

M.O. 528

Met Row
30 JAN 1950

The Marine Observer



Volume XX No. 147

JANUARY, 1950

FIVE SHILLINGS NET



METEOROLOGICAL INSTRUMENTS

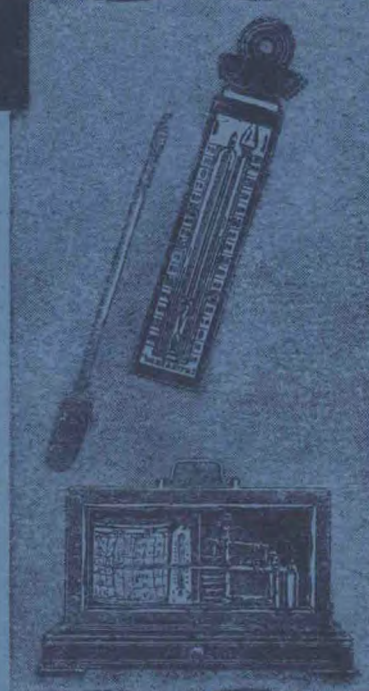
Patentees and Specialists in the
manufacture of Navigational
Instruments for over 100 years.

The "Hezzanith" range of products
includes—

SEXTANTS, COMPASSES, BINOCULARS,
BINOCULARS, TELESCOPES, SOUNDING
MACHINES, CHART INSTRUMENTS,
CLOCKS, ANEROIDS, RULES, ETC.

TEMPERATURE INDICATING AND
RECORDING INSTRUMENTS.

Catalogues (M048) will be gladly sent
upon request.



HEATH & COMPANY
NEW ELTHAM **LONDON, S.E.9**

Phone: ELTHAM 3836

Grams: "Polaris, Phone," London

METEOROLOGICAL MAGAZINE

The Magazine contains authoritative articles on a wide variety of topics, including the first accounts of much recent research of great importance, international collaboration in meteorology and aviation, reports of scientific meetings, notices and reviews of new books, descriptions of new instruments, notes on interesting weather and optical phenomena in this country and abroad, letters from correspondents. Figures are also given every month, summarising the weather experienced at many places in the British Commonwealth.

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
and obtainable from the following Sales Offices

LONDON, W.C. 2: York House, Kingsway [Post Orders: P.O. Box No. 569,
London, S.E. 1]; MANCHESTER 2: 39, King Street; EDINBURGH 2: 13a,
Castle Street; CARDIFF 1: St. Andrew's Crescent; BRISTOL 1: Tower Lane;
BIRMINGHAM: 2, Edmund Street; BELFAST: 80, Chichester Street;
OR THROUGH ANY BOOKSELLER

Price 1s. net. By post 1s. 1d. Annual Subscription 13s. including postage

THE MARINE OBSERVER

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

VOL. XX No. 147 JANUARY 1950

TABLE OF PRINCIPAL CONTENTS

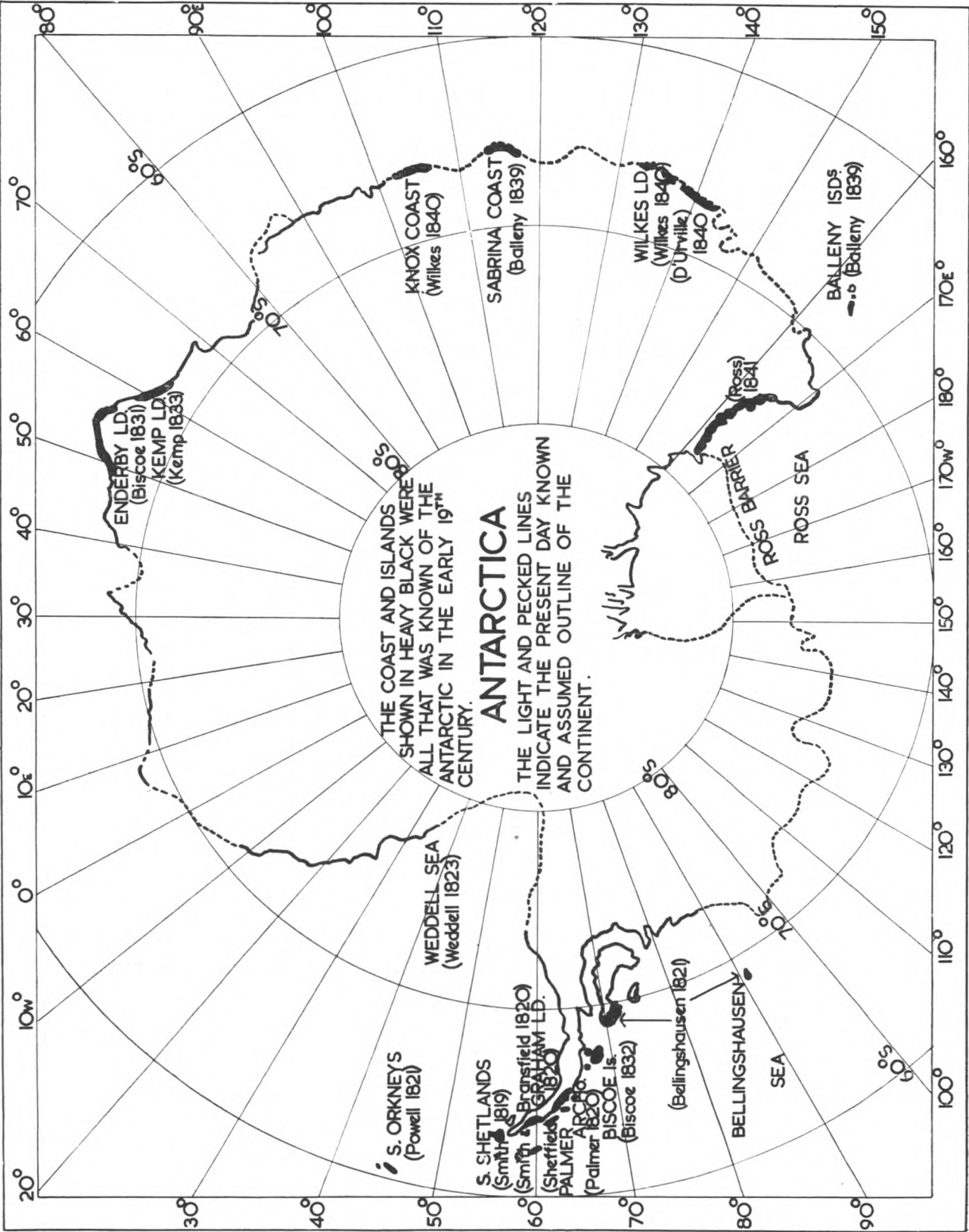
	<i>Page</i>
Editorial	3
The Marine Observers' Log—January, February and March	4
Some Discoveries in the Far South. By Cdr. C. H. Williams, R.N.R.	15
Landing Aircraft by Radar and Other Means. By D. D. Clark, M.A.	24
Weather Wise. Part I. By Cdr. C. E. N. Frankcom, R.N.R.	29
Hurricanes at Barbados. By A. H. Gordon, M.S... .. .	37
Radar in Ocean Weather Ships. By K. Milburn	40
The Disappearance of the " Samkey ". By P. M. Shaw	45
Canadian Excellent Awards	49
Weather and Pack-Ice in the Antarctic. By Lt.-Cdr. C. Minchin, R.N... .. .	50
Reviews	51
Southern Ice Reports—January, 1948, January, February and March, 1949	52
Personnel	56

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

To be purchased directly from H.M. Stationery Office at the following addresses:
York House, Kingsway, London, W.C.2; 13a Castle Street, Edinburgh, 2;
39 King Street, Manchester, 2; 2 Edmund Street, Birmingham, 3;
1 St. Andrew's Crescent, Cardiff; Tower Lane, Bristol, 1;
80 Chichester Street, Belfast
OR THROUGH ANY BOOKSELLER

Printed in Great Britain by The Campfield Press, St. Albans, Herts
S.O. Code No. 40-38—1-50

PRICE 5s. NET or £1 1s. 0d. per annum (post free)



Map of Antarctic to illustrate article, "Some Discoveries in the Far South."

EDITORIAL

Those of us who were fortunate enough to be in England throughout 1949 will look back with gratitude upon the glorious weather that the year provided. This is, indeed, an unusual remark for an Englishman to make, but it is true; and so consistent was the sunshine that the inevitable comment upon the day's weather, which always prefaces a British conversation, rather lost its point. Contrary to general expectation the long spells of fine, dry weather appear to have had no very adverse effect upon crops—probably because there were occasional short bursts of refreshing rain.

We are grumblers by tradition, particularly about the weather (and even about the forecasts), but, thanks to the kindly Atlantic, we neither suffer from drought nor extremes of heat and cold, and, even if we are a bit "hard up" at present, we have much to be thankful for. All of which makes one think, perhaps, how lucky we are to live in "This precious stone set in a silver sea . . . this England".

The changing panorama of our British skies and the moods of our weather help to produce the beauty of our countryside, which has been made immortal by our artists, poets and authors. To the majority of the readers of *The Marine Observer*, however, Britain is frequently a pleasant dream and memory which lies at the backs of their minds as they sail the seven seas. And, as is usual with those who go down to the sea in ships, there will often be a measure of envy of those who live and work ashore. But it is quite surprising how frequently the mariner who has "swallowed the anchor" has urges to be back at sea again; he only remembers the "flying fish weather" and the other pleasanter things of sea life. As an island race it is good that we do have a love of the sea, even if we spend much of our time complaining when we are at sea, for it is certain that we cannot live without a Merchant Navy.

"Who would sell a farm and go to sea?" It is surprising how many farmers' sons do find their way to the sea, and perhaps it is this mixture of soil and salt water that induces sailors to have visions of poultry and pig farms and other agricultural pursuits.

Sailors and farmers do have many common interests: both spend much of their life in the open air; the lives of both are very intimately affected by the weather; both are, to some extent, dependent upon the other—the sailor carries in his ship the goods the farmer produces; and agricultural and maritime history are both as old as time. The amateur meteorologist at sea has it in his power to contribute quite a lot to knowledge of world meteorology, and there is little doubt that one of the chief benefactors of increased knowledge about the weather would be the farmer.

Meteorology is a subject which those connected with shipping cannot very well escape, even if they wish to. Every operation connected with ships, either at sea or in harbour, is affected by the weather in one way or another—be it navigation, maintenance, comfort of passengers and crew, and the care of cargo, whether aboard the ship or when being loaded or discharged. The Merchant Navy officer should thus look upon it not only as a duty, but a perfectly natural function, to know something about the practical side of meteorology. This is particularly true, at present, when our survival depends upon our efficiency.

When this magazine reaches its readers, we shall already have left 1949

behind and set a course with, we hope, "a good departure" into 1950. On behalf of our Director, we wish our readers health and happiness and safe voyages throughout the New Year. Voluntary observers sailing aboard ships of all countries of the British Empire have, during 1949, done an admirable job. By their efforts they have provided each day a large portion of the synoptic picture of the world, whereby meteorologists of all nations have been enabled to issue weather bulletins and forecasts, not only for the benefit of aircraft and shipping, but for agriculture, industry and, in fact, for all human activities. It is not only day-to-day forecasting that is affected; there is that important matter of research and investigation which is an essential towards our better understanding of the vagaries of the weather. When we do know more, we shall perhaps be able to foretell the weather a month or more ahead, and thereby be able to plan our industries and other activities accordingly. This is a dream of meteorologists the world over—a dream of which the realisation lies in the dim and distant future.

MARINE SUPERINTENDENT.



JANUARY, FEBRUARY AND MARCH

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 logbook of marine observers and from individual manuscripts. Photographs or sketches are particularly desirable.

Responsibility for each observation rests with the contributor.

LINE OF DEMARKATION OF CURRENT

Gulf of Panama

S.S. *Tamaroa*. Captain H. S. Cox. Colon to Wellington. Observer, Mr. A. H. Baber, 3rd Officer.

16th February, 1949, 2149 G.M.T. Vessel passed through a very distinct line of demarkation running SE-NW. Set previous to observation S37°E, subsequently N17°W. Wind NE × E, 3, visibility 20 miles, trace of Cu. cloud. Course 227°. Speed 15.5 knots.

Position of Ship : Latitude 4° 16'N., Longitude 83° 23'W.

CURRENT RIP AND DISCOLOURED WATER

Gulf of Panama

M.V. *Derryclare*. Captain G. Smith. Panama Canal to Noumea, New Caledonia. Observer, Mr. E. T. Paddon, 2nd Officer.

4th February, 1949, 1910 G.M.T. A current rip was observed running 120° – 340° and a strip of discoloured water running 050° – 230° at one end of the rip and about one mile 340° from ship's position. The current gave a severe boiling effect and the discoloured water was about $\frac{1}{2}$ -mile long. Weather conditions: Corrected barometer 1009 mb. falling, air temperature 80°F. , wet bulb 75° , sea 80° , wind 045° , force 4, waves 045° , 4 sec., 4 ft., visibility 25 miles, sky $1/8$ clouded with Ci. about 30,000 ft. Course 228° . Speed 12.5 knots.

Position of Ship: Latitude $5^{\circ} 36' \text{N.}$ Longitude $81^{\circ} 21' \text{W.}$

DISCOLOURED WATER

Off Coast of Peru

M.V. *San Adolfo*. Captain F. R. H. Atkinson. Panama to Valparaiso. Observer, Mr. R. W. Wilkinson, 2nd Officer.

10th January, 1949, 1500–2000 G.M.T. Vessel steamed through large patches of discoloured water of a red hue. The colouring appeared to be within a foot of the sea surface and to the naked eye seemed to be fluid, not emanating from particles of matter. The patches appeared to lie in the direction of the wind and were observed between lat. $6^{\circ} 23' \text{S.}$, long. $81^{\circ} 29' \text{W.}$, and lat. $7^{\circ} 07' \text{S.}$, long. $81^{\circ} 28' \text{W.}$ Air temperature 74°F. , sea 69° , wind SSW, 2, barometer 29.88 in. (corrected). Sea and swell were S'ly, slight.

PHOSPHORESCENCE

Arabian Sea

M.V. *Repton*. Captain D. Cownie. Abadan to Bombay. Observer, Mr. G. R. Watts, 3rd Officer.

20th January, 1949, 1900–1930 G.M.T. Vessel passed through a belt of brilliant phosphorescence extending $4\frac{1}{2}$ miles. The night was dark and the phosphorescence was a dense mass of uniform radiance which cast a bright reflection in the sky resembling a large patch of very low mist or a field of ice. Wind WSW, 2, slight sea and swell, cloudless sky, visibility very good. Course 115° . Speed 9.3 knots.

Position of Ship: Latitude $22^{\circ} 23' \text{N.}$, Longitude $64^{\circ} 40' \text{E.}$

Note. This is the type of phosphorescence known as "white water".

S.S. *Lassell*. Captain D. Roberts. Durban to Karachi. Observer, Mr. S. Dickinson, Chief Officer.

25th January, 1949, 1500 G.M.T. Observed a glow in the sky which at first was thought to be aurora. As it became brighter it was definitely seen to be reflection from the sea. At 1925 the vessel steamed into phosphorescence which at one time appeared to stretch to the horizon on all sides.

Throughout the night, and also on the next night, the ship steamed across patches of varying brilliancy. The largest area took about six hours to traverse.

Position of Ship : Latitude $17^{\circ} 36' \text{N.}$, Longitude $62^{\circ} 01' \text{E.}$

PHOSPHORESCENT WHEEL

Bay of Bengal

S.S. *Laomedon*. Sumatra to Colombo. Observer, Mr. F. D. Glover, 2nd Officer.

25th February, 1949. At 1755 G.M.T. the sea commenced to show flashing spots of phosphorescence, approximately twice every second. As the vessel approached a line of Cb. the phosphorescence increased in intensity and took on the form of bars moving at great speed and apparently around some centre. I was unable to identify the direction of this centre of radiation. The phosphorescence was of a brilliant nature and was unlike anything I have ever observed before. It had the appearance of shock waves moving outwards from some centre and activating the phosphorescence in successive waves. These waves had the appearance of revolving round the centre like the spokes of a bicycle wheel, but with a very large radius. At 1800 it had reached its greatest intensity and maintained this until 1810, after which it decreased until 1820, when it resumed its flashing character and eventually faded away. Prior to this occurrence phosphorescence had been present in the water. During this time all weather conditions remained the same except for a slight fall of .001 in. in the barometric pressure due to diurnal range. The phenomena was at its greatest intensity when the vessel was directly under the line of Cb. My own opinion is that this may have been caused by an earth tremor somewhere in the vicinity. Weather conditions : Wind NW, 3, sea rippled, no swell. Line of Cb. lying E and W with precipitation to the WNW of vessel, distant 6 miles approximately, elsewhere Ci. and Cs. No moon. Barometer 30.02 in., air temperature 80°F. , sea temperature $82\frac{1}{2}^{\circ}$.

Position of Ship : Latitude $5^{\circ} 20' \text{N.}$, Longitude $97^{\circ} 48' \text{E.}$

Note. The phenomenon is known as the "phosphorescent wheel". Its occurrence is well established and several accounts of it have been received by us during the last twenty years, but it is rare. Of three other observations of the wheel, two occurred in the eastern part of the Bay of Bengal, not far from the position of this observation, while the third was seen in the China Sea. The phenomenon is usually observed in the equatorial regions of the Indian Ocean and China Sea, but it cannot be definitely stated that it does not occur elsewhere at times. The bands rotating round the centre are sometimes seen to be straight and on other occasions curved. It is of interest to time the rate of passage of the bands past the ship. In two of the observations above referred to, the rate was given as two per second. The third report is uncertain, as one observer on the ship gave this same rate while two other observers stated that the bands passed the ship very regularly every two seconds. The rate of revolution is too great to be accounted for by the movement of the ship passing stationary phosphorescent bands. The centre of the rotating bands has sometimes been definitely seen. No explanation has yet been found to account for this remarkable phenomenon. The suggestion of an earth tremor is interesting ; it would not appear improbable that shock waves, if present, might stimulate the micro-organisms responsible for phosphorescence. In the case of one of the other observations in the Bay of Bengal the captain considered that there was a possibility of submarine volcanic disturbance, as the main engines were straining and revolutions dropped considerably.

WATERSPOUTS

Mediterranean Sea

M.V. *Dilwara*. Captain F. L. Sampson, D.S.C. Port Said to Southampton. Observer, Mr. T. E. Harris, 3rd Officer.

1st February, 1949, 0725 G.M.T. A waterspout was observed to be forming. The funnel descended from a large bank of Ns. and the sea beneath became agitated, spray being drawn upwards in an anticlockwise direction. The spout was travelling E with great rapidity; in 10 minutes it reached its maximum with funnel halfway to the sea and then started to decrease, and by 0740 had vanished entirely. In its wake, about $\frac{1}{2}$ -mile distant, was a heavy rain squall which lasted for about 5 minutes.

Position of Ship : Latitude $33^{\circ} 47' \text{N.}$, Longitude $23^{\circ} 43' \text{E.}$

South Atlantic Ocean

S.S. *Princesa*. Captain E. J. Loughed. Las Palmas to Montevideo. Observers, Mr. W. Pike, 1st Officer, and Mr. H. Sargent, 2nd Officer.

22nd February, 1949, 1945 G.M.T. Observed waterspout forming about 2 points on the port bow, distance 5 miles. It travelled 2 miles in 15 minutes in a N'y direction before it subsided. The vessel passed through the position of the waterspout after it had started to subside and a noticeable drop in temperature was felt and cold rain fell for about 2 minutes. The clockwise movement of the cloud could still be seen when directly beneath the disturbance and the sea for a radius of 500 yards appeared to be boiling; elsewhere it was calm.

The spout, when subsiding, parted in the centre and the two parts travelled up and down respectively, the clockwise motion being plainly visible until the end. While passing through the disturbance the wind backed and veered 6 points, gusting to force 6-7. Another spout was observed at the same time bearing due W, distance about 15 miles. Weather conditions : Air temperature 78°F. , sea 78° , wind S, 2-3. Cb. (without anvil) 4/8, Ac. 2/8, height of base 1,500 ft. Course $222^{\circ} (\text{T})$. Speed $10\frac{1}{2}$ knots.

Position of Ship : Latitude $24^{\circ} 48' \text{S.}$, Longitude $42^{\circ} 57' \text{W.}$

Atlantic Equatorial Waters

S.S. *Lanarkshire*. Captain C. E. O'Byrne. Dakar to Cape Town. Observer, Mr. W. W. S. Arnott, 4th Officer.

8th March, 1949, 0720 G.M.T. A well-formed waterspout was observed extending below Cb. to within approximately 300 ft. above sea level. A heavy shower of rain had just passed over and the spout was following the rain.

Position of Ship : Latitude $4^{\circ} 29' \text{N.}$, Longitude $11^{\circ} 29' \text{W.}$

MIRAGE AND EXCEPTIONAL VISIBILITY

Australian Waters

S.S. *Devon*. Captain A. Hocken. Coasting. Observer, Mr. M. M. Shaw, 3rd Officer.

27th January, 1949, 0915 G.M.T. Mirage effects were noticed of S.S. *Diomed* ahead, distant 6 miles (radar). She appeared square, i.e. showing no funnel or masts, only occasionally the funnel appeared.



A vessel was also observed on the starboard bow showing as two ships, i.e. one right way up and the reflection upside down, mast to mast, with a continuous shimmer across them. The distance was over 15 miles. Half-an-hour later S.S. *Gothic* bound for Port Adelaide, distance off 14 miles, appeared thus



At 10 miles distant she appeared normal.

28th January, 1949, 1600 G.M.T. While proceeding from Backstairs Passage to a position 9 miles off Rivoli Bay, Margaret Brock Light was observed at 48 miles distant. At the same time Cape Willoughby was still visible astern. Ships were easily visible at 20 and 22 miles, and the radar showed clearly Margaret Brock Lighthouse (100 ft.) at 31 miles distant and Cape Jaffa at 31 miles. Temperature 66°F., barometer 30.01 in., steady. Sky 1/8 Sc., with distant lightning.

Position of Ship : Latitude 36° 27'S., Longitude 138° 49'E.

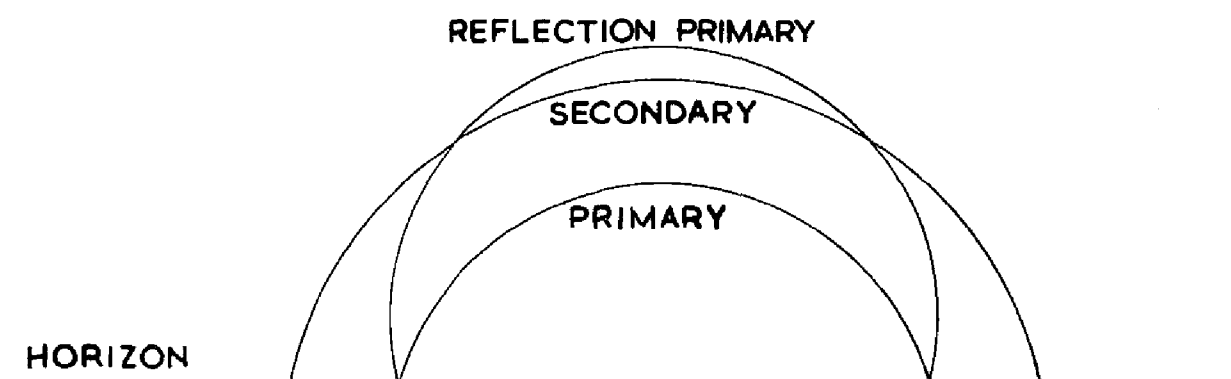
RAINBOWS

North Atlantic Ocean

M.V. *Port Pirie*. Captain W. Enright, O.B.E., R.D., R.N.R. Curaçao to London. Observer, Mr. A. W. Kensett, 3rd Officer.

12th January, 1949, 1900 G.M.T. With the sun approximately astern and dense As. clouds ahead, a distinct rainbow was observed ahead and later another bow was seen outside the first with the colours reversed. This remained until 1945, when an additional bow was seen between the two with colours in the same order as the inner bow but going almost vertical until it appeared to blend with the outer bow. This centre bow lasted for about 20 minutes, but the two remaining bows lasted until 2100. The altitude of the inner bow at 2000 was 35° and the horizontal distance between the lower parts was 81°, but this increased slowly until the end.

Position of Ship : Latitude 28° 00'N., Longitude 53° 50'W.



Note. Additional rainbows are sometimes seen produced by the reflected image of the sun in the sea or other body of water. The base of the reflection primary bow meets that of the ordinary primary bow, as shown in the sketch. The bow rises more steeply from the horizon, as observed on this occasion. When completely seen the apex of the reflection primary bow lies a little above that of the ordinary secondary bow. A reflection secondary bow must also be formed, but it is so faint that it is seldom, if ever, visible.

LUNAR RAINBOW

North Atlantic Ocean

S.S. *Regent Hawk*. Captain J. Ward. Trinidad to Avonmouth. Observer, Mr. W. Elliott, 2nd Officer.

21st February, 1949, 0650 G.M.T. After a heavy rain squall a lunar rainbow was observed, mean bearing 315° , with bases extending approximately 15° each side of mean. The rainbow persisted for about 6 minutes after it was first seen. The approximate altitude of crest was 20° and the sky was $1/8$ covered with Cu. at 2,000 ft. Its general colouring was grey and variation of grey tints could be seen within inner and outer circumferences. The moon had entered its last quarter on 20th February at 0043.

Position of Ship : Latitude $22^\circ 21\frac{1}{2}'N.$, Longitude $52^\circ 03'W.$

S.S. *Argyll*. Captain J. Dodds. Mississippi River to Hull. Observer, Mr. T. R. Rowe, 2nd Officer.

11th January, 1949, 0335 G.M.T. A splendid lunar rainbow was observed. The full arc was clearly visible with the spectrum colours violet, green and orange easily discerned and it lasted for 5 minutes. It appeared several times later, but not in its entirety nor with such clarity. Moon's bearing 280° , approximate altitude $20\frac{1}{2}^\circ$. Sky $2/8$ clouded with Cs. and $1/8$ Cu.

Position of Ship : Latitude $43^\circ 52'N.$, Longitude $22^\circ 45'W.$

LUNAR HALO AND CORONA

Atlantic Equatorial Waters

S.S. *Essex Trader*. Captain C. Arundell. Immingham to River Plate via Dakar. Observer, Mr. F. Stamps, 2nd Officer.

17th January, 1949, 0215 G.M.T. A lunar halo commenced to form, and at 0245 was complete, with a radius of 21° , the breadth subtending an angle of $40'$. The moon's altitude was 71° . From 0245 to 0300 it was very bright and luminescent; the light from the star Procyon was completely dimmed and only visible through a glass, although no cloud could be seen in the vicinity. At 0300 the arc 020° - 360° - 200° commenced to dissolve and a 50° arc of a corona SW of the moon appeared which fully developed later. The colouring of the corona was very brilliant, yellow, purple, violet, green and red from the centre outwards and its radius was 7° . At 0320 all traces of both halo and corona had disappeared. During the observation the cloud form was Cs. and Cc. $4/8$, Cu. $1/8$ and the wind was light and variable.

Position of Ship : Latitude $2^{\circ} 30'N.$, Longitude $25^{\circ} 16'W.$

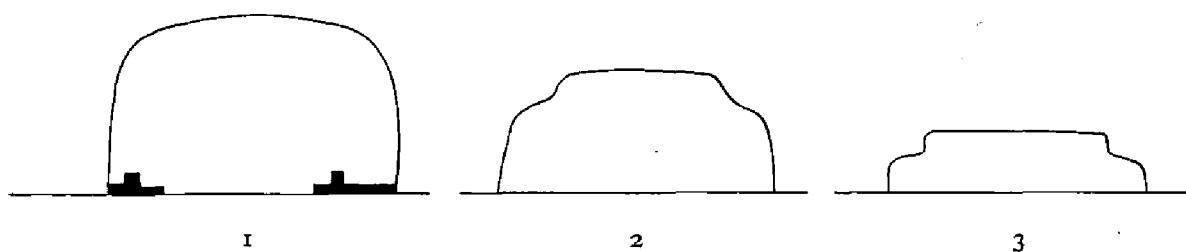
GREEN FLASH

Off San Diego, California

M.V. *Pacific Exporter*. Captain W. F. Swann. Balbao to Los Angeles. Observer, Mr. R. E. G. Simmons, 1st Officer.

21st March, 1949, at sunset. Green flash was distinctly observed, and presented rather unusual features. The sky in the W was covered by a very thin veil of Ci. or Cs. cloud, with one narrow band of either dense Cs. or thin As. cloud lying about two "sun diameters" above the horizon. This state of sky persisted throughout the observation.

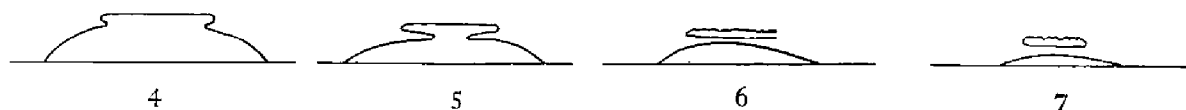
Weather conditions : Barometer (corrected) 1014.1 mb. Temperatures : air $60^{\circ}F.$, wet bulb 56° , dew point 52° , sea 60° , wind 300° , force 2, visibility 25 miles. The sun was of a pale golden colour and as the altitude decreased to about $15'$ its shape was decidedly not round. The sky in the background was a dusty red colour. As the altitude decreased to about $7'$ the lower half of the sun showed traces of orange, which spread upwards as the altitude decreased still further. The following sequence of events then occurred.



Sketch 1. Lower half appeared a soft orange colour tinged with salmon pink, and upper half became a bright golden yellow. As the lower limb touched the horizon the sun assumed a somewhat square form, and the sides were constantly in agitation as that of a jelly.

Sketch 2. Colours similar, but upper part seemed to increase its brilliancy. Shape was altering to assume a flat "crown" as illustrated.

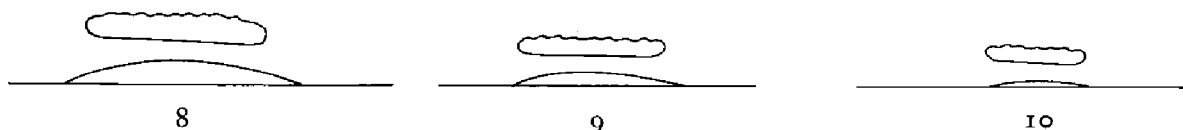
Sketch 3. Colours similar, but deeper orange at horizon and more brilliant crown. Shape of crown and shoulders more pronounced.



Sketches 4 and 5. Crown beginning to separate from main body of sun and brilliancy increasing.

Sketch 6. Crown became almost separated and its brilliancy was now almost blinding.

Sketches 7 and 8. These sketches represent a very sudden change. As soon as the crown became totally separated from the sun its edges showed bright red for a fraction of a second and the green began to form inside the red. The central part remained an exceedingly bright yellow and the top of the crown showed a corrugated and constantly moving surface like that of boiling water.



Sketches 9 and 10. The green spread towards the centre and was a brilliant emerald colour. When the upper limb of the sun was only just visible the whole of the crown turned green; as soon as the upper limb disappeared behind the horizon the crown vanished as if into thin air, and definitely did not follow down the path of the sun.

The whole sequence was clearly observed through binoculars and the sketches made immediately after observation. The time during which the green flash was visible lasted approximately 4 seconds from Sketches 7 to 10, and only a fraction of a second during which it was wholly green. It is believed that the sun was being viewed through a thin veil of Cs. cloud, or else saturated air. The black marks shown on Sketch 1 are believed to have been cloud, but were not observed after that phase.

Note. This is an interesting observation, particularly the momentary appearance of red colour at the ends of the detached crown, which is unusual. Another unusual feature is the length of time over which the green coloration developed; this normally occurs much more quickly. The way in which the colour developed, from the edges of the crown spreading inwards to the centre, has often been observed, but there is hardly time to see this on many occasions.

AURORAE

North Atlantic Ocean

M.V. Pacific Exporter. Captain W. F. Swann. Los Angeles to Manchester. Observer, Mr. M. J. Brown, 2nd Officer.

24th January, 1949, 0015 G.M.T. Distinct aurora visible between N and NW, rising to an approximate altitude of 30° and partially obscured by Cu.

Position of Ship : Latitude $38^{\circ} 12' \text{N.}$, Longitude $45^{\circ} 30' \text{W.}$

25th January, 1949, 2230 G.M.T. Distinct aurora first appeared bearing 000° , with a base of 20° and slowly tapered to a point within an altitude of 65° . The light was orange-crimson and moved slowly in azimuth from 000° to 315° where it faded.

Position of Ship : Latitude $40^{\circ} 25' \text{N.}$, Longitude $41^{\circ} 45' \text{W.}$

M.V. *Norfolk*. Captain A. I. Robertson, R.D., R.N.R. Curaçao to London. Observer, Mr. A. B. Moss, 3rd Officer.

25th January, 1949, 2230 G.M.T. An intense reddish glow was visible over 60° of the horizon from 330° (T) through N to 030° and to an altitude of 35° . Numerous vertical whitish rays were seen and other colours, orange, purple and blue became distinguishable later. The whole phenomenon lasted about 45 minutes. Aurora was seen again at 2400 to 0030 on the same night, and at 0100 to 0130 when the sky became obscured by cloud. Finally it was seen at 0430 to 0445, and each of these subsequent observations were as brilliant and extensive as the first one.

Position of Ship : Latitude $35^{\circ} 59' \text{N.}$, Longitude $39^{\circ} 28' \text{W.}$

S.S. *Memling*. Captain D. C. Roberts. Antwerp to St. Vincent. Observer, Mr. R. L. Pedley, 3rd Officer.

25th January, 1949, 2230 G.M.T. Aurora was observed as red haze on the horizon over an arc 326° to 045° through N. An angle of about 10° was subtended between the horizon and the top of the glow. The brightest intensity was between 326° and 340° , and in this portion two white beams appeared for about 5 seconds. The aurora was visible until 2310.

Position of Ship : Latitude $34^{\circ} 14' \text{N.}$, Longitude $15^{\circ} 40' \text{W.}$

M.V. *Reina del Pacifico*. Captain W. A. Hearle. Bermuda to Nassau. Observer, Mr. J. B. Olson, 2nd Officer.

25th January, 1949, 0001 G.M.T. Aurora was observed as a red glow bearing 330° (T). The glow lasted until 0230 then died away gradually, but reappeared at 0400 with rays of light resembling searchlight beams.

Position of Ship : Latitude $31^{\circ} 32\frac{1}{2}' \text{N.}$, Longitude $65^{\circ} 26' \text{W.}$

M.V. *Durango*. Captain P. M. Burrell. Bermuda to Kingston, Jamaica. Observer, Mr. M. W. Weekes.

25th January, 1949, 0015–0130 G.M.T. Northern Lights were observed covering an arc between 320° (T) and 036° (T). A red glow was seen with a pale green light, giving a searchlight and glow effect.

Position of Ship at 0000 G.M.T. : Latitude $31^{\circ} 37' \text{N.}$, Longitude $65^{\circ} 06' \text{W.}$

S.S. *Lanarkshire*. Captain C. E. O'Byrne. Port Said to Liverpool. Observer, Mr. M. T. Morton, 3rd Officer.

25th January, 1949, 2220 G.M.T. Observed faint lightening of the northern sky. The light, at first milky white, quickly intensified and changed to a scarlet hue which spread over an arc of about 75° , bearing from 305° to 020° , altitude approximately 18° . A narrow, almost vertical shaft of white light appeared in the north, wavering slightly. The phenomenon lasted about 10 minutes, then gradually faded, but brightened again for a

short time and plainly silhouetted a group of St. low in the northern sky. The aurora again faded gradually until by 2320 the whole had almost disappeared, but a faint glow remained for a few hours afterwards. There was no apparent disturbance of magnetic compasses.

Position of Ship : Latitude $38^{\circ} 42' \text{N.}$, Longitude $9^{\circ} 48' \text{W.}$

Other ships reporting aurora on 25th January in the North Atlantic :

S.S. *Markhor*, approximately lat. $47^{\circ} 09' \text{N.}$, long. $26^{\circ} 00' \text{W.}$ "Aurora Borealis observed" (time not stated).

O.W.S. *Weather Observer* on station Jig observed aurora at midnight.

O.W.S. *Weather Explorer*, in lat. $59^{\circ} 30' \text{N.}$, long. $17^{\circ} 48' \text{W.}$, observed slight aurora to NE at midnight and at 0300 on 26th in lat. $59^{\circ} 27' \text{N.}$, long. $17^{\circ} 30' \text{W.}$, reported "aurora covering sky".

S.S. *Matina*. Captain A. G. Jones. Cristobal to Rotterdam. Observer, Mr. F. O. W. Stokes, 3rd Officer.

26th January, 1949, 0001 G.M.T. A vivid display of aurora was observed. At first the sky glowed with crimson light in the shape of a dome bearing NW, about 20° altitude. This light increased and decreased in intensity and changed its bearing over an arc of some 90° . At times the red glow was most intense from NE and on various bearings ranging between NW and NE. Occasionally most of the sky was aglow between the two bearings and at times rays of white light radiated from the glow when in the NE sky. The display was seen until about 0300, when it was obscured by cloud. At 2200 aurora was again observed as a crimson glow bearing NW-NE, but of a greater intensity than on the previous night. The light reached an altitude of 30° and again ranged over an arc of nearly 90° , at times as a dome-shaped glow bearing NW or NE and at other times over most of the arc between the two bearings. Cloud obscured the display at about 2300.

Position of Ship at 0001 G.M.T. : Latitude $35^{\circ} 53' \text{N.}$, Longitude $42^{\circ} 58' \text{W.}$
At 2200 G.M.T. : Latitude $39^{\circ} 40' \text{N.}$, Longitude $36^{\circ} 47' \text{W.}$

S.S. *Loch Ryan*. Captain A. R. Osburn. Curaçao to Liverpool. Observers, Mr. R. C. Hunnisett, Jnr. 2nd Officer, and Mr. V. Charles, 3rd Officer.

4th February, 1949, 0130 G.M.T. A red glow was observed near the horizon bearing N. Rays and diffused light of considerable brilliancy reached an altitude of approximately 20° ; the colour was intense red. The sky was $\frac{4}{8}$ covered with Cb. and visibility was excellent.

Position of Ship : Latitude $39^{\circ} 45' \text{N.}$, Longitude $30^{\circ} 11' \text{W.}$

METEORS

Indian Ocean

S.S. *Matheran*. Captain A. B. Bannatyne, O.B.E. Aden to Colombo. Observer, Mr. R. M. Lucas, 3rd Officer.

12th January, 1949, 1608 G.M.T. A brilliant white meteor was observed bearing 050° , altitude 35° , travelling W at a moderate speed. It disappeared behind a large bank of Cu. bearing 350° , altitude approximately 15° . Duration of visible flight was 4 seconds and a brilliant trail was left for a minute after

the disappearance of the meteor. A noticeable feature was the trail, which was divided, the upper portion brilliant green and the lower white.

Position of Ship : Latitude $8^{\circ} 36' \text{N.}$, Longitude $70^{\circ} 41' \text{E.}$

North Atlantic Ocean

M.V. *Napier Star*. Captain E. N. Rhodes. Teneriffe to London. Observer, Mr. E. W. Jenkins, 2nd Officer.

23rd January, 1949, 0316 G.M.T. A very bright meteor was observed to fall from the vicinity of Polaris bearing 359° , approximate altitude 41° . It gave off a very bright green light as if a green flare had been dropped from the masthead, and the sea was lit up as day for about a second. It disappeared at an altitude of 5° .

Position of Ship : Latitude $40^{\circ} 35' \text{N.}$, Longitude $11^{\circ} 28' \text{W.}$

Pacific Ocean

S.S. *Stanthorpe*. Captain R. G. Roberts. Vancouver to Vizagapatam. Observer, Mr. N. G. Arnott, Cadet.

30th January, 1949, 0900 G.M.T. Observed a large meteor with fiery trail. It appeared about 5° above Canopus and disappeared near Achernar. Duration of flight 4 seconds. Magnitude comparable to Procyon (0.5), slightly red. The meteor was seen in twilight with no clouds.

Position of Ship : Latitude $20^{\circ} 23' \text{N.}$, Longitude $141^{\circ} 53' \text{E.}$

Atlantic Equatorial Waters

M.V. *Pacuare*. Captain H. G. Cruickshank. Manchester to Nigeria. Observer, Mr. L. B. Scott, 3rd Officer.

20th February, 1949, 2314 G.M.T. A meteor of unusual brilliance was observed with an altitude of 50° , rising in the SE and showing a brilliant white trail. The body turned red on culminating at 70° and showed a vivid green as it disappeared, bearing S with an altitude of 40° . The whole phenomenon lasted approximately 15 seconds, and lit up the entire sky.

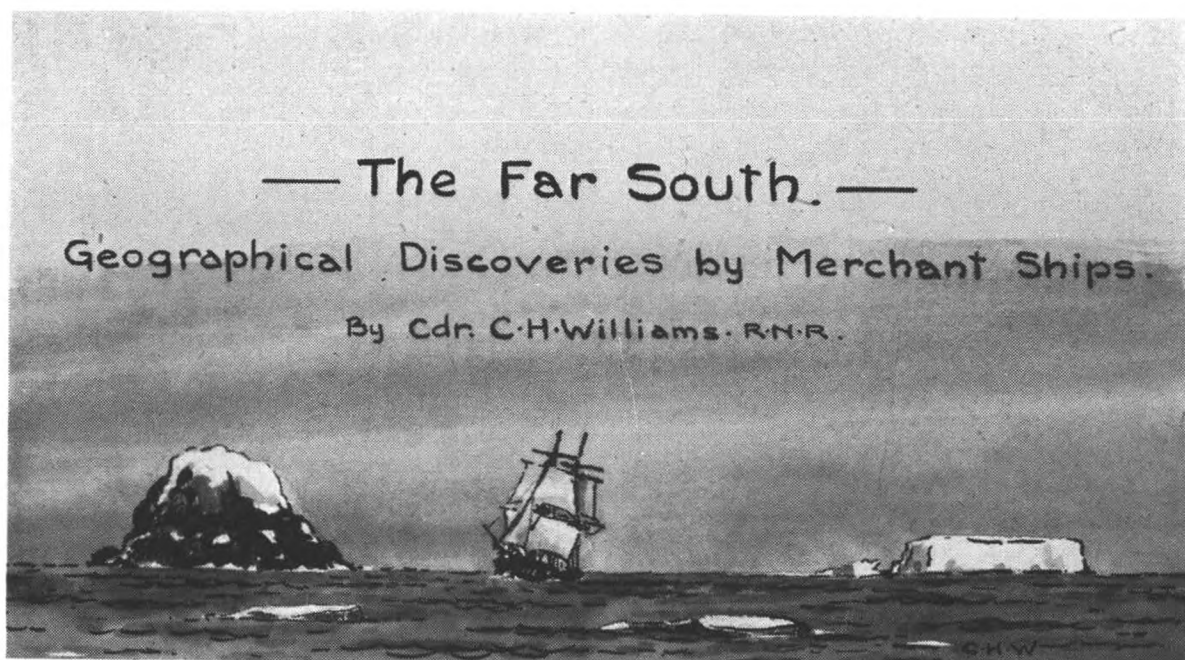
Position of Ship : Latitude $5^{\circ} 10' \text{N.}$, Longitude $9^{\circ} 50' \text{W.}$

Pacific Equatorial Waters

S.S. *Waitemata*. Captain C. W. Ostenfeld. Papeete to Vancouver. Observer, Mr. J. A. Barbour, 3rd Officer.

31st March, 1949, 0831 G.M.T. An exceptionally brilliant whitish meteor of magnitude -2 was observed bearing $300^{\circ} (\text{T})$. It was travelling at a comparatively low speed parallel to the NW horizon at an approximate altitude of 15° . It travelled in a N'y direction for 4 seconds and finally disappeared bearing $000^{\circ} (\text{T})$. Its exceptional brilliance, which was comparable to that of a low parachute flare, was bright enough to read a watch by. It left a trail which was visible for approximately 30 seconds after its disappearance. The sky was extremely clear, with only $1/8$ Cu. to the SW.

Position of Ship : Latitude $6^{\circ} 17' \text{S.}$, Longitude $146^{\circ} 14' \text{W.}$



The ancients believed in the existence of a great southern continent, and showed it on their maps and globes as “ Terra Australis Incognita ”, without any apparent evidence to support the belief.

Early southern voyages by the ships of several European nations gradually discovered more and more vast areas of ocean and sighted a few islands, but no great land area was found before the opening years of the nineteenth century.

By that time some geographers had come to doubt the existence of any great mass of Antarctic land.

Thus, strange to say, the great Antarctic Continent had first of all been thought to exist, then its existence had been doubted, and finally its slow discovery has made clear its character and, to a large extent, its outline.

Since the war ended there has been renewed interest in the Antarctic regions. A considerable amount of exploration on modern lines has been carried out, notably by the second great American naval expedition under the command of Admiral Byrd, with a U.S. naval task force of thirteen ships and over 4,000 men.

Also a number of whaling factory ships of several nationalities worked in the far south during the 1946-47 season, and again each season since. Expeditions of one sort or another from no fewer than twelve countries have been made.

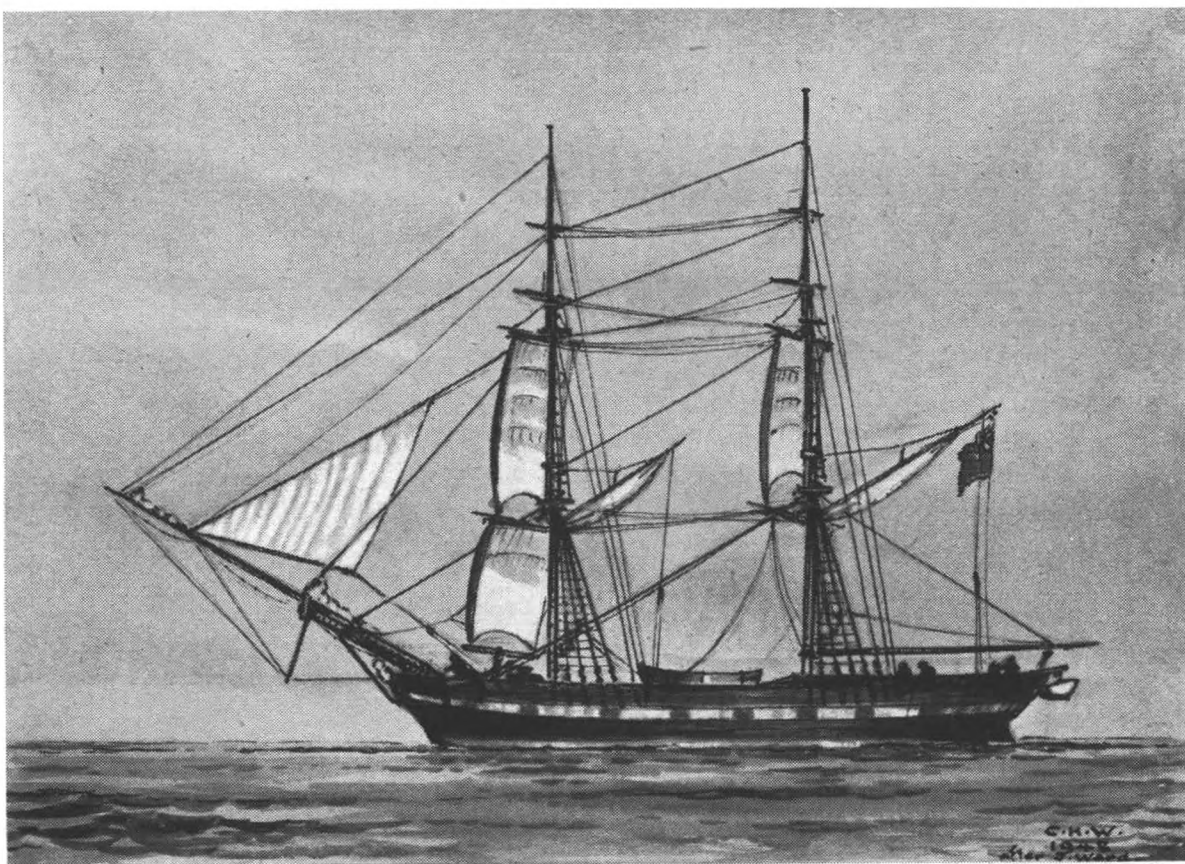
It is probably true to say that the icy south polar seas have recently seen more ships than for many years. Any of these vessels could possibly sight new land, or confirm or disprove previous reports of land. On the southern charts there are still a number of places marked “ appearance of land ”, and some islands and rocks with (P.D.) or (E.D.) printed against their names, meaning “ position doubtful ”, or “ existence doubtful ”.

These, and the many blank spaces on the charts, which may turn out to be either land or water, must remain a challenge to all maritime nations until exploration or chance sighting have dispelled the doubts.

Among the whaling ships is the fine new British vessel *Balaena*, of 15,760 tons gross, which is again in the southern ocean this season. An account of her 1946-47 voyage, on which she carried a meteorologist and also an aircraft for spotting whales, was published in the October, 1947, number of *The Marine Observer*.

The name *Balaena* has been used in the past for other whaling ships. One of these, the wooden auxiliary barque *Balaena*, 416 tons gross, of Dundee, was in the Weddell Sea in 1893, in company with three other British whalers, the *Active*, *Diana* and *Polar Star*, and the Norwegian whaler *Jason*.

Meteorological log books kept by the four British ships are still in the Marine Branch of the Meteorological Office. It was while perusing these logs that the idea of this article occurred to the writer.



Brig, 223 tons. About 90 ft. B.P.

From a drawing by J. Ward, of Hull, about 1840, now in the Print Room of the National Maritime Museum, Greenwich.

Accounts of the work of expeditions fitted out solely for exploration by various countries are well known. They include the work of such famous navigators and explorers as Captain James Cook, R.N., Captain Bellingshausen, of Russia, Captain d'Urville, of France, Captain Wilkes, U.S.N., and Captain James Clark Ross, R.N., in the eighteenth and early nineteenth centuries, and those of more recent times, such as Scott, Shackleton, Amundsen, Mawson, von Drygalski, Charcot, Nordenskjöld, Byrd, Rymill and others. We do not propose to repeat the accounts of their voyages here, but to confine ourselves to relating briefly the voyages and discoveries made by the less well-known merchant seamen while engaged upon "their lawful occasions" in far southern waters.

In the early days, these merchant ships were mostly vessels employed in the whale or seal fisheries. As a rule they were quite small craft. No doubt they discovered more sea than land, but in doing so they nevertheless added much to our knowledge of the South Polar regions. Their owner's business, whaling or sealing, was, of course, their main job ; discovery was a secondary affair, but was often encouraged by such enterprising shipowners as Messrs. Enderby & Sons, of London. (The wharf on Thames-side at Greenwich once owned by this firm is still known as Enderby's Wharf, but is now occupied by the Telegraph Construction and Maintenance Co. Ltd.)

The drawing opposite is of a typical English brig of the early nineteenth century. Large numbers of these small vessels, British and American, were engaged in the whaling and sealing in the far south.

Ships owned by Enderby's visited the Southern Ocean from 1785, and later their vessels discovered Enderby Land, Graham Land, Kemp Land, the Biscoe Islands and the Balleny Islands.

It is, of course, highly probable that some discoveries were kept secret for business reasons. If still in existence, their old logbooks and records would no doubt prove a fruitful field for research into early discoveries.

Certainly very little was officially known of the Antarctic regions before the opening of the nineteenth century. A chart of the Antarctic published in 1833 showed nothing of the Antarctic Continent except the partly explored coast of Graham Land south of Cape Horn, and the small portion of coast known as Enderby Land in about long. 50°E . There had then been only two penetrations beyond the 70th parallel ; those of Cook and of Weddell. The rest of the South Polar Chart was blank, and the existence of the great Antarctic continent as we now know it was only a conjecture.

Then, within a few years, whaling and sealing ventures discovered many of the lonely islands in high southern latitudes and also sighted what are known now to be parts of the Antarctic continent. Considerable knowledge of the weather, climate and ice conditions of these hitherto unknown seas was gained painfully by the men engaged in the small ships of the whaling and sealing fleets.

The following brief accounts are in chronological order. They are necessarily incomplete ; discoveries made by some early sealers and even by modern whale catchers being perhaps kept secret for business reasons. Some remote islands reported long ago and for a long time shown on the charts with the name of their discoverer, have since proved to be non-existent. They were probably icebergs mistaken for islands. A map showing all that was known of Antarctica in the early nineteenth century is shown on page 2.

The ships and the men

In 1799 Captain R. Rhodes, of the British sealer *Hillsborough*, made a rough chart of the east coast of Kerguelen Island.

In the year 1808 two small whaling vessels owned by Messrs. Enderby & Sons, of London—the *Swan*, commanded by Captain James Lindsey, and the *Otter* (Captain Hopper)—searched for and rediscovered Bouvet Island, thus verifying its existence. This had been in some doubt, as it had seldom, if ever, been seen since it was discovered in 1739 by M. Bouvet de Lorzier, with the French exploring ships *Aigle* and *Marie*. It had been twice searched for by Captain Cook in H.M.S. *Resolution*, in 1772 and 1775,

without success, and by Captain Furneaux in H.M.S. *Adventure* in 1774. Lindsey's position of the island differed somewhat from that given by Bouvet. Both estimates, mainly dead reckoning, were incorrect. Bouvet Island was not accurately charted until something like a hundred years after its rediscovery by Lindsey. During that period the island was again often searched for with varying success. The island is in lat. $54^{\circ} 26'S.$, long. $3^{\circ} 24'E.$ Bouvet Island was again sighted in 1825 by Captain Norris, with the Enderby sealers *Sprightly* and *Lively*. He named it Liverpool Island, after Lord Liverpool, then Prime Minister. A landing was made with some difficulty. Captain Williams, of the American schooner *Golden West*, landed on the island in 1878. In 1927 a depot of food and clothing was established on the island by the Norwegian whaler *Norvegia* (Captain H. Horntvedt).

In 1810 Captain F. Hasselborough, in the British brig *Perseverance*, discovered Macquarie Island in lat. $54^{\circ} 37'S.$, long. $158^{\circ} 54'E.$ He named the island after the then Governor of New South Wales.

In February, 1819, Captain Wm. Smith, master of the British brig *Williams*, bound round Cape Horn from Buenos Aires to Valparaiso, discovered land in lat. $62^{\circ} 25'S.$, long. $60^{\circ} 05'W.$ The next voyage he again sighted this land, and other land to the south-west. Smith named his discovery New South Shetland.

On arrival at Valparaiso he reported the matter to Captain Sheriff, R.N., the Senior British Naval Officer there, in H.M. frigate *Andromache*. Seeing the importance of the discovery, this officer sent Mr. Edward Bransfield, R.N., the master of the frigate, with an assistant surgeon, three midshipmen and a total crew of twenty-six, to survey the new land. They sailed with Smith in the brig *Williams*, which was chartered for the purpose on behalf of the British Government. The new land was sighted in January, 1820, and a headland in $62^{\circ} 42'S.$, $61^{\circ} 27'W.$, was named "The Start" by Bransfield. A landing was made in King George's Bay, and Desolation Island was sighted and named. Other islands were surveyed and Bransfield charted the strait that now bears his name.

Proceeding to the eastward they later sighted the land first seen by Smith, master of the brig, in February, 1819. Bransfield and Smith landed on what they called "the mainland" (presumably Trinity Peninsula), and took possession in the name of His Majesty King George IV. Bransfield hoisted the British flag and gave the land the general name of New South Britain. They surveyed a number of the islands and part of the mainland, named several capes and mountains and described the types of rock, etc. Notes of the winds, weather and tides were also made.

Exploring to the south-west, the little brig was, on the 29th January, in lat. $63^{\circ} 16'S.$ (by observation), and long. $60^{\circ} 28'W.$ (by chronometer), and the hitherto unknown coast was seen to be extending southward to at least $64^{\circ}S.$ The land was called Trinity Land (now Trinity Peninsula).

It would thus seem that the credit for the first reported sighting of the Antarctic continent should go to Captain William Smith. (Until recent years it was uncertain whether or not Graham Land was really part of the Antarctic continent.) Many years later the Swedish explorer Nordenskjöld, referring to Graham Land, said, "For my part, I am inclined to call this mass of land Smith Land". Rymill, in 1934-37, and the Falkland Islands Dependencies Survey more recently, have established the fact that Graham

Land is a peninsula, and that the channels reported as separating it from the Antarctic continent do not exist.

The brig later attempted to sail to the southward to cross the Antarctic Circle in about long. 52°W., that is in what was later to be known as the Weddell Sea, but was prevented by ice.

She returned to Valparaiso on the 15th April, 1820. The news of Smith's discovery spread rapidly, and soon numerous British and American sealers were reaping a rich harvest in the newly-found islands. They had already for a number of years carried on their business in the Falkland Islands and the islands around Cape Horn. By 1821-22 about forty-four British and American sealing vessels were at the South Shetlands, and the following season there were at least ninety-one sealers there.

Sealing had, in fact, been carried out by British and Americans on the coasts of Patagonia and Tierra del Fuego, the Falklands and South Georgia from about 1790 onwards, as shown in the book *Voyages round the World*, published in 1834 by Captain Edmund Fanning, of Stonington, Connecticut, U.S.A.

The *Hersilia*, an American sealing brig commanded by Captain James Sheffield, visited the South Shetlands in 1820 (about fifteen months after their discovery by Smith) in company with the 40 ton cutter *Hero* (Captain Nathaniel B. Palmer), and added to the knowledge of the islands and anchorages. Mountains were sighted to the south, and Palmer in the *Hero* went to investigate. He discovered the islands to the southward of Bransfield Strait now known as the Palmer Archipelago.

The following season 1820-21, five American sealers from Stonington, Connecticut, made their headquarters in Yankee Harbour, Deception Island, in lat. 63°S. They were the brigs *Frederick* (Captain Benjamin Pendleton) and *Hersilia* (Captain James Sheffield), the schooners *Express* (Captain E. Williams) and *Free Gift* (Captain F. Dunbar) and the little cutter *Hero*, again commanded by Captain Palmer.

The sealing trade attracted many vessels to the neighbourhood, and Captain Bellingshausen, of the Imperial Russian Navy, on his famous circumpolar voyage in the *Vostok*, recorded meeting the American Captain Palmer at Deception Island, South Shetlands, in January, 1821. Eighteen other sealers, British and American, were there at the time, including Smith, in the brig *Williams*. Captain Bellingshausen rightly predicted the early extermination of the fur seal in these islands. The above are only a few of the names. Actually there were hundreds of small sealing vessels, and no doubt some of them made geographical discoveries of which no authentic record exists. They were working in competition, and so kept their discoveries to themselves.

1821-22 Captain George Powell, in the British sealing sloop *Dove*, carried out a survey of the South Shetlands, where he met the American Captain N. B. Palmer, in the sloop *James Monroe*. He also discovered, in December, 1821, the islands now known as the South Orkneys, which he claimed for the British crown. These islands appear on some old English, French and American charts as the Powell Islands, and it seems that in justice to the almost forgotten discoverer, they should revert to that name. The islands were discovered independently a few days later by Captain M. McLeod in

the cutter *Beaufoy*. Weddell visited the islands in February, 1822.

Powell later published one of the first charts of the Antarctic regions. While the French and others have acknowledged the importance of his work, his own countrymen appear to have taken little notice of his discoveries.

The American Captain Palmer, in the *James Monroe*, did more exploring and sealing in the islands of the Palmer Archipelago that season.

The British sealing vessel *Lady Trowbridge* (Captain Richard Sherratt) was wrecked on King George Island in the South Shetlands in December, 1820. Sherratt made a rough chart of the central South Shetland Islands.

In 1819-20 the South Shetland Islands were visited by an Argentine sealer, the *San Juan Nepomuceno* (Captain Carlos Timblon), and in 1820 sealers found the wreck of a Spanish vessel, the *San Telmo*, on Livingstone Island, South Shetland Islands.

In 1820-21 the British sealing vessel *Lord Melville* (Captain Clark) visited the South Shetland Islands, and the mate and ten men made the first wintering in the Antarctic, at King George Island.

In 1819-21 James Weddell, in the brig *Jane* of Leith, 160 tons, made a voyage to the southern seas and the newly-discovered South Shetland Islands. No record of this voyage appears to be in existence.

Weddell again sailed for the south in 1822 aboard the *Jane*, in company with the cutter *Beaufoy*, of London, 65 tons (Captain Brisbane), on what was to prove a memorable voyage. The brig had a crew of twenty-two officers and men, and the cutter a crew of thirteen. Both ships were fitted out for a long sealing voyage and were provisioned for two years. Weddell had three chronometers (unusual in a merchant ship in those days) and was an experienced navigator. He was part-owner of the *Jane* in partnership with Mr. John Strachan of Edinburgh and Mr. James Mitchell of London.

The two little ships sailed from the Downs on the 17th September, 1822, and on the 4th October arrived at Madeira. They also called at the Cape Verde Islands. Crossing the line in 30°W. they visited some small harbours on the coast of Patagonia and then proceeded to the southward.

At noon on 2nd January, 1823, they were in lat. 51° 55'S., long. 65° 07'W. In this latitude, but an uncertain longitude, the L'Aigle Shoal had been reported by Captain Bristow in 1817. Weddell searched for it, but without success, which is not surprising, as no such shoal exists. In Weddell's day the searching for a non-existent danger such as this must have been the cause of much delay, for the best of navigators were often in doubt as to their correct longitude, and a prudent seaman would be under the necessity of heaving to during the night or in poor visibility when in the vicinity of such an obstruction. Having to thus waste time with a fair wind must have been a great annoyance.

The two little ships pushed on to the south, and on the 12th January, 1823, made the South Orkneys, discovered two years earlier by George Powell. Weddell had visited these islands the previous year, but his ship being at the time loaded and homeward bound, he had been unable to spare the time for any exploring. This time he was able, with the two vessels and by sending boats inshore, to make a reasonably accurate survey, with careful observations of the latitude and longitude. He gave names to some of the islands and bays.

They then searched for possible land between the South Orkneys and South Sandwich Islands, carefully avoiding the tracks covered by Captain Cook's ships. Much ice was seen, but no land. Their tracks, were, however, in unexplored seas, and thus added something to hydrographic knowledge.

Weddell and Brisbane decided to stand to the southward into totally unknown waters in the hope of finding new land (and, of course, seals). An iceberg much coated with black earth encouraged them in the belief that land could not be far distant. Continuing south in about long. 30°W. , they passed through great masses of bergs until on the 16th February, 1823, they were in lat. $70^{\circ}26'\text{S.}$ with fine weather and very few bergs in sight. Two days later, in $72^{\circ}38'\text{S.}$, they had light easterly winds, weather still remarkably fine and clear, and not a particle of ice of any description in sight.

On the 20th February, 1823, Weddell reached his farthest south, lat. $74^{\circ}15'\text{S.}$, in long. $34^{\circ}17'\text{W.}$ The atmosphere was remarkably clear, and nothing like land was to be seen in any direction ; only three bergs were in sight.

The lateness of the season and a fresh southerly wind prevented him from exploring farther to the southward, much as he desired to do so. Taking advantage of the fair wind, the two little ships returned to the northward.

Weddell had reached a far higher south latitude, less than a thousand miles from the Pole, than had been attained by any previous navigator. It was not to be equalled in this longitude for nearly a century ; until Dr. Filchner in the *Deutschland*, in 1912, and Sir Ernest Shackleton in the *Endurance*, charted Coats Land, on the eastern shore of the Weddell Sea, as far as 78° south.

On the way south in this new-found sea, Weddell had found the current set to the WNW. This had rather surprised him, as farther north it had usually set to the eastward. He thought his estimation was probably incorrect, due to possible errors in his dead reckoning on account of the many changes of course and speed when passing through the ice. It now seems, however, that he was right. Both Filchner in the *Deutschland* and Shackleton in the *Endurance*, experienced sets to the west and north when beset in the ice in the Weddell Sea.

Weddell named the large sea area he had discovered " King George IV Sea ", but it is usually known by his own name. He could not know that the area he sailed into was a great bight ; in fact he thought it possible there was no more land to the southward, and that his newly-found Polar Sea might extend to the South Pole itself. He surmised that the range of land we now know as Graham Land did not extend farther south than lat. 73° . These views are understandable when one realises that in Weddell's day the Antarctic Circle had only been crossed in very few places. The South Polar Chart was mostly blank, and with the exception of Smith's discovery of the land to the southward of Cape Horn, the great ice-covered Antarctic continent had not been sighted.

The two ships returned to the northward by a more westerly route. Passing to the eastward of the South Orkneys, they sighted South Georgia on the 12th March, 1823, and anchored in Adventure Bay (now known as Undine Harbour).

After refitting the ships as far as possible, and resting his crews after their arduous voyage, Weddell sailed for the Falklands.

During the passage he made a thorough search for the Aurora Islands, then on the charts as reported by the Spaniards in 1762. No trace of the islands could be found, and they are now known to be non-existent. His careful observations and remarks added considerably to the hydrographic knowledge of the Falkland Islands, and of the South Shetlands and the Cape Horn area of Tierra del Fuego.

Weddell was undoubtedly an enterprising and courageous seaman; an observant and careful navigator who took great interest in fixing the positions of all land sighted as accurately as was possible with the means at his disposal. A true explorer, he regretted not having time to carry out more thorough investigations, but his duty to his partners in their sealing venture was naturally given first place.

He returned to England in 1824 and published a book entitled *A Voyage towards the South Pole*, from which much of the above has been taken.

A British sealing expedition in 1820-23, in the vessel *Princess of Wales* (Captain W. Veale), was wrecked on Crozet Island, where the crew spent twenty-two months.

The *Sprightly* (Captain Edward Hughes) was on a sealing expedition to the South Shetland Islands in the 1824-25 season, and a survey of Hughes Bay, west of Graham Land, was made by James Hoseason, the mate.

An American sealing schooner, the *Wasp* (Captain Benjamin Morrell), was also in the Weddell Sea area in 1823. According to the book written by him several years later, he had sailed from New York in June, 1822, and after calling at several ports on the coasts of South America, arrived at the Falkland Islands in October. Leaving there in early November, he stood to the south and east, and like Weddell, searched unsuccessfully for the Aurora Islands.

Morrell visited South Georgia in search of seals, and finding none proceeded eastward to Bouvet Island, where he arrived on the 6th December. Few seals were found and the *Wasp* sailed on eastward to Kerguelen Island, then also known as Desolation Island, arriving on the 31st December, 1822. Leaving Kerguelen in mid-January, they sailed to the south-eastward for ten days until in lat. $62^{\circ} 27' S.$ and long. $94^{\circ} 11' E.$ Extensive field-ice was met. Continuing eastward until the 31st January, when the *Wasp* was in lat. $64^{\circ} 52' S.$, long. $118^{\circ} 27' E.$, Morrell decided, as the wind was NE, to return to the westward. In $69^{\circ} 11' S$ and $48^{\circ} 15' E$ he recorded that no field-ice was in sight, and very few bergs. This position is seriously in error, and throws doubt on some of his other remarks, for the place he claimed to have sailed over is now known to be part of the Antarctic continent. He noted that the winds were mainly from SE or NE.

In about the same latitude he crossed the Greenwich meridian, and then steered north-west for the Sandwich Islands, arriving on the 28th February. Here also they found no fur-seals, and on the 6th March, 1823, with a WNW wind, the *Wasp* steered to the south and west into what was later to be known as the Weddell Sea. After negotiating a passage through pack-ice, the ship reached open water to the southward, just as Weddell had found that same year. Morrell's farthest south was lat. $70^{\circ} 14'$ in longitude about $40^{\circ} W.$ on the 14th March. Shortage of fuel for cooking and of drinking water and the lateness of the season compelled Morrell to return to the northward. He steered north-westerly, and on the 15th sighted land to the westward.

This land he referred to as New South Greenland (now generally known as Graham Land), and a further search for seals was made along the coast until the 19th March, when he proceeded north to Staten Island, the eastern island of Tierra del Fuego.

Here he met another American sealing schooner, the *Hersilia*, of Stonington, Conn., whose captain, James Sheffield, was a fellow townsman of his. Morrell continued his sealing venture in the Falklands and again in the islands of Tierra del Fuego and around Cape Horn, finally proceeