd. ..	4.11.48
<i>Bibury</i> ..	J. R. Faulkner ..	E. F. Cole, G. R. Evans ..	J. I. Waddell ..	F. Leyland & Co., Ltd. ..	12.1.49
<i>Black Prince</i> ..	H. I. Pinnel ..	G. R. Sherlock, P. N. Giles, B. S. Biggs ..	F. E. Smith ..	Ellermans' Wilson Line, Ltd. ..	19.5.48
<i>Brasil Star</i> ..	G. Duff, G.M. ..	D. S. Gilmore, L. J. Thompson, D. M. McPhail ..	D. I. Eastwood ..	Cunard White Star, Ltd. ..	4.9.48
<i>Bravo</i> ..	E. Tyler ..	C. Everingham, J. McAndrew, J. H. Spandler ..	R. A. Macleod ..	British Tanker Co., Ltd. ..	16.4.47
<i>Brisbane Star</i> ..	F. N. Riley, D.S.O. ..	R. M. Bremburg, R. H. Stark, G. Munro ..	J. Sheeham ..	British Tanker Co., Ltd. ..	7.5.48
<i>Britannic</i> ..	H. Dixon ..	M. J. Dodds, R. McDougall, J. Rawlinson ..	A. E. Adams ..	British Tanker Co., Ltd. ..	29.12.47
<i>British Colonial</i> ..	E. L. Miller ..	W. S. Jager ..			
<i>British Commodore</i> ..	N. Pinkney ..	R. Maybourne, E. W. Shingler, W. H. Thornton ..			
<i>British Endurance</i> ..	W. Watkin-Thomas O.B.E., D.S.C. ..	S. H. Faulkner, A. D. Millar, P. C. Coyne ..			

<i>British Energy</i>	..	J. G. Hill	..	E. Hornby, D. Mackinnon, F. Derby	F. J. O'Commer	British Tanker Co., Ltd.	6.8.48
<i>British Escort</i>	..	H. G. Jeary	..	J. A. S. Miller, J. S. Lawson, J. Mackay	P. Charlton	British Tanker Co., Ltd.	26.1.49
<i>British Hussar</i>	..	T. J. Dicken	..	J. A. Picken, W. R. Syman, D. H. Ferrett	C. O'Mahony	British Tanker Co., Ltd.	18.12.47
<i>British Lancer</i>	..	W. S. Vittle	..	E. L. Mitchinson, S. E. Banyard, G. Lawrence	J. Appleton	British Tanker Co., Ltd.	24.8.48
<i>British Marquis</i>	..	G. W. Kemp	..	J. Hutchison, C. D. Bishop-Leggett	F. P. Bellamy	British Tanker Co., Ltd.	12.11.48
<i>British Patience</i>	..	F. S. Hall	..	L. McRitchie, H. Haigh, W. Johnston	H. Dunne	British Tanker Co., Ltd.	7.7.48
<i>British Pilot</i>	..	R. O. Cash	..	H. D. Williams, A. F. Bowen, C. A. Patterson	A. E. Trim	British Tanker Co., Ltd.	5.1.49
<i>British Piper</i>	..	J. Samson	..	A. Fraser, P. F. Mason, E. C. Ford	F. G. Rimmington	British Tanker Co., Ltd.	15.10.48
<i>British Power</i>	..	K. M. Mitchell	..	A. L. Wheaton, T. Horne, W. Chanville	F. Guiller	British Tanker Co., Ltd.	8.9.48
<i>British Pretige</i>	..	J. H. Wilson	..	T. Giffard, D. Battell	K. Morris	British Tanker Co., Ltd.	2.10.47
<i>British Resolution</i>	..	J. Balger	..	C. V. Harrison, J. B. Hunter, F. A. Lapper	G. W. Bayliss	British Tanker Co., Ltd.	29.12.47
<i>British Statesman</i>	..	W. P. Booth	..	J. Fox, J. Cavanagh, A. N. Brook	E. E. Clancy	British Tanker Co., Ltd.	28.10.48
<i>British Swordfish</i>	..	H. A. Wright	..	F. W. Gant, J. H. Looker	N. W. Hodgson	Royal Mail Lines, Ltd.	12.10.48
<i>Brittany</i>	..	D. J. Jones	..	L. A. Savers, Lt.-Cdr., R.N.R., W. T. Pitcher, B. E. Cole	T. J. Keily	Moor Line, Ltd.	18.9.48
<i>Brockley Moor</i>	..	J. Whayman, D.S.C. and Bar, R.D., R.N.R.	..	A. Coratt	E. Johnson	Lampport & Holt Line, Ltd.	11.1.49
<i>Bronte</i>	..	G. Bull	..	C. Sutherland, C. Percy, J. Holland	R. Young	Cairns, Noble & Co., Ltd.	6.12.48
<i>Bulby</i>	..	J. W. Binns	..	J. Hogg, W. Errington, J. Baxter	S. J. D. Taylor	Cairns, Noble & Co., Ltd.	19.1.49
<i>Byron</i>	..	A. Henderson	..	T. D. Ridley, N. E. Forth, J. W. Curthbertson	J. R. C. Johnson	P. & O Steam Navigation Co.	14.12.48
<i>Carnarvon</i>	..	I. G. Foster	..	T. O. Langlands, J. W. Gorrie, C. Milne	I. A. Hamilton	Hudson Bros. Trawlers, Ltd.	13.2.47
<i>Carnesh</i>	..	N. E. Forth	..	G. S. Gooden-Christian, J. M. Donkin, F. T. Jones	R. N. Dixon	Hudson Bros. Trawlers, Ltd.	14.6.48
<i>Carnusvalona</i>	..	J. H. Brown	..	J. A. Hamilton	S. Gracie	Cape York S.S. Co., Ltd.	4.7.48
<i>Caledonia</i>	..	G. Stable	..	W. E. Woodall, R. N. Dixon	H. Butler	Union Castle Mail S.S. Co., Ltd.	5.1.49
<i>Canton</i>	..	C. Agerscow	..	G. O. Lambert, D. E. Cornack, I. Thomson	J. Park	R. Chapman & Sons	4.1.49
<i>Cape Barfleur</i>	..	W. E. Woodall	..	L. MacEwan, A. George, R. J. King	W. A. Brown	Union Castle Mail S.S. Co., Ltd.	21.9.48
<i>Cape Gloucester</i>	..	R. A. Cook	..	H. Butler	W. H. Chick	P. & O. Navigation Co., Ltd.	19.1.49
<i>Cape Mariato</i>	..	H. S. Todd	..	A. Dodd, W. A. Marriss, A. A. Abdullah	A. Austin	Barberry's S.S. Co., Ltd.	22.11.47
<i>Cape Trafalgar</i>	..	J. B. McReynolds, D.S.C.	..	K. T. McNish, W. S. Brown, J. Scott	M. Ward	Monarch S.S. Co., Ltd.	6.1.47
<i>Cape York</i>	..	D. W. Sorrel	..	D. Parsons, P. J. Passmore, D. T. Bolas	J. E. Unsworth	Shaw, Savill & Albion Co., Ltd.	13.1.48
<i>Capetown Castle</i>	..	K. Wardale	..	T. Burke, F. Barber, E. Harvey	T. Goodman	Hadley S.S. Co., Ltd.	29.9.48
<i>Carlton</i>	..	J. B. McReynolds, D.S.C.	..	J. Wilson, F. Hamilton, R. Crawford	R. C. Whiting	Bibby Line, Ltd.	13.10.48
<i>Carnarvon Castle</i>	..	S. H. French	..	E. A. Muir	J. O'Brien	Prince Line, Ltd.	14.12.48
<i>Caronia</i>	..	S. A. Sapsworth	..	W. Slater, B. P. Payling	G. C. Fyfe	British India Steam Navigation Co., Ltd.	5.1.49
<i>Carthage</i>	..	J. M. Cherny	..	R. D. Filder, P. Saunders, R. Sly	Ellerman City Line, Ltd.	Ellerman City Line, Ltd.	12.10.48
<i>Castina</i>	..	J. H. Keir	..	M. Musson, H. Jennings, H. Bragg			
<i>Celtic Monarch</i>	..	A. V. Richards	..	R. W. Allerton, H. S. F. Strawbridge, W. Hilcoat			
<i>Ceramic</i>	..	I. F. Auld	..	J. Henderson, J. Ballantyne, D. Russell			
<i>Cerintus</i>	..	F. C. Brooks	..	A. B. Bowman, R. J. Binnie, E. V. Williams, P. Seiffert			
<i>Cheshire</i>	..	F. S. Thornton, O.B.E.	..	D. Inglis, I. McDermid, N. Dalziel, A. Bickerton			
<i>Chinese Prince</i>	..	J. D. Woods	..				
<i>Chupra</i>	..	A. C. Johnston	..				
<i>Cilicia</i>	..	E. M. Jenkins	..				
<i>City of Barcelona</i>	..	W. H. Matheson, O.B.E.	..				
<i>City of Calcutta</i>	..		..				

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
City of Canberra	F. Tibbetts	W. H. Wilson, E. J. A. Smith, D. J. Curson	J. S. Forest	Ellerman Line, Ltd.	31.7.48
City of Capetown	W. S. Coughlan, O.B.E.	W. E. Fletcher, P. Redhead, A. Ramsden	D. R. Cronbie	Ellerman Hall Line, Ltd.	13.8.48
City of Carlisle	L. E. Smith, M.B.E.	W. Taggart, J. Irvin, B. Pickering	P. J. McKeon	Ellerman & Bucknall S.S. Co., Ltd.	19.12.47
City of Chester	R. Longstaff, D.S.O.	K. B. James, R. M. Faulds, P. G. Thomas	J. A. Vallance	Ellerman Hall Line, Ltd.	23.6.48
City of Derby	A. M. Hamilton	F. Chisholm, D. J. Inglis, J. A. Potter	J. Appleton	Ellerman Line, Ltd.	21.9.47
City of Delhi	A. G. Melville	R. T. Tyrrell, J. Waddleton, R. Huntingdon	R. MacDonald	Ellerman & Bucknall S.S. Co., Ltd.	18.1.48
City of Dieppe	E. G. Chapman	A. J. Tyrrell, D. J. Lloyd, A. G. Hine	W. Foster	Ellerman Line, Ltd.	5.12.48
City of Dundee	F. M. Womersley	R. Jones, J. A. Whieldon, L. G. Powell	H. M. O'Gorman	Ellerman Line, Ltd.	26.1.49
City of Durham	T. H. Speakman	H. McL. Farquhar, D. S. Taylor, J. W. Terris	J. Martwieu	Ellerman City Line, Ltd.	14.10.48
City of Exeter	J. J. Andrew	R. Miller, N. Groundwater, D. W. Wardlaw	G. S. Creighton	Ellerman City Line, Ltd.	16.12.48
City of Hereford	G. A. Ring	T. Rigg, J. F. Mason	S. C. Ombler	Ellerman Line, Ltd.	25.1.49
City of Johannesburg	D. L. Lloyd, O.B.E.	H. Routledge, H. Lewis, C. Craddock	A. R. Henderson	Ellerman Hall Line, Ltd.	4.1.49
City of Khartoum	J. A. Beynon	D. L. Cox, W. Folder, D. A. Appleton	J. Dolan	Ellerman Hall Line, Ltd.	5.11.48
City of Lille	E. Scrymgeour	R. B. May, H. M. Steele, G. S. Gurnes	A. Julius	Ellerman Line, Ltd.	17.3.48
City of Lyons	H. Johnson	J. Morrison, A. R. Horan, R. Clark	W. Anderson	Ellerman Hall Line, Ltd.	7.9.48
City of Paris	H. Percival, O.B.E., R.D., Cdr., R.N.R. (Rtd.)	G. G. Francis, M. A. Perry, J. Brown	W. Rouffinac	Ellerman City Line, Ltd.	25.5.48
City of Pretoria	T. F. Labey	T. C. Dickinson, P. Seiffert, K. Haslam	W. Lupton	Ellerman & Bucknall S.S. Co., Ltd.	2.3.48
City of Swansea	G. Vickers	B. Walker, J. I. Blanch, Cooper	M. Price	Ellerman Hall Line, Ltd.	5.11.48
City of Sydney	J. B. Maclaren	E. Bondfield, R. H. Bellhouse, E. Redshaw	—, McTigue	Ellerman Hall Line, Ltd.	4.1.49
City of Tokyo	R. L. Stewart	M. Graham, T. Ruigg, E. F. Brick	A. C. Macaully	Ellerman & Bucknall S.S. Co., Ltd.	9.9.48
City of Windsor	W. S. Doidge	W. Kendall, S. F. Nicholson, E. J. E. Owen	W. M. Morrison	Clan Line Steamers, Ltd.	4.1.49
Clan Brodie	B. Vernon-Browne	G. Hughes, F. King, G. Healy	W. Harper	Clan Line Steamers, Ltd.	4.1.49
Clan Buchanan	T. W. Inman, O.B.E.	D. S. Tosh, E. M. Crawley, J. Benyon, J. Hay	R. F. Cole	Clan Line Steamers, Ltd.	16.9.47
Clan Campbell	J. A. Forster	J. W. Ward, F. Turton, D. R. Godfrey	J. Shillabeer	Clan Line Steamers, Ltd.	27.9.48
Clan Chattan	H. C. Simpson, O.B.E.	R. S. Russell, A. G. Allison, J. P. Marshall	J. A. Gray	Clan Line Steamers, Ltd.	4.1.49
Clan Chisholm	J. H. Crellin	F. C. Doyle, A. T. Campbell, C. J. Abbott	W. H. Seville	Clan Line Steamers, Ltd.	15.12.48
Clan Davidson	H. J. Anchor, O.B.E., R.D., R.N.R.	T. R. Halliday, M. P. R. Turner, J. L. Easton	R. G. Gooseman	Clan Line Steamers, Ltd.	7.12.48
Clan Forbes	H. S. Pengelly	J. P. Dumphy, F. Lionet, D. Milner	G. Martyn	Clan Line Steamers, Ltd.	5.11.48
Clan Macaulay	A. G. Storkey	G. Bagnell, J. C. Montgomery, R. C. Pearce	C. E. C. Crew	Clan Line Steamers, Ltd.	18.1.49
Clan Mac Donald	H. Cater	J. Baxter, R. Harris, D. Richards	R. W. Moore	Clan Line Steamers, Ltd.	4.1.49
Clan Macdougall	R. P. Galer, C.B.E., R.D., R.N.R.	L. W. Gibbins, A. Graham, P. L. Leslie	R. Dingley	Clan Line Steamers, Ltd.	7.12.48
Clan Maclaren	E. H. O. Stone	J. C. Mathieson, D. F. R. Bussereau, T. Aitchison	A. P. Young	Clan Line Steamers, Ltd.	1.9.48
Clan Mac Nair	E. W. Jenkin	R. E. Hayward, J. Chappell, P. C. W. Hobby	N. J. Braddon	Clan Line Steamers, Ltd.	27.8.48
Clan Macneil	S. F. Carter	W. C. Rodgers, M. N. Ure, T. N. Geesin, J. Walker	A. F. MacIntyre	Bank Line, Ltd.	14.7.48
Clan Macrae	H. J. Anchor, O.B.E., R.D., Cdr., R.N.R.	G. A. Gregory, A. R. Howson, E. A. D. Vargas	A. G. Roberts		
Clan Urquhart	C. G. Parfitt				
Clydebank	J. W. Griez				

<i>Clydefield</i>	..	H. Vaughan-Jones	W. C. Muir, A. L. Dixon	P. Dwyer	Northern Petroleum Tank S.S. Co., Ltd.	25.1.49
<i>Columbia Star</i>	..	C. I. W. Jones	L. Tessier, A. G. Smith, B. Edgington	J. Lovelock	Blue Star Line, Ltd.	16.7.48
<i>Comanche</i>	..	T. Potts	W. A. Willis, A. E. Hughes, F. P. Barber	W. E. Gilbert	Anglo-American Oil Co., Ltd.	1.10.48
<i>Comedian</i>	..	R. L. Williams	D. Ashdown, D. O. Percy, D. P. Rennie	A. Copeland	Charente S.S. Co., Ltd.	13.10.48
<i>Comlebank</i>	..	W. Mendus	A. J. Whiston, R. Clark, S. J. East	W. M. Fryer	Bank Line, Ltd.	16.2.48
<i>Condesa</i>	..	R. Smiles	E. G. Roberts, R. F. Martin, A. Byers	M. McDougall	Furness Houlder Argentine Line, Ltd.	19.2.48
<i>Consuelo</i>	..	F. Barnard, M.B.E.	C. Everingham, G. Saltmarsh, R. C. Neasham	K. K. Klosser	Ellerman's Wilson Line, Ltd.	12.1.49
<i>Corinthic</i>	..	G. M. Robertson, D.S.C.	J. H. Wilde, Woodbridge, Moore	B. Baxter	Shaw, Savill & Albion Line Co., Ltd.	16.12.48
<i>Cornwall</i>	..	J. W. C. Pring	R. S. Webster, P. A. Ogden, G. W. Wotton	J. Couchman	Federal Steam Navigation Co., Ltd.	11.11.48
<i>Corrientes</i>	..	W. Anderson	R. Allan, C. Martin, R. Aitken	R. Andrews	Donaldson Line, Ltd.	1.7.48
<i>Coulgorm</i>	..	G. Robinson	W. J. Kelly, T. F. Tuomey, J. Ridley	A. J. Long	Dornoch S.S. Co., Ltd.	16.12.48
<i>Custodian</i>	..	A. H. Thompson	C. S. S. Boam, A. P. Sandford	N. Bradbury	Charente S.S. Co., Ltd.	22.4.47
<i>Darro</i>	..	B. A. Gammon	J. M. Barber, R. Finch, W. Tressider, B. Harrison	J. Freeman	Royal Mail Lines, Ltd.	13.10.48
<i>Deebank</i>	..	B. Rivett	D. Campbell, T. Ridgeway, I. McKay	T. Stowers	Bank Line, Ltd.	2.5.48
<i>Defoe</i>	..	W. C. Blake	J. Crowe, P. Leighton, H. Smith	A. Read	Lampport & Holt Line, Ltd.	14.10.48
<i>Delane</i>	..	R. McNie	D. Stewart, J. Rodger, J. Wainwright	R. Pryer	Lampport & Holt Line, Ltd.	22.1.49
<i>Deltus</i>	..	H. W. Underhill	W. Jones, A. Bennett, D. Bottomley	G. Heapy	Donaldson Line, Ltd.	13.10.48
<i>Dentighshire</i>	..	W. J. Dark	E. G. Painter, D. MacLachlan, L. Henshall	H. Kenny-Levick	Glen Line, Ltd.	17.8.48
<i>Derryclare</i>	..	G. Smith	E. T. Paddon, E. Racher	S. Fletcher	MacGowan & Gross, Ltd.	4.1.49
<i>Deseado</i>	..	B. C. Dodds, O.B.E.	J. H. Napper, W. B. Avison, J. Holt, F. C. Alwoon	L. Brazill	Royal Mail Lines, Ltd.	4.11.48
<i>Devils</i>	..	T. J. Sweeney	D. H. Cordovo, G. Shackleton	A. Williams	Lampport & Holt Line, Ltd.	9.7.48
<i>Devon</i>	..	A. Hocken	J. Bryant, J. M. Mead, M. Shaw, W. Smith	J. Fletcher	Federal Steam Navigation Co., Ltd.	7.12.48
<i>Devonshire</i>	..	J. E. Cullan, O.B.E.	J. Farrow, R. Driver, B. McMannus	S. J. Taylor	Bibby Line, Ltd.	27.9.48
<i>Dizwara</i>	..	F. L. Sampson, D.S.C.	H. B. Cray, J. A. G. Bridgeman, J. W. Walker	J. Murphy	British India Steam Nav. Co., Ltd.	18.8.48
<i>Dominion Monarch</i>	..	Sir Henry Gordon, K.B., D.S.C.	A. H. B. Anderson, A. H. N. Pugh, R. D. Fox	J. Cooper	Shaw, Savill & Albion Co., Ltd.	18.7.48
<i>Dorelian</i>	..	D. MacQueen	A. J. Dougall, I. M. Macfarland, E. H. Knox	G. M. Hargreaves	Donaldson Line, Ltd.	3.1.49
<i>Doris Clunies</i>	..	J. G. Stevenson	J. B. White, K. M. Hamilton, W. D. Blingow	N. T. Roberts	Doris S.S. Co., Ltd.	4.11.48
<i>Drina</i>	..	A. N. Anderson	R. M. Tysoe, J. Rutter, C. A. Miller	G. A. Sutherland	Royal Mail Lines, Ltd.	5.11.48
<i>Dromore</i>	..	R. E. L. Holland	J. McCool, R. Simmons, P. R. Farthing	S. J. Hardman	Johnston Warren Lines, Ltd.	31.7.48
<i>Dryden</i>	..	C. L. Lagg	K. Quirk, J. S. Peterkin, J. L. Radcliffe	D. R. Uglow	Lampport & Holt Line, Ltd.	17.7.47
<i>Duke of Athens</i>	..	J. G. Lomas, A.I.N.A.	J. Morris, L. Labistour, J. G. Perrin	J. Humphrey	Trent Maritime Co., Ltd.	29.9.48
<i>Dunkery Beacon</i>	..	A. C. E. Green	I. D. B. Wylie	A. S. J. Broadbent	Crawford Shipping Co., Ltd.	22.9.48
<i>Dunster Grange</i>	..	F. Kent	H. Neal, A. Gibbs, C. Mullings	H. A. Liggins	Houlder Line, Ltd.	5.1.49
<i>Durango</i>	..	W. H. Roberts	M. W. N. Weeks, M. J. Dean, J. M. Cree	E. R. Saunders	Royal Mail Line, Ltd.	18.1.49
<i>Durban Castle</i>	..	C. C. Page	K. M. Knight, R. G. Patterson	E. C. Bouel	Union Castle Mail S.S. Co., Ltd.	31.7.48
<i>Durham</i>	..	R. J. Dunning	G. Fulcher, J. Van der Stratten, G. Dunsfield	J. Hodgson	Eastern Australian S.S. Co., Ltd.	18.10.48
<i>Eastern</i>	..	M. C. G. Stratford	C. D. Dykes, W. S. Drew, E. Bennett, S. W. Mort	L. Sutton	Union Castle Mail S.S. Co., Ltd.	26.1.49
<i>Edinburgh Castle</i>	..	T. W. McAllen	R. S. G. Eckford, J. W. Rogers	L. Hooper	Lobitos Oilfields, Ltd.	7.12.48
<i>El Gallo</i>	..	E. N. Richardson	W. Swan, A. C. Bramble, T. M. Webber	D. Thompson	Donaldson Bros. & Black, Ltd.	13.1.49
<i>Empire Brent</i>	..	J. Cook	J. Short, A. G. McCallum, S. Erving	T. M. Keddie	Anchord Line, Ltd. (Managers)	14.10.48
<i>Empire Halladale</i>	..	E. Stornmont, M.B.E.	G. Ramage, W. A. Brownlie, W. Marshall	T. Prenton	Bullard King & Co., Ltd. (Managers)	19.6.47
<i>Empire Kinsman</i>	..	A. Richardson	G. McGowan, D. B. Butler		Bolton S.S. Co., Ltd. (Managers)	18.1.49
<i>Empire Martaban</i>	..	E. Longster	A. F. Cameron, A. Moore, R. V. Perkin		Bibby Line, Ltd.	
<i>Empire Pride</i>	..	E. D. Bland				

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Empire Star</i> ..	S. J. C. Phillips, C.B.E.	M. R. Bremberg, F. P. McGuckin, J. D. Brewster ..	M. J. Hynes ..	Blue Star Line, Ltd. ..	28.10.48
<i>Empire Viceroy</i> ..	M. D. Mackenzie ..	A. C. Cable, A. Purvis, D. L. Jardine ..	R. Porter ..	Counties Ship Management Co., Ltd. ..	4.11.47
<i>Empress of Australia</i> ..	J. P. Dobson, D.S.C., R.D., Cdr., R.N.R. ..	B. Snell, A. C. Ingram ..	W. Campbell ..	Canadian Pacific S.S., Ltd. ..	15.12.48
<i>Empress of Canada</i> ..	E. A. Shergold ..	A. F. Miller, B. Snell, J. H. Fraser ..	J. M. Butterworth ..	Canadian Pacific S.S., Ltd. ..	4.1.49
<i>Empress of France</i> ..	H. H. Davies ..	W. R. Owen, R. D. Williams ..	T. Murphy ..	Canadian Pacific S.S., Ltd. ..	19.1.49
<i>Epsom</i> ..	R. D. Griffiths, O.B.E. ..	G. T. Sharpe, R. M. King, E. Thomson ..	R. T. Jonas ..	Briton S.S. Co., Ltd. ..	13.10.48
<i>Eros</i> ..	R. C. Vigers ..	V. Irving, C. P. Turquand, W. Marvin ..	H. Lammas ..	Elders & Fyffes, Ltd. (Managers) ..	21.10.48
<i>Esperance Bay</i> ..	T. V. Roberts, R.D. Capt., R.N.R. ..	D. T. Mouldrey, K. Murray-Brown, D. Wright ..	P. Moloney ..	Shaw, Savill & Albion Co., Ltd. ..	16.12.48
<i>Essex Trader</i> ..	C. Arundell ..	H. P. Ellison, F. Stamps, D. Harris ..	A. B. Pilkington ..	Trader Nav. Co., Ltd. ..	4.1.49
<i>Eso Glasgow</i> ..	O. H. Sheppard ..	V. Bridges, J. Davies, F. Allchin ..	C. C. H. Wilks ..	Anglo-American Oil Co., Ltd. ..	20.1.49
<i>Etrichbank</i> ..	T. Watkins ..	J. L. Williams, G. Cubbin, R. H. Soar ..	G. A. Bart ..	Inver Transport & Trading Co., Ltd. ..	6.1.49
<i>Explorer</i> ..	W. F. O'Neill ..	A. Fee, R. Coffey, R. G. Pass ..	A. L. Thomson ..	Ulster S.S. Co., Ltd. ..	27.2.47
<i>Fanad Head</i> ..	W. A. Haddock ..	P. M. Ralston, G. H. Griffiths, S. Burley ..	W. A. Johnston ..	Elder Dempster Lines, Ltd. ..	2.3.48
<i>Fantise</i> ..	J. W. Andrew ..	I. C. Macdonald ..	J. W. Leask ..	South Georgia Lines, Ltd. ..	21.1.49
<i>Fenja</i> ..	C. R. J. Simmons ..	G. A. Alexander, D. E. Dobinson ..	C. C. Wade ..	Anglo-Saxon Petroleum Co., Ltd. ..	27.1.49
<i>Ficus</i> ..	A. Wilson, O.B.E. ..	J. S. Dryman, J. W. Phinister ..		Currie Line, Ltd. ..	18.3.48
<i>Finland</i> ..	T. Oliver ..	M. Harries, Beadnell, R. Welch, A. O. Griffith, B. Clarke-Lera ..	J. Knight ..	Shaw, Savill & Albion Co., Ltd. ..	5.11.48
<i>Forddale</i> ..	F. E. Patchett ..	K. D. A. Lamb, N. MacAlister, H. Parry-Williams ..	G. K. Ramsey ..	Cunard White Star, Ltd. ..	16.8.48
<i>Fort Cadotte</i> ..	E. A. Stuart ..	J. Robinson, I. D. Smythe, D. R. Burton ..	M. J. Sheahan ..	Cunard White Star, Ltd. ..	16.8.48
<i>Fort Musquarro</i> ..	J. Johnson ..	A. M. Allan, R. F. Leithead, A. S. Kelly ..	J. K. McCormack ..	J. & J. Denholme, Ltd. (Managers) ..	18.1.49
<i>Fort Nakasley</i> ..	A. B. Fasting, R.D., R.N.R. ..	J. Farrow, M. U. Measdon, R. J. Ogilvy ..	V. P. Monahan ..	Cunard White Star, Ltd. ..	6.1.49
<i>Fort Spokane</i> ..	J. S. Binnie ..	K. Montgomery, L. Jamieson, J. Horne ..	W. Steele ..	Lyle S.S. Co., Ltd. ..	4.8.47
<i>Fort Steele</i> ..	W. V. Doughty ..	L. Richardson, M. Wardle, W. Owen ..	M. H. Whitehead ..	Reardon Smith Line, Ltd. ..	10.7.48
<i>Fresno City</i> ..	A. E. Jackson ..	F. Bridges, E. Tunnicliffe, A. L. Searle ..	R. J. Wealthy ..	Charante S.S. Co., Ltd. ..	31.12.47
<i>Geologist</i> ..	A. G. Robins ..	J. O. Springall, K. J. Jones, H. P. Williams ..	A. G. Hill ..	Anglo-American Oil Co. ..	16.9.48
<i>Geo. W. McKnight</i> ..	H. Dixon ..	R. G. Edwards, F. A. Miller, J. E. Webb ..	E. Roberts ..	Cunard White Star, Ltd. ..	7.12.48
<i>Georgic</i> ..	J. Macarthur ..	C. Lorimer, J. B. Mothersill ..	F. Wilson ..	Ocean S.S. Co., Ltd. ..	25.1.49
<i>Glaucus</i> ..	W. E. Coates ..	W. Murphy, D. V. Hoskins ..	W. Lingbottom ..	Glen Line, Ltd. ..	5.1.49
<i>Glenarthy</i> ..	T. Fraser ..	C. C. J. Neaves, C. J. Sawle, J. F. Parry ..	E. F. Power ..	Bank Line, Ltd. ..	10.4.48
<i>Glenbank</i> ..	C. Houghton ..	L. James, P. Glocombe, P. D. Moran ..	R. J. Devin ..	Glen Line, Ltd. ..	3.1.49
<i>Glenorchy</i> ..	H. D. Horwood ..	D. M. Allan, G. B. Marson, I. Barbour ..	A. Wright ..	Wyre Steam Trawling Co., Ltd. ..	6.9.48
<i>Goth</i> ..	J. Harper ..	H. Smallwood, A. R. Simpson, D. Smythe ..	R. E. Bennett ..	Donaldson Line, Ltd. ..	18.1.49
<i>Gracia</i> ..	J. McInnes ..	T. Rylance, J. Gall, R. B. Dales ..	H. Reynolds ..	Mediterranean & Atlantic Lines, Ltd. ..	8.1.49
<i>Grampound</i> ..	P. F. Ewart ..	J. Ramsay, H. P. Lunn, J. T. Peattie, E. B. Mallett ..	W. G. Fitzgerald ..	United Africa Co., Ltd. ..	4.5.48
<i>Guineam</i> ..	H. Coffey, R.D., R.N.R. ..	G. S. Robinson, J. B. Steele ..	J. Matthews ..	New Zealand Shipping Co., Ltd. ..	
<i>Haparangui</i> ..	C. R. Pilcher, O.B.E. ..	P. S. Sharer, M. B. MacTavish ..	D. J. O'Brien ..	J. & C. Harrison, Ltd. ..	
<i>Harmaris</i> ..	A. R. Phelps ..	J. W. Embleton, K. Cobb ..	A. W. Hutchinson ..	Anglo-Saxon Petroleum Co., Ltd. ..	
<i>Helisma</i> ..	J. F. Rumbellow ..	M. C. Mills, J. W. MacKinley, J. T. Whiteside ..	I. Donald ..	Charante S.S. Co., Ltd. ..	
<i>Herdsman</i> ..	W. A. Short ..		T. Greaves ..	Bibby Line, Ltd. ..	12.10.48
<i>Herefordshire</i> ..	T. J. A. Thomson ..				



<i>Highland Brigade</i>	H. D. Hooper, O.B.E. . . .	R. J. Hall, C. N. Wightman, B. Clarke . .	W. Gay . .	Royal Mail Lines, Ltd. . .	2.9.48
<i>Highland Chieftain</i>	G. A. Bannister . .	L. W. Green, J. P. Martin, G. W. T. Griffiths, H. R. Wright . .	T. Desborough . .	Royal Mail Lines, Ltd. . .	8.1.49
<i>Highland Monarch</i>	B. K. Berry, R.D., R.N.R. . .	A. Ferguson, J. Perkins, R. Stirling, G. Lillie . .	L. Cooper . .	Royal Mail Lines, Ltd. . .	26.1.49
<i>Highland Princess</i>	P. Cooper . .	M. Warello, R. Mawley, H. Nixon . .	F. Goodall . .	Royal Mail Lines, Ltd. . .	19.5.47
<i>Hopecrown</i>	Stewart Wilson, O.B.E. . .	H. G. Strickland, D. Barfoot, J. D. Todd . .	P. Probert . .	Clive S.S. Co., Ltd. . .	14.12.48
<i>Hopepeak</i>	G. Grindrod . .	V. Thompson, C. E. Pain, J. A. Leech . .	M. J. Beirne . .	Hope Mount S.S. Co., Ltd. . .	25.8.48
<i>Hororata</i>	A. E. Taylor, R.D., Cdr., R.N.R. . .	E. Allen, P. Jeannes, N. Wright . .	C. L. Lambe . .	New Zealand Shipping Co., Ltd. . .	1.11.48
<i>Horsa</i>	D. Dickson . .	W. Urquhart, A. Wotherspoon . .	None carried . .	Currie Line, Ltd. . .	7.7.48
<i>Hubert</i>	H. Sapsworth, D.S.C. . .	A. S. Richardson, P. J. Wahlberg, J. Mawhinney . .	F. N. Baskerville . .	Booth Line, Ltd. . .	19.10.48
<i>Hurui</i>	F. Loughheed . .	J. Anderson, N. I. Collett, P. R. Moulton . .	C. Littleboy . .	New Zealand Shipping Co., Ltd. . .	15.12.48
<i>Inishowen Head</i>	G. A. Moore . .	A. Farrell, C. O'Connor, I. Pigott . .	F. Murray . .	Ulster S.S. Co., Ltd. . .	5.1.49
<i>Inverbank</i>	A. M. Williamson . .	S. Duncan, H. E. Hoyle . .	L. Chalmers . .	Bank Line, Ltd. . .	28.9.48
<i>Jamaica Producer</i>	P. D. Allen, O.B.E. . .	E. G. J. Roberts, F. Saunders, P. R. K. Davis . .	K. Hartley . .	Jamaica Banana Producers S.S. Co., Ltd. . .	13.10.48
<i>Jersey City</i>	J. M. Cox . .	D. L. Beynon, J. H. J. Frost, J. Thomas . .	C. Codling . .	Reardon Smith Line, Ltd. . .	19.5.48
<i>Jessmore</i>	A. C. Bailey . .	P. V. McCullough, E. B. Pratt, T. P. Jones . .	J. J. Sheridan . .	Johnston Warren Lines, Ltd. . .	16.12.48
<i>John Biscoe</i>	H. Kirkwood, Cdr., R.N. . .			Falkland Island Dependencies Govt. . .	
<i>John Holt</i>	A. Kennedy . .	P. Bathurst, W. L. Harrison, R. E. Griffiths . .	P. A. Senior . .	John Holt & Co. (Liverpool), Ltd. . .	26.4.48
<i>Kaipaki</i>	T. Fenwick . .	D. M. Steven, J. R. Suffren, F. le Messurier . .	F. Matthews . .	New Zealand S.S. Co., Ltd. . .	21.8.48
<i>Kaituna</i>	R. F. Hellings . .	C. F. Turner, J. Milne, J. Newing . .	T. Herbert . .	New Zealand S.S. Co., Ltd. . .	4.1.49
<i>Kaipara</i>	G. P. Parkinson . .			New Zealand S.S. Co., Ltd. . .	
<i>Kallada</i>	I. M. Reynolds . .	P. F. Ilisley, R. H. Wakeford . .	M. S. M. Harding . .	New Zealand S.S. Co., Ltd. . .	20.8.48
<i>Kelinscott</i>	Blacklock . .	P. E. Carnochan, D. M. Welsh, J. Airken . .	E. J. Lewis . .	I. Nourse, Ltd. . .	3.9.47
<i>Kewinworth Castle</i>	J. E. R. Wilford . .	J. Toogood, G. Beaumont, G. D. Attwood, D. A. Davies . .	A. C. Cockburn . .	Pachesham S.S. Co., Ltd. . .	16.2.48
<i>Kent</i>	N. A. Thomas . .	R. W. W. Sims, D. A. G. Dickens, A. B. Stalker . .	L. Roberts . .	Union Castle Mail S.S. Co., Ltd. . .	13.10.48
<i>Ketos</i>	G. I. Gjertsen . .	H. Johansen, J. F. Jarvis . .	J. Murphy . .	Federal Steam Nav. Co., Ltd. . .	10.10.47
<i>King Robert</i>	G. Craze . .	W. Keith, G. Griffiths, P. Kidd . .	L. Fielding . .	United Whalers, Ltd. . .	7.12.48
<i>King William</i>	A. B. Drever . .	J. C. Davies, G. F. Hogg, A. J. Moore . .	P. Kelly . .	King Line, Ltd. . .	12.1.49
<i>Kohistan</i>	A. N. Henderson . .	W. G. Smith, J. E. Belt, P. H. Alexander . .	P. Goss . .	Shahristan S.S. Co., Ltd. . .	2.11.48
<i>Lacklan</i>	G. K. Billet . .	N. McRae, H. R. Machin, A. R. Norton . .	E. Morrison . .	Socony-Vacuum Transport Co., Ltd. . .	11.3.48
<i>Laguna</i>	A. E. Aylard . .	T. Hiatt, W. R. Goldie, P. McMenamin . .	T. Dunshire . .	Pacific Steam Navigation Co. . .	21.6.48
<i>Lambrook</i>	H. J. McInnes . .	J. Orr, A. Sillars, R. F. Arnold . .	J. W. Fulton . .	Austin Friars S.S. Co., Ltd. . .	12.8.48
<i>Lamarshire</i>	C. E. O'Byrne . .	J. K. Robertson, J. S. Catterall, D. Crawford . .	J. B. Allen . .	Scottish Shire Line, Ltd. . .	6.1.49
<i>Lancashire</i>	A. Beharrel . .	W. H. Malley, J. C. Priest, B. McManus . .	A. Jones . .	Bibby Line, Ltd. . .	13.10.48
<i>Lassell</i>	D. Roberts . .	S. Dickenson, J. Bicknell, P. V. Landes . .	N. Moore . .	Lampport & Holt Line, Ltd. . .	2.11.48
<i>Latia</i>	R. S. Walker . .	W. J. Erskine, R. W. Lumsden, G. A. Hubbard . .	W. A. Delamere . .	Anglo-Saxon Petroleum Co., Ltd. . .	3.11.48
<i>Lavernbank</i>	D. Gillies . .	C. R. Eaddy, C. G. Watterson, D. A. Kiddell . .	W. C. Doyle . .	Bank Line, Ltd. . .	1.6.48
<i>Livorno</i>	E. S. Green . .	F. E. Barnes, F. Metlan, G. Dineley . .	L. Bradshaw . .	Ellerman's Wilson Line . .	4.11.48
<i>Llangibby Castle</i>	C. C. Page . .	H. D. Lawton . .	J. Eager . .	Union Castle Mail S.S. Co., Ltd. . .	
<i>Lloydcrest</i>	T. Walker . .	H. L. Halcrow, D. W. Verniers, A. H. Benson . .	N. Riley . .	Junecrest Shipping Co., Ltd. . .	15.1.48
<i>Lobos</i>	R. H. Sissons . .	P. H. Ray, J. Norman, R. T. Riley . .	N. P. Sherin . .	Pacific Steam Nav. Co. . .	
<i>Loch Avon</i>	W. W. Lowe . .	G. E. Leech, D.S.C., W. H. Morton, J. V. Bradbury, J. N. Ashworth . .	M. R. Littlejohn . .	Royal Mail Lines, Ltd. . .	18.3.48

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Loch Garth</i> ..	H. G. Whittle, O.B.E. ..	E. A. E. Littlewood, P. J. Reaker, J. K. Cook, L. Oliver ..	D. Morgan ..	Royal Mail Lines, Ltd. ..	16.12.48
<i>Loch Ryan</i> ..	A. R. Osburn ..	D. R. Bryden, R. C. Hunnisett, V. Charles ..	D. Douglas ..	Royal Mail Lines, Ltd. ..	30.9.48
<i>Lochmontar</i> ..	H. H. Treeweeks ..	G. B. Medleycott, J. E. Robson, Lt. Cdr., R.N.R., P. T. Davies ..	J. Coutts ..	Royal Mail Lines, Ltd. ..	15.12.47
<i>Lord Gladstone</i> ..	J. Abuelo ..	A. H. Treikelder, J. Janczak ..	E. Lane ..	Norwood S.S. Co., Ltd. ..	2.9.48
<i>Lord Glenloran</i> ..	W. J. Leinster ..	W. R. Nelson, A. F. James, D. Philpotts ..	D. O'Callaghan ..	Ulster S.S. Co., Ltd. ..	13.3.48
<i>Lord O'Neil</i> ..	R. A. Ferguson ..	R. M. Hall, R. Harper, C. R. Wilson ..	C. A. Murphy ..	Ulster S.S. Co., Ltd. ..	7.12.48
<i>Loriga</i> ..	G. B. Wardle ..	F. Lewis, K. Thomas, R. Mumford ..	H. Benson ..	Pacific Steam Nav. Co. ..	2.12.47
<i>Losada</i> ..	P. L. Hockey ..	F. Leicester, G. E. Turner, J. Galston ..	S. Money ..	Pacific Steam Nav. Co. ..	4.1.49
<i>Luminous</i> ..	S. J. Smith ..	J. Billet ..	A. Akhurst ..	Aral S.S. Co., Ltd. ..	20.8.48
<i>Machoon</i> ..	J. L. W. Johnston ..	E. R. Pollar, C. Hartmoll, T. H. L. Boyd ..	Fisher ..	Ocean S.S. Co., Ltd. ..	14.12.47
<i>Macharda</i> ..	R. A. Penston ..	Jackson, L. J. S. Saxty, Kirkham, Ralli ..	A. Orum ..	T. & J. Brocklebank, Ltd. ..	14.9.48
<i>Magdagar</i> ..	A. Hill, O.B.E. ..	N. H. Embleton, S. Baxter, A. Halcrow ..			
<i>Mahanada</i> ..	J. W. B. Robertson, R.D., R.N.R. ..	J. Brand, J. C. Long, P. Greenall, G. P. Hurus ..	T. Williams ..	T. & J. Brocklebank, Ltd. ..	4.1.49
<i>Mahia</i> ..	J. W. Hart ..	D. L. Campbell, E. G. Anderson, L. Burn ..	C. W. Jacobs ..	T. & J. Brocklebank, Ltd. ..	5.10.47
<i>Mahout</i> ..	H. F. Scoins ..	D. Evans, A. P. Briggs, J. W. Ross ..	P. Kinderman ..	T. & J. Brocklebank, Ltd. ..	16.2.48
<i>Mahsud</i> ..	R. Humble ..	J. P. Pembbridge, M. N. Taylor, D. L. des Landes ..	A. G. Lea ..	T. & J. Brocklebank, Ltd. ..	16.12.48
<i>Makar</i> ..	S. Broughton ..	C. Grey, T. J. Moore, E. McAulley ..	A. E. Weston ..	T. & J. Brocklebank, Ltd. ..	28.10.48
<i>Makaila</i> ..	T. C. Eddy ..	H. Defty, J. P. Hackworth, D. Hay ..	J. Caddy ..	T. & J. Brocklebank, Ltd. ..	13.10.48
<i>Malakand</i> ..	J. Owen ..	W. Gibson, D. S. Carter, J. Kemp ..	R. Burton ..	T. & J. Brocklebank, Ltd. ..	22.4.48
<i>Malancha</i> ..	H. MacGregor ..	E. Roberts, J. R. Stephens, N. A. Hill ..	G. Close ..	Rio Cape Line, Ltd. ..	21.7.48
<i>Malayan Prince</i> ..	J. D. Fraser ..	R. H. Sinclair, G. E. Howe, J. C. Jenkins ..	A. Macbeth ..	Ellerman's Wilson Line, Ltd. ..	18.1.49
<i>Malmo</i> ..	J. W. Calvert ..	W. Hine, G. R. Thompson, S. Hinchliff ..	H. J. Coates ..	P. & O. Steam Navigation Co., Ltd. ..	20.1.49
<i>Maloja</i> ..	E. J. Parry ..	W. E. Quick, J. E. Askew, R. Wadsworth ..	A. R. Evans ..	Manchester Liners, Ltd. ..	9.6.47
<i>Manchester City</i> ..	F. L. Osborne ..	M. J. Robinson, C. Cuird, T. H. Lynn ..	P. Cummins ..	Manchester Liners, Ltd. ..	8.6.48
<i>Manchester Commerce</i> ..	H. Hancock ..	F. Lewis, L. Taylor, C. Marchant ..	W. C. Critchley ..	Manchester Liners, Ltd. ..	2.2.48
<i>Manchester Division</i> ..	E. W. Espley ..	W. R. McLaren, D. Thomas, A. C. Caird ..	J. Reid ..	Manchester Liners, Ltd. ..	5.1.49
<i>Manchester Port</i> ..	F. Downing ..	F. Lewis, D. Heaton, T. H. Lynn ..	E. Ambler ..	Manchester Liners, Ltd. ..	14.1.47
<i>Manchester Progress</i> ..	W. H. Downing ..	W. E. Oliver, P. N. Fielding, A. C. Caird, N. Cockshoot ..	A. C. Gavin ..	Manchester Liners, Ltd. ..	12.1.49
<i>Manchester Regiment</i> ..	W. D. Struss, O.B.E., D.S.C. ..	D. A. Morris, A. W. Wiltshire, J. P. Attwood ..	G. W. Hazell ..	Manchester Liners, Ltd. ..	11.1.49
<i>Manchester Shipper</i> ..	I. Barclay ..	N. P. McLeod ..	J. B. Anderson ..	Bank Line, Ltd. ..	21.8.48
<i>Manchester Trader</i> ..	E. W. Raper ..	A. Hillerby, R. Turty, J. Leach ..	Geo. Camm ..	Ellerman's Wilson Line ..	7.12.48
<i>Mandator</i> ..	L. E. Jeans ..	W. Forster, M. G. Stevens, J. Bloomfield ..	J. Young ..	"K" S.S. Co., Ltd. ..	
<i>Maplebank</i> ..	N. P. McLeod ..	L. D. Forster, R. H. Jenkins, W. F. Moss ..	T. Laing ..	Dalhousie S.S. Co. ..	
<i>Marengo</i> ..	F. Ellison ..	I. A. MacLaren, J. Ritchie, R. N. Bonny ..	D. Owen ..	T. & J. Brocklebank, Ltd. ..	27.4.48
<i>Margay</i> ..	E. A. Prentice ..	R. J. Sinclair, W. Allen ..	K. C. Wright ..	South Georgia Co., Ltd. ..	27.8.48
<i>Marietta Dal</i> ..	J. G. F. Brighty ..	H. Jones, J. Tiers, L. Mansell ..		Coolham S.S. Co., Ltd. ..	14.1.49
<i>Markhor</i> ..	W. Hill, O.B.E. ..	E. L. Jones, P. A. Litherland, W. H. Clifford-Hicks ..	D. H. Butterworth ..	"K" S.S. Co., Ltd. ..	
<i>Marna</i> ..	R. R. Hume ..			T. & J. Brocklebank, Ltd. ..	
<i>Marquisia</i> ..	F. C. Jennings ..				
<i>Marisdale</i> ..	M. Ferguson ..				
<i>Martand</i> ..	T. Fox-Lloyd ..				

<i>Martina</i>	..	H. Bunn	E. Prest, D. J. J. Thomson, P. Parker	A. E. Campbell	..	"K" S.S. Co., Ltd.	7.12.48
<i>Mataroa</i>	..	S. Oswald	C. M. Williams, A. V. Mackay, T. Parell	A. McMurray	..	Shaw, Savill & Albion Co., Ltd.	2.10.48
<i>Matheran</i>	..	A. B. Bannantyne, O.B.E.	H. Simpson, B. Dey, P. A. Cunson	P. Neilson	..	T. & J. Brocklebank, Ltd.	16.12.48
<i>Matina</i>	..	A. G. Jones	T. C. Crane, J. Nicholson, J. Mayo	A. C. Knight	..	Elders & Fyffes, Ltd.	6.1.49
<i>Mauretania</i>	..	C. Ivan Thompson	N. Carter, J. Ward, J. Mitchell	F. Clarke	..	Cunard White Star, Ltd.	10.11.48
<i>Media</i>	..	C. S. Williams	J. A. B. Munro, R. A. Elder, C. H. Cooke	J. MacArdle, M.B.E.	..	Cunard White Star, Ltd.	20.7.48
<i>Melbourne Star</i>	..	F. N. Riley, D.S.O.	..	..	..	Blue Star Line, Ltd.	..
<i>Mening</i>	..	D. C. Roberts	..	..	..	..	..
<i>Millais</i>	..	A. R. Bibby, O.B.E.	L. A. Ankers, D. J. Ashworth, W. A. Sparks	J. Brown	..	Lampport & Holt Line	4.1.49
<i>Mirror</i>	..	S. A. Gannon	J. Edgar, D. S. Leicester, A. B. Baines	G. Norton	..	Lampport & Holt Line	12.1.49
<i>Mooltan</i>	..	C. H. Baxter	R. E. Small, P. B. Henderson, C. E. Burrill	J. Crouch	..	Cable & Wireless, Ltd.	3.12.47
<i>Monarch</i>	..	J. P. F. Betson	M. R. Prowse, H. R. Wade, G. Buckley, R. Garne	A. R. Porter	..	P. & O. Steam Nav. Co., Ltd.	14.12.48
<i>Moveria</i>	..	T. S. Graham	K. H. Joy, A. Hoar, Black-Tuckwell	E. Robinson	..	Postmaster-General	18.7.47
<i>Murillo</i>	..	W. Gillespie	J. C. C. Young, I. M. MacFarlane, R. S. Hopkins	R. H. Hallam	..	Donaldson Line, Ltd.	6.12.48
<i>Myrtlebank</i>	..	F. Hale	K. M. Maguire, W. J. Neil, R. Cawthorne	J. Adamson	..	Lampport & Holt Line	12.11.48
<i>Napier Star</i>	..	E. N. Rhodes	J. T. Duncan, G. G. Hodgson, F. J. Adamson	N. Kehoe	..	Bank Line, Ltd.	23.8.48
<i>Nautica</i>	..	P. D. Secar	E. W. Jenkins, J. B. Kennedy, J. Bain	T. W. Murray	..	Blue Star Line, Ltd.	7.7.48
<i>Nestor</i>	..	E. W. Powell, M.B.E.	P. Kendall, N. Goddard, L. Stephens	J. E. Conway	..	Anglo-Saxon Petroleum Co., Ltd.	4.1.49
<i>Newfoundland</i>	..	A. T. Church, O.B.E.	N. W. Martin, M. Spencer-Hogbin, B. Paip	L. Booth	..	Ocean S.S. Co., Ltd.	20.9.48
<i>New Zealand Star</i>	..	G. Owen, O.B.E., R.D., Cdr., R.N.R.	J. B. Stewart, H. T. Sheffield, N. A. Blitch, L. Rooney	T. Cahill	..	Johnston Warren Lines, Ltd.	4.1.49
<i>Norfolk</i>	..	A. I. Robertson, R.D., Capt., R.N.R.	R. Stewart, G. Munro, F. Wood	C. J. Carter	..	F. Leyland & Co., Ltd.	15.12.48
<i>Northumberland</i>	..	A. E. Williams	J. G. Robinson, A. B. Moss, J. S. Glover	J. Heath	..	Federal Steam Nav. Co., Ltd.	21.8.48
<i>Norwegian</i>	..	J. Pollock	H. Cubitt, C. Masson, J. Witchell	J. Charter	..	Federal Steam Nav. Co., Ltd.	7.12.48
<i>Nova Scotia</i>	..	J. E. Wilson, O.B.E.	J. D. P. Williamson, E. Cunningham, K. Rowland	W. C. Brock	..	Donaldson Line, Ltd.	..
<i>Novelist</i>	..	T. E. Steele	H. Skelly, W. G. Jackson, W. Grierson	J. Whitehead	..	Johnston Warren Line, Ltd.	5.1.49
<i>Ocean Valley</i>	..	W. McMellin	P. I. Leech, J. Brett	W. Humphries	..	Charante S.S. Co., Ltd.	21.9.48
<i>Orari</i>	..	E. A. J. Williams	A. Mackenzie, W. Peto, J. Edmondson	F. Wilman	..	Houlder Bros. & Co., Ltd. (Managers)	3.1.49
<i>Orbita</i>	..	J. Sutherland	W. Singleton, T. Wilcockson, P. Wheelbourn	W. McCormick	..	New Zealand S.S. Co., Ltd.	3.1.49
<i>Orcades</i>	..	C. Fox, C.B.E.	..	..	..	Pacific Steam Nav. Co., Ltd.	3.1.49
<i>Orduna</i>	..	J. Whitehouse	B. A. King, J. B. Olsson, J. Patterson	N. Clark	..	Orient Line, Ltd.	..
<i>Orion</i>	..	T. L. Shurrock, O.B.E.	M. R. Wilmshurst, A. Murray, D. Kinloch	T. Shannon	..	Pacific Steam Nav. Co., Ltd.	5.11.48
<i>Ormonde</i>	..	I. E. Goldsworthy, R.D., R.N.R.	C. S. Thomas, R.D., Lt. Cdr., R.N.R., L. C. Kingswood, P. J. Collier	..	..	Orient Steam Nav. Co., Ltd.	11.1.49
<i>Orontes</i>	..	N. A. Whinfield	R. F. Underwood, F. W. Woolley, D. R. Wood	R. Oakley	..	Orient Steam Nav. Co., Ltd.	7.12.48
<i>Pacific Exporter</i>	..	Roy E. L. Holland	H. M. Head, B. A. Gouldstone, G. K. Williams	F. Murphy	..	Orient Steam Nav. Co., Ltd.	4.1.49
<i>Pacific Importer</i>	..	B. M. Colland	G. Cook, A. Linden, G. Williams	R. P. McEwan	..	Norfolk & North American S.S. Co., Ltd.	29.9.47
<i>Pacific Shipper</i>	..	E. V. Richards	W. E. Thomas, R. Hughes, S. G. Edwards	V. Ash	..	Furness Withy & Co., Ltd.	8.12.48
<i>Pacific Stronghold</i>	..	F. H. Perry	J. Clarke, D. R. Gibson, Keene	G. Mostyn	..	Furness Withy & Co., Ltd.	14.9.47
<i>Pakeho</i>	..	H. C. Smith	H. P. Last, A. H. N. Pugh, A. R. Stephenson	S. Vincent	..	Furness Withy & Co., Ltd.	21.1.49
<i>Palacia</i>	..	M. H. Atkinson, D.S.C.	McKinley, G. C. Newman, R. Budson	I. G. Lawrie	..	Shaw, Savill & Albion Co., Ltd.	5.1.49
<i>Palana</i>	..	F. R. Spurn	M. A. Frenfield, G. T. Pape, A. J. Stephenson	R. McCarthy	..	MacAndrews & Co., Ltd.	14.12.48
	..	..	..	H. Olding	..	P. & O. Steam Nav. Co., Ltd.	16.12.48

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Palomares</i> ..	D. L. Thomas, M.B.E.	F. Sznage	J. Stone	MacAndrews & Co., Ltd.	6.8.48
<i>Pampas</i> ..	T. Powell	K. E. McClure, C. W. Williams, K. R. Towers	H. Booth	Royal Mail Lines, Ltd.	13.9.48
<i>Papanui</i> ..	B. Evans	G. R. Naylor, E. White, T. Bennett	A. R. Smith	New Zealand S.S. Co., Ltd.	18.1.49
<i>Paparoa</i> ..	E. Hopkins	H. A. Owen, C. B. Hewett, W. Dan	L. P. Rayner	New Zealand S.S. Co., Ltd.	21.1.49
<i>Paraguay</i> ..	H. V. Todd	G. A. Gibbons, D. Davies, M. Blackmon	P. Goulden	Royal Mail Lines, Ltd.	15.7.48
<i>Pardo</i> ..	R. N. Fletcher	C. G. M. Smith, M. Hawkins, J. M. Barker	H. J. Coates	Royal Mail Lines, Ltd.	6.8.48
<i>Parima</i> ..	J. Smith, R.N.R.	J. T. Jones, R. C. Honnisset	J. Barlow	P. & O. Steam Nav. Co., Ltd.	31.7.48
<i>Paringa</i> ..	C. E. Pollitt	P. C. Reed, G. P. Blyth, A. W. Dallas	B. S. Magennis	Cunard White Star, Ltd.	2.12.48
<i>Parthia</i> ..	G. H. G. Morris	K. T. Jones, F. Watts, P. Walton	A. O. Sullivan	British and Burmese Nav. Co., Ltd.	3.1.49
<i>Pegu</i> ..	S. Thomson	J. Walker-Brown, I. S. MacColl, Crozier	R. Wilson	P. & O. Steam Nav. Co., Ltd.	13.10.48
<i>Pegim</i> ..	J. C. Mellonie	H. Toon, P. Hewitt, R. T. Neve	F. Groves	Scottish Shire Line, Ltd.	4.1.49
<i>Pertshire</i> ..	A. J. Hogg	J. Browne, C. Stonehouse, D. Geddes, M. J. Skillington	F. Rayner	General Steam Nav. Co., Ltd.	4.1.49
<i>Philomal</i> ..	H. M. Selmer	D. P. Warren, P. Anthony, J. Egan	P. Hampson	Royal Mail Lines, Ltd.	4.1.49
<i>Pilomayo</i> ..	T. Davies	P. M. Bushy, S. Oates, D. G. Seward	L. Sayers	New Zealand S.S. Co., Ltd.	28.10.48
<i>Pipiriki</i> ..	R. G. Rees	J. L. Cole	E. Smith	Charente S.S. Co., Ltd.	8.6.48
<i>Planter</i> ..	J. J. Wallis	J. Gilman	M. J. Sheeham	Polar Whaling Co., Ltd.	8.7.48
<i>Polar Chief</i> ..	J. O. Bowrie	P. A. N. Thomas, C. M. Watkins, R. D. Harris	B. Morley-Evans	Port Line, Ltd.	16.12.48
<i>Polar Maid</i> ..	H. Leask		R. C. Crompton	Port Line, Ltd.	31.7.48
<i>Port Chalmers</i> ..	E. T. W. Lawney		P. T. McKeon	Port Line, Ltd.	4.1.49
<i>Port Hobart</i> ..	T. F. Kippings, O.B.E., D.S.C.	A. J. Braund, J. D. Aitchison, R. G. Gilling	P. Smyth	Port Line, Ltd.	13.8.48
<i>Port Jackson</i> ..	F. W. Bailey, M.B.E.	C. Guest, D. M. MacKeith, R. C. Harris	B. McGovern	Port Line, Ltd.	6.1.49
<i>Port Lincoln</i> ..	H. H. Smith, O.B.E.	G. Carter, D. M. Robinson, M. W. Raggett	W. Miller	Port Line, Ltd.	25.1.49
<i>Port Macquarie</i> ..	E. Roswell	T. S. Paron, H. Thompson, P. M. Hudson, V. A. Hunt	J. S. Macpherson	Port Line, Ltd.	12.7.48
<i>Port Philip</i> ..	J. G. Lewis, O.B.E.	F. M. Barton, E. G. Gilling, H. R. Long	J. N. Coutts	Royal Mail Lines, Ltd.	15.12.48
<i>Port Pirie</i> ..	W. J. Enright, O.B.E., R.D., R.N.R.	R. C. Matthews, A. W. Kensett, H. J. Haldrup	D. Smith	Union Castle Mail S.S. Co., Ltd.	11.5.48
<i>Port Wellington</i> ..	W. G. Higgs, O.B.E.	J. M. Bedwell, D. Sinclair, K. Marshall	H. Oliver	Furness Houlder Argentine Lines, Ltd.	8.1.47
<i>Port Wyndham</i> ..	H. Steele	P. R. Lewis, C. P. Williams, P. G. Henneker	E. Whitehead	New Zealand S.S. Co., Ltd.	12.8.48
<i>Potaro</i> ..	S. J. G. Hill	J. Green, R. R. Thompson, J. T. Price	P. Holmes	P. & O. Steam Nav. Co., Ltd.	18.1.49
<i>Pretoria Castle</i> ..	J. C. Brown, C.B.E., R.D., R.N.R.	D. Kernick, N. Knowles, C. J. Willis	R. V. Gregory	New Zealand S.S. Co., Ltd.	18.1.49
<i>Princesa</i> ..	E. J. Lougheed	A. Cochrane, J. Newton, H. P. Sargent	S. Peeling	Charante S.S. Co., Ltd.	8.1.49
<i>Rakata</i> ..	J. S. Oxmond	J. Slader, B. Crust, F. Christall	J. Clarke	Iago Steam Trawler Co., Ltd.	8.1.49
<i>Ranchi</i> ..	R. E. T. Tunbridge, D.S.C., R.D., A.D.C., R.N.R.	E. R. Rose, J. Clayton, C. E. Waller		Iago Steam Trawler Co., Ltd.	
<i>Rangitiki</i> ..	E. Holland, C.B.E.	G. C. Simpson, R. E. Baker, J. E. Crewdson			
<i>Recorder</i> ..	R. F. Longster	H. M. Jones, P. B. Dilleigh			
<i>Red Charger</i> ..	R. Nash	C. Noble			
<i>Red Crusader</i> ..	B. Rogerson				

<i>Red Knight</i>	..	E. Littler	..	G. R. Arthur, F. S. Farrar, A. L. Helmas	R. Green	..	Iago Steam Trawler Co., Ltd.	..	28.10.48
<i>Red Lancer</i>	..	M. Wright	..	..	..	..	Iago Steam Trawler Co., Ltd.	..	18.10.48
<i>Red Sword</i>	..	J. Tomlinson	..	..	R. W. Jones	..	Trinidad Leaseholds, Ltd.	..	..
<i>Regent Hawk</i>	..	J. Ward	..	..	J. Moffat	..	West Dock Steam Fishing Co.	..	..
<i>Reighton Wyke</i>	..	G. Clirby	..	..	..	..	Pacific Steam Nav. Co., Ltd.	..	..
<i>Reins del Pacifico</i>	..	W. A. Hearl	..	..	..	..	Bolton S.S. Co., Ltd.	..	1.11.48
<i>Rembrandt...</i>	..	D. Norrie	..	..	..	..	Bolton S.S. Co., Ltd.	..	19.1.49
<i>Repton</i>	..	D. Cowrie	..	..	J. Pattison	..	Blue Star Line, Ltd.	..	7.12.48
<i>Rhodesia Star</i>	..	C. H. Watson	..	..	R. C. Wilde	..	Union Castle Mail S.S. Co., Ltd.	..	13.10.48
<i>Richmond Castle</i>	..	J. A. Sowden	..	..	J. H. Burgess	..	Union Hill S.S. Co., Ltd.	..	6.12.48
<i>Richmond Hill</i>	..	J. P. Allen	..	..	J. Scott	..	Union Castle Mail S.S. Co., Ltd.	..	22.2.48
<i>Riebeck Castle</i>	..	M. S. Hodson	..	..	S. Godfrey	..	P. & O. Steam Nav. Co.	..	30.9.48
<i>Rimutaka</i>	..	W. Wilson, O.B.E.	..	..	S. Peeling	..	Houlder Line, Ltd.	..	22.4.48
<i>Ripplingham Grange</i>	..	R. Owen	..	..	R. Munro	..	Anglo-American Oil Co., Ltd.	..	10.11.48
<i>Robert F. Hand</i>	..	E. J. Inatone, O.B.E.	..	..	..	..	Great Northern Fishing Co., Ltd.	..	..
<i>Robert Hewitt</i>	..	G. Elliot	..	..	P. Butler	..	Union-Castle Mail S.S. Co., Ltd.	..	19.8.48
<i>Rochester Castle</i>	..	F. R. Pope	..	..	J. J. Smith	..	Andross S.S. Co., Ltd.	..	19.7.48
<i>Rockside</i>	..	G. W. B. Lloyd	..	..	..	..	Union Castle Mail S.S. Co., Ltd.	..	..
<i>Roslin Castle</i>	..	J. M. Rayner, R.D., Cdr., R.N.R.	..	..	..	..	..	..	..
<i>Rosburgh Castle</i>	..	..	..	..	..	..	..	..	..
<i>Royal Star</i>	..	G. Aldridge	..	..	L. W. Bettinson	..	Union Castle Mail S.S. Co., Ltd.	..	15.10.48
<i>Rutland</i>	..	W. Thom	..	..	M. Cahill	..	Union Cold Storage Co., Ltd.	..	11.1.49
<i>Ruydael</i>	..	D. E. Norrie	..	..	J. Macfarland	..	Currie Line, Ltd.	..	8.1.47
<i>Sacramento</i>	..	J. Robinson, M.B.E.	..	..	H. Holdridge	..	Bolton S.S. Co., Ltd.	..	..
<i>St. Appollo</i>	..	..	..	..	..	..	Ellerman's Wilson Line, Ltd.	..	31.7.48
<i>St. Crispin</i>	..	J. H. Ellis	..	..	W. Parratt	..	T. Hamling & Co., Ltd.	..	..
<i>St. Just</i>	..	A. E. Hall	..	..	D. L. Verity	..	St. Andrews Steam Fishing Co.	..	10.12.47
<i>St. Merriel</i>	..	V. A. Buschini	..	..	..	..	Howard Trawlers, Ltd.	..	..
<i>St. Nectar</i>	..	F. Meneight	..	..	..	..	South American Saint Line	..	3.1.49
<i>St. Zeno</i>	..	..	..	..	W. Flood	..	T. Hamling & Co., Ltd.	..	4.5.48
<i>Salacia</i>	..	H. McLachlin	..	..	G. Schofield	..	T. Hamling & Co., Ltd.	..	6.1.49
<i>Salamanca</i>	..	..	..	..	..	..	Donaldson Line, Ltd.	..	4.1.49
<i>Salaverry</i>	..	D. W. Hutchinson	..	..	J. Wilson	..	Pacific Steam Nav. Co.	..	16.7.48
<i>Salinas</i>	..	J. D. Richards	..	..	W. A. Steel	..	Pacific Steam Nav. Co.	..	18.1.49
<i>Salmonier</i>	..	J. Williams	..	..	T. Slater	..	Pacific Steam Nav. Co.	..	28.10.48
<i>Saluta</i>	..	J. D. Wilson	..	..	H. M. O'Gorman	..	W. Thompson & Co.	..	16.12.48
<i>Samancia</i>	..	S. Begg	..	..	H. MacKay	..	Chr. Salvesson & Co.	..	21.6.48
<i>Samaria</i>	..	A. Lyall	..	..	..	..	Pacific Steam Nav. Co.	..	2.9.48
<i>San Adolfo</i>	..	J. A. Myles, R.D., R.N.R.	..	..	R. M. Evans	..	Cunard White Star, Ltd.	..	3.1.49
<i>San Cirilo</i>	..	F. R. H. Atkinson	..	..	E. P. Bishop	..	Eagle Oil & Shipping Co., Ltd.	..	6.1.49
<i>San Felix</i>	..	M. A. Connel	..	..	A. Smith	..	Eagle Oil & Shipping Co., Ltd.	..	16.12.48
<i>San Velino</i>	..	J. B. Macauley, O.B.E.	..	..	D. W. Powell	..	Eagle Oil & Shipping Co., Ltd.	..	..
<i>San Veronica</i>	..	H. C. Archer, O.B.E.	..	..	..	..	Eagle Oil & Shipping Co., Ltd.	..	20.10.48
<i>San Vulfrano</i>	..	R. M. Atkinson	..	..	W. L. Radcliffe	..	Eagle Oil & Shipping Co., Ltd.	..	14.5.48
<i>Santander</i>	..	J. Thomson, O.B.E.	..	..	J. Clark	..	Eagle Oil & Shipping Co., Ltd.	..	28.10.48
<i>Sarmiento</i>	..	T. I. Naylor	..	..	T. A. Henderson	..	Eagle Oil & Shipping Co., Ltd.	..	12.7.48
<i>Saxon Star</i>	..	G. H. Ruce	..	..	J. W. Barry	..	Pacific Steam Nav. Co.	..	4.1.49
..	..	J. D. W. Davies	..	..	J. C. Tomlinson	..	Pacific Steam Nav. Co.	..	1.11.48
..	..	..	..	..	V. McKenzie	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	J. C. Kane	..	F. Leyland & Co., Ltd.	..	4.1.49
<i>Scholar</i>	..	D. Wolstenholme	..	..	E. A. Mills	..	Charente S.S. Co., Ltd.	..	6.8.48



NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS	LAST RETURN RECEIVED
<i>Scythia</i> ..	W. M. Stewart, O.B.E.	D. R. Rosling, A. R. Graham, O. G. Dalziel	W. Blanchard	Cunard White Star, Ltd.	5.1.49
<i>Selecter</i> ..	W. H. Slaughter	W. G. McGuinness, V. F. Harrison, R. J. Turnbull	J. Macdonald	Charante S. S. Co., Ltd.	..
<i>Settler</i> ..	R. F. Phillips	W. Bates, H. P. Roberts, L. Broadbent	A. Smith	Charante S. S. Co., Ltd.	18.10.48
<i>Silverbriar</i> ..	Morgan	E. N. Stone, J. F. Robertson,	J. Whyman	Silver Line, Ltd.	26.1.49
<i>Silvercedar</i> ..	J. Thompson	G. K. Harrison	R. Burrow	Silver Line, Ltd.	10.11.48
<i>Silverguana</i> ..	W. G. Cole	N. W. Rothwell, D. M. Lamont, N. C. Jones	D. Will	Silver Line, Ltd.	8.9.48
<i>Silveroak</i> ..	W. N. Tullock	F. E. Godley, K. A. Wise, P. R. Miller	..	..	..
<i>Silverplane</i> ..	H. Woodrow	P. Hildred, J. M. Beaumont, J. McK. Batchen	A. B. King	Silver Line, Ltd.	14.9.48
<i>Silverstandard</i> ..	E. Stark	W. L. N. Fisker, J. M. Evans, H. Rose	S. P. Garnett	Silver Line, Ltd.	25.1.49
<i>Silverteak</i> ..	C. J. Metcalf	W. I. Ross, J. B. de West, F. A. Ferguson	J. Hands	Silver Line, Ltd.	6.1.47
<i>Silverwadmuit</i> ..	E. L. Tilmouth	S. Webb, D. R. Crocker, J. Jameson	A. D. Carter	..	6.8.48
<i>Sneaton</i> ..	W. Armstrong	F. W. M. Pearce, E. Owen, E. Snowden,	H. Camp	P. & O. Steam Nav. Co., Ltd.	23.8.48
<i>Socotra</i> ..	C. F. Halliday	P. W. F. Holmes	L. Whittington	Federal Steam Nav. Co., Ltd.	5.1.49
<i>Somerset</i> ..	P. S. Calcutt	D. Davies, W. Martin, A. Robinson	W. S. Hayes	South Georgia Co., Ltd.	9.9.47
<i>Southern Collins</i> ..	D. Hunter	L. McNaughton, R. Cramb, T. Johnstone	J. D. Todd	South Georgia Co., Ltd.	28.10.48
<i>Southern Garden</i> ..	W. J. Swanson	W. Scott, A. W. Aiken, E. G. Sutton	J. Spratt	South Georgia Co., Ltd.	8.6.48
<i>Southern Harvester</i> ..	K. Grange	T. J. Morgan, J. T. Petrie	C. H. Houston	South Georgia Co., Ltd.	3.11.48
<i>Southern Opal</i> ..	J. O. Bowie	D. Watt, D. Wilson, J. Budge	E. Hobson	South Georgia Co., Ltd.	..
<i>Southern Venture</i> ..	H. Nilsen	J. Miller, R. Jarrett, J. D. Nutter	..	Socoony-Vacuum Transportation Co., Ltd.	15.12.48
<i>Sovac</i> ..	H. Anthony	R. J. Abbott	J. Glover	Charente S. S. Co., Ltd.	10.11.48
<i>Speaker</i> ..	C. C. Heaton	J. Bean, A. F. Perry	A. Guy	Charente S. S. Co., Ltd.	18.1.49
<i>Specialist</i> ..	T. R. Mackle	J. Reid	T. W. Bearman	Springwell Shipping Co.	10.11.47
<i>Springford</i> ..	L. F. Wainford	J. A. Jones	L. Sandfrey	Stanhope S. S. Co., Ltd.	18.10.48
<i>Stancourt</i> ..	S. G. Larrard	L. M. Davies, J. R. Sims, H. Brown	J. M. Bannerman	Stanhope S. S. Co., Ltd.	12.7.48
<i>Stanhall</i> ..	R. G. Roberts	E. L. Davies, R. S. Drew, N. R. Brown	P. Williams	Union Castle Mail S. S. Co., Ltd.	21.8.48
<i>Stanthorpe</i> ..	J. F. Oakley	M. Kenshoe, R. Hudson, M. Gray	..	..	..
<i>Stirling Castle</i> ..	J. F. McCrone	A. S. Palethorpe-May, G. A. Winter, A. Graham, W. A. Read	J. Stott, R. S. Riddell	Scottish Shire Line, Ltd.	12.8.48
<i>Stirlingshire</i> ..	..	M. H. D'aeth, R. L. Pigeon, J. Owen	F. E. Ash	P. & O. Steam Nav. Co., Ltd.	10.11.48
<i>Strathaird</i> ..	H. S. Allen, R.D., R.N.R.	H. Toon, D. G. Daniel, B. S. Mordaunt	H. S. Horn	P. & O. Steam Nav. Co., Ltd.	19.1.48
<i>Stratheden</i> ..	S. W. S. Dickson	I. Davison, F. G. Bevis, J. Healey	J. Turnham	Federal Steam Nav. Co.	4.9.48
<i>Suffolk</i> ..	E. A. Burton	T. L. Ison, J. E. Collins, P. Tate	J. MacMahon	Junecrest S. S. Co., Ltd.	6.2.48
<i>Suncrest</i> ..	T. G. Barwell	R. Thwaites, A. L. Clement, R. Edgar	R. L. Sinclair	B. J. Sutherland & Co., Ltd.	30.8.48
<i>Sutherland</i> ..	J. W. Nicholson	C. Dick, D. Hogben, J. Walker	J. T. Melville	Currie Line, Ltd.	31.3.48
<i>Sutherland</i> ..	J. McClure	K. Jackson, R. Dunn, Wm. Fallon	D. Hoyle	Ropner S. S. Co., Ltd.	3.3.48
<i>Swainby</i> ..	J. E. Roddam	J. C. Davies, A. Smith, E. Mackintosh	W. Williams	Charente S. S. Co., Ltd.	18.1.49
<i>Sydney Star</i> ..	T. F. McDonald, O.B.E.	G. F. Penston, H. Cowley, J. G. Jones	N. Brewer	Pacific Steam Nav. Co., Ltd.	6.8.48
<i>Tactician</i> ..	A. Robertson	D. I. Jones, I. Butterworth, W. R. Holmes	D. Macrae	Shaw, Savill & Albion Co., Ltd.	11.1.49
<i>Talca</i> ..	A. G. Litherland	P. Oliver, F. Packman, A. Baber	F. Broomfield	Elder Dempster Lines, Ltd.	14.5.47
<i>Tamaroa</i> ..	H. S. Cox	P. J. Finan, D. Thomson, A. Lamper	..	..	..
<i>Tamara</i> ..	W. Munt	N. E. Wood, T. de N. Ogier, C. C. D. Gough	L. Cottell	Shaw, Savill & Albion Co., Ltd.	21.9.48
<i>Taramaki</i> ..	F. A. Smith	R. Munro, G. Moore, A. Bird	G. Gilling	Elder Dempster Lines, Ltd.	6.1.49
<i>Tarkua</i> ..	G. D. Simpson	..	..	..	..

<i>Tasso</i>	..	H. Scarborough	..	D. J. C. Martin, R. Cudbertson, R. Whitleton	J. Williamson	..	Ellerman's Wilson Line, Ltd.	26.2.47
<i>Tekoura</i>	..	F. Sutton	..	D. E. Edmonds	D. E. Edmonds	..	Heward Trawlers, Ltd.	..
<i>Telemachus</i>	..	G. Brown, M.B.E.	..	A. G. Reed, P. D. F. Cruickshank, E. Brown	J. C. Wilson	..	Ocean S.S. Co., Ltd.	5.1.49
<i>Teniot</i>	..	H. E. Sang	..	T. A. Buckney, R. J. Kistler, G. F. I. Jamieson	L. W. Bell	..	Royal Mail Lines	6.12.48
<i>Thamesfield</i>	..	R. Cunningham	..	J. P. Ross, R. L. Newcombe, P. B. Goldie	T. Carter	..	Northern Petroleum Tank S.S. Co., Ltd.	16.12.48
<i>Tinto</i>	..	S. H. Bennett, M.B.E.	..	A. Ledger	..	..	Ellerman's Wilson Line, Ltd.	..
<i>Tongariro</i>	..	Chadwick	..	E. W. Clubb, D. L. Parkin, S. W. Lambrick	W. F. Sykes	..	New Zealand S.S. Co., Ltd.	10.11.48
<i>Torr Head</i>	..	M. Kennedy	..	D. Gault, A. J. Farrel, W. Greig	G. Penkeith	..	Ulster S.S. Co., Ltd.	17.3.48
<i>Tower Grange</i>	..	G. Robson	..	P. A. Chubb, J. M. Settle	L. B. Priestley	..	Tower S.S. Co., Ltd.	5.1.49
<i>Tressillian</i>	..	M. G. Symons	..	C. Downs, W. R. Bulman, E. L. Cussons	D. Perks	..	Hain S.S. Co., Ltd.	24.6.48
<i>Trevaylor</i>	..	W. J. Spencer	..	R. B. Oliver, J. I. Males, D. R. Jenkins	I. Stewart	..	Hain S.S. Co., Ltd.	14.6.48
<i>Tribesman</i>	..	A. Smart	..	W. Lawton, J. S. Jones, J. Adams	J. T. W. Nixon	..	Charente S.S. Co., Ltd.	10.11.48
<i>Tweed</i>	..	D. R. Miller	..	Meldrum, J. Chester, D. S. Guinness	W. G. Fitzgerald	..	Royal Mail Lines, Ltd.	31.8.48
<i>Twickenham</i>	..	Wm. D. Shields, O.B.E.	..	H. Blair, D. A. Forrester, J. L. Kirby	J. H. Parkes	..	Britann S.S. Co., Ltd.	16.8.48
<i>Umtali</i>	..	F. E. J. O'Hea	..	J. A. Bonsley, F. Evans, D. G. Jupp, D. McNeill	S. Hewitt	..	Bullard, King & Co., Ltd.	25.5.48
<i>Unitata</i>	..	J. W. Miles	..	H. J. Thorn, H. K. Underwood, L. Farrer	A. H. Coxhead	..	Bullard, King & Co., Ltd.	27.7.48
<i>Valacia</i>	..	W. L. P. Cox	..	J. D. Smythe, N. Jones, A. Hoyle	P. A. Hayes	..	Cunard White Star, Ltd.	13.12.47
<i>Vancouver</i>	..	B. Cornafan	..	J. Cooper, F. English, W. Rendall	W. Ansell	..	Sir Wm. Reardon Smith & Sons	13.10.48
<i>Vardulia</i>	..	J. F. Drake, O.B.E., R.D., R.N.R.	..	I. A. Stewart, J. M. Hughes, A. Bull	F. Berry	..	Cunard White Star	14.10.48
<i>Vasconia</i>	..	G. S. Evans	..	A. L. Davies, R. H. Arnatt, N. Abbot	D. McCartney	..	Cunard White Star	13.12.48
<i>Vestra</i>	..	D. S. Archibald	..	I. D. Mackenzie, I. Macalpine	D. S. Archibald	..	J. T. Salveson	..
<i>Victrix</i>	..	E. Garnett	..	C. F. Lawrence	..	..	Henriksen & Co.	..
<i>Vienna</i>	..	A. P. Sutton	..	J. A. Tulley, R. Fergus, E. Atkinson	F. Howell	..	British Railways (Eastern Region)	..
<i>Vivienne Louise</i>	..	G. McLeod	..	R. E. Garisch	..	..	(Managers)	..
<i>Valo</i>	..	A. Morrill	..	T. Briggs, T. A. Firth, J. Johnson	G. Williams	..	British Oil Shipping Co.	28.12.47
<i>Waipana</i>	..	L. J. Hopkins	..	J. W. Paine, A. S. Masters, K. C. Davies	T. P. Jones	..	Ellerman's Wilson Line, Ltd.	22.4.48
<i>Waipawa</i>	..	R. G. Ireland	..	R. Hutchinson, G. Watkins, J. Moore	W. Charlton	..	Shaw, Savill & Albion Co., Ltd.	13.10.48
<i>Waipangi</i>	..	W. G. West	..	E. D. L. Harper, V. H. Vizer, R. D. Fox	H. Jardine	..	Shaw, Savill & Albion Co., Ltd.	4.9.48
<i>Watara</i>	..	B. Forbes-Moffatt	..	J. L. Carroll, P. S. Yeoman, B. Hammond	C. E. Lee	..	Shaw, Savill & Albion Co., Ltd.	12.10.48
<i>Wanderer</i>	..	J. L. Curle	..	W. C. Johnston, R. Bibby, E. A. Clarke	Shaw	..	Charente S.S. Co., Ltd.	6.9.48
<i>Warwick Castle</i>	..	J. Trayner	..	A. M. McLean, B. W. Mitton, R. D. Lofis	..	..	Union Castle Mail S.S. Co., Ltd.	22.1.49
<i>Winkleigh</i>	..	T. D. Jones	..	A. Bruce	T. Richardson	..	W. J. Tatem, Ltd.	22.7.48
<i>Zent</i>	..	C. R. Hodder	..	..	..	..	Elders & Fyffes, Ltd.	28.1.48
<i>Comway, H.M.S.</i>	..	T. M. Goddard, Capt., R.N.R.	..	The Senior Cadets	..	..	..	10.4.48
<i>Pangbourne Nautical College</i>	..	H. C. Skinner, O.B.E., Cdr., R.N.	..	The Senior Cadets	..	..	..	3.4.48
<i>Worcester, H.M.S.</i>	..	G. C. Steele, V.C., Capt., R.N.R.	..	The Senior Cadets	..	..	..	7.4.48

FLEET LIST (New Zealand)  
VOLUNTARY OBSERVING SHIPS

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

NAME OF VESSEL	CAPTAIN	OBSERVER	RADIO OFFICER	OWNERS
<i>Huia</i>	A. J. Matheson	B. R. Druce	G. M. Gormlie	Nobel (Australasia) Proprietary Ltd.
<i>Kaikorai</i>	G. S. Beaton	A. Mackay	B. G. Hart	Union S.S. Co. of New Zealand, Ltd.
<i>Karanga</i>	T. S. McNicol	E. W. Robb	L. M. Harvey	Union S.S. Co. of New Zealand, Ltd.
<i>Kareu</i>	W. E. Jones	D. H. Turnbull	A. E. Whalley	Union S.S. Co. of New Zealand, Ltd.
<i>Kartlane</i>	G. Evans	J. C. Young	G. M. Throp	Union S.S. Co. of New Zealand, Ltd.
<i>Kauri</i>	A. T. Adam	E. Clark	W. A. Hawkins	Union S.S. Co. of New Zealand, Ltd.
<i>Komata</i>	F. Chapman	B. E. Avery	E. H. Ward	Union S.S. Co. of New Zealand, Ltd.
<i>Kopua</i>	A. F. Inman	E. R. Warner	W. A. Taylor	Union S.S. Co. of New Zealand, Ltd.
<i>Kurou</i>	J. Holm	G. H. Edwards	A. J. Stanton	Capt. J. Holm and crew.
<i>Manuka</i>	A. R. Russel	J. Hare	E. H. Ward	Union S.S. Co. of New Zealand, Ltd.
<i>Matua</i>	L. C. Boulton	A. F. Jenkins	W. A. Taylor	Government of New Zealand (Pacific Islands Admin.)
<i>Maui Pomare</i>	H. S. Collier	E. Anderson	A. J. Stanton	Government of New Zealand
<i>Pamir</i>	J. Keith	K. Mitchell	J. G. Rea	A. F. Watchlin.
<i>Port Waikato</i>	N. Worth	D. S. Brayshay	S. J. Waters	Public Works Department.
<i>Ranui</i>	W. Grey	J. K. West	C. V. Hayes	Union S.S. Co. of New Zealand, Ltd.
<i>Waikare</i>	C. Burgess	J. W. Keyworth	E. L. Hulme	Union S.S. Co. of New Zealand, Ltd.
<i>Waipori</i>	F. W. Gibson			Union S.S. Co. of New Zealand, Ltd.
<i>Waipori</i>	W. Whitfield			Union S.S. Co. of New Zealand, Ltd.
<i>Waitemata</i>	F. A. Barrett			Union S.S. Co. of New Zealand, Ltd.
<i>Whakakura</i>				Tasman S.S. Co.

FLEET LIST (Canada)  
VOLUNTARY OBSERVING SHIPS

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

NAME OF VESSEL	OWNERS
<i>Fort Amherst</i>	Furness, Withy & Co.
<i>Fort Townsend</i>	Furness, Withy & Co.
<i>Imperial Quebec</i>	Imperial Oil, Ltd. (Marine Department).
<i>Imperial Toronto</i>	Imperial Oil, Ltd. (Marine Department)
<i>Imperial Edmonton</i>	Imperial Oil, Ltd. (Marine Department).
<i>Lady Nelson</i>	" Lady Nelson " Ltd. (Canadian National Steamships).
<i>Lady Rodney</i>	" Lady Rodney " Ltd. (Canadian National Steamships).
<i>Victoria County</i>	Acadia Overseas Freighters, Ltd.
<i>Waltham</i>	Canadian Union Line, Ltd.
<i>Waikawa</i>	Canadian Union Line, Ltd.
<i>Wairuna</i>	Canadian Union Line, Ltd.
<i>Watomo</i>	Canadian Union Line, Ltd.

## FLEET LIST (Hong Kong)

### VOLUNTARY OBSERVING SHIPS

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

NAME OF VESSEL	OWNERS
<i>Bris</i> .. .. .	China Siam Line.
<i>Caroline Moller</i> .. .. .	Moller's (Hong Kong), Ltd.
<i>Chak Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Choy Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Eastern Saga</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>E Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Fengtien</i> .. .. .	China Navigation Co., Ltd.
<i>Foochow</i> .. .. .	China Navigation Co., Ltd.
<i>Fuhsing</i> .. .. .	Chinese Maritime Customs.
<i>Fukien</i> .. .. .	China Navigation Co., Ltd.
<i>Hai Lee</i> .. .. .	China Siam Line.
<i>Hang Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Hanyang</i> .. .. .	China Navigation Co., Ltd.
<i>Hermelin</i> .. .. .	China Siam Line.
<i>Hin Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Hiram</i> .. .. .	China Siam Line.
<i>Hong Siang</i> .. .. .	Ho Hong Steamship Co., Ltd.
<i>Hunan</i> .. .. .	China Navigation Co., Ltd.
<i>Hunghsing</i> .. .. .	Chinese Maritime Customs
<i>Hupoh</i> .. .. .	China Navigation Co., Ltd.
<i>Yunghsing</i> .. .. .	Chinese Maritime Customs.
<i>Kut Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Lot Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Mau Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Mei Shan</i> .. .. .	Standard-Vacuum Oil Co., New York.
<i>Nanchang</i> .. .. .	China Navigation Co., Ltd.
<i>Nellore</i> .. .. .	Eastern & Australian Steamship Co., Ltd.
<i>Newchwang</i> .. .. .	China Navigation Co., Ltd.
<i>Ninghai</i> .. .. .	China Navigation Co., Ltd.
<i>Pakhoi</i> .. .. .	China Navigation Co., Ltd.
<i>Poyang</i> .. .. .	China Navigation Co., Ltd.
<i>Shansi</i> .. .. .	Australian-Oriental Line, Ltd.
<i>Shengking</i> .. .. .	China Navigation Co., Ltd.
<i>Szechuen</i> .. .. .	China Navigation Co., Ltd.
<i>Tai Chung Shan</i> .. .. .	Shun Cheong Steam Navigation Co.
<i>Tai Ping</i> .. .. .	China Pacific Shipping & Trading Co.
<i>Tai Po Shan</i> .. .. .	Shun Cheong Steam Navigation Co.
<i>Tak Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Tehhsing</i> .. .. .	Chinese Maritime Customs
<i>Wing Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Wo Sang</i> .. .. .	Indo-China Steam Navigation Co., Ltd.
<i>Yochow</i> .. .. .	China Navigation Co., Ltd.
<i>Yunhsing</i> .. .. .	Chinese Maritime Customs.

### LIGHT VESSELS

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

NAME OF VESSEL	MASTER
<i>East Goodwin</i> .. .. .	A. Giblin
<i>Humber</i> .. .. .	
<i>Newarp</i> .. .. .	
<i>Royal Sovereign</i> .. .. .	
<i>Shipwash</i> .. .. .	H. L. Neale

## NOTICES TO MARINE OBSERVERS

### Postal Arrangements

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

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

Shipowners, Marine Superintendents, and all concerned in the despatch of mails to ships 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 captains of ships, contains information which is required for the conduct of meteorological work at sea, and is most effective if received by the captains 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, in the pages provided at the end of the logbook (Form 911), or on Form 912, which may be supplied to the captain of any British ship on application to a Port Meteorological Officer or Merchant Navy Agent.

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

### RETURN OF LOGBOOKS

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



## Meteorological Services for Shipping

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

### Transmission of Radio Weather Messages through Ocean Weather Ships

Observing ships in the North Atlantic, equipped only with medium frequency transmitters, may, when out of range of Valentia Radio or Malin Head Radio, send weather reports on 500 kc/s to either of the British Ocean Weather Ships on station in Longitude 60°N., Latitude 20°W., and Longitude 53° 50'N., Latitude 18° 40'W. for relay via Portishead Radio.

To avoid interference and possible confusion at coast stations handling the same class of traffic, reports for relay should not be sent to Ocean Weather Ships from positions within 400 miles of the coast.

As a temporary measure, the northern and southern Ocean Weather Ships will use the call signs MEA and MEB respectively.

Reports should be transmitted as soon as possible after observation times and the letters OBS included in the call immediately after the abbreviation QTC.

Ocean Weather Ships will maintain watch on 500 kc/s for the reception of weather reports at the following times (GMT).

0940-1000 1217-1245 1730-1800 2140-2200

In the event of failure to contact one of the British Ocean Weather Ships, weather reports may be sent to CQ on 500 kc/s for information of shipping in the vicinity.

The attached schedule will perhaps emphasise the reason for the programme outlined above.

SCHEDULE FOR RELAY OF WEATHER MESSAGES THROUGH O.W.S. FROM MERCHANT SHIPS ONLY EQUIPPED WITH M/F W/T TRANSMISSION

Time of Merchant Ship Synoptic Observation	Single Operator Watch Period (E. of 30°W.)	O.W.S. Upper Air Observation.	O.W.S. Weather Messages to Dunstable.	Single Operator M/S traffic to O.W.S.†
00			00-0015	
06	08-10	02-03 08-09	03-0340 06-0615	
12	12-14	14-15	09-0940 12-1215	0940-10 1217-1245
18*	16-18 20-22	20-21	15-1540 18-1815 21-2140	* { 1730-1800 or { 2140-2200

† Should the merchant ship be unable to contact the O.W.S., she should send her weather message CQ at the first opportunity.

\* Instructions have already been given to merchant ships in this area that, in order to clear their 1800 observation during the Single-operator period 1600-1800, that observation can be made at 1730.

## **Great Britain**

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

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

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

### **TRANSMISSION OF WEATHER MESSAGES THROUGH DETAILED STATIONS**

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

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

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

### **Gale Warnings and Storm Warnings British Coastal Waters and Eastern North Atlantic**

Attention is drawn to the fact that in the weather bulletins issued by the British Meteorological Office for shipping around the coasts of the British Isles, *gale warnings* are issued when the wind is expected to reach *Beaufort force 8 or above*.

The *storm warnings* in the Atlantic Weather Bulletin for Shipping, however, are only issued when the wind is expected to reach *Beaufort force 10 or above*. *Note.*—In some parts of the world *hurricane warnings* are issued ; these will infer that a wind of *Beaufort force 12 or above* is expected.

## GREAT BRITAIN—LOCAL WEATHER FORECASTS

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

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

PORT	ADDRESS OF NEAREST FORECAST CENTRE	TELEPHONE NO.
Aberdeen	The Meteorological Officer, Dyce Airport, Aberdeenshire	Dyce 332. Ex. 70
Bristol	The Meteorological Officer, Bristol Airport, Whitchurch, Bristol	Bristol 26451. Ex. 22
Cardiff	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110.
Dundee	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
Falmouth	The Senior Meteorological Officer, H.Q. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Glasgow	The Meteorological Officer, Renfrew Airport, Renfrewshire	Renfrew 2352. Ex. 21/3.
Hartlepool	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731/5. Ex. 230/1.
Hull	The Senior Meteorological Officer, H.Q. No. 1 Group, Royal Air Force, Bawtry, Doncaster, Yorkshire	Bawtry 363/7. Ex. 105
Inverness	The Senior Meteorological Officer, Royal Air Force, Raigmore, Inverness	Inverness 1853/8. Ex. 114/5/6/7.
Kirkwall	The Meteorological Officer, Hatston Airport, Orkneys	Kirkwall 421. Ex. 2.
Leith	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
London	The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2	Holborn 3434. Ex. 629.
Liverpool	The Senior Meteorological Officer, Speke Airport, Liverpool, 19	Garston 1240. Ex. 21/2.
Milford Haven	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Newcastle	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731. Ex. 230/1.
Plymouth	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Southampton	The Senior Meteorological Officer, Southampton Airport	Eastleigh 87228. Ex. 10.
Swansea	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110.

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

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

### **Headquarters**

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

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

### **Mersey**

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

### **Thames**

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

### **Bristol Channel**

Captain R. Reid, Port Meteorological Officer, 2 Bute Crescent, Cardiff.

### **Southampton**

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

## **AGENTS**

### **Clyde**

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

### **Forth**

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

### **Humber**

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

### **Tyne**

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

## **OFFICERS OF THE METEOROLOGICAL SERVICE OF CANADA**

### **Headquarters**

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

### **Halifax**

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

### **Saint John**

Mr. Francis N. Barnes, The Observatory, Saint John, N.B. (Telephone : 3-3500.)

### **Vancouver**

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



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



## SOME PUBLICATIONS ISSUED UNDER THE AUTHORITY OF THE METEOROLOGICAL COMMITTEE

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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.)

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

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

**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). 6s. (6s. 6d.)

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

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

**Weather Map.** An introduction to modern meteorology. M.O. 225i. 3rd edition. 1939 (reprinted 1948). 3s. (3s. 3d.)

**Meteorological Glossary.** M.O. 225ii. 3rd edition. 1939 (reprinted 1947). 7s. 6d. (7s. 10d.)

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

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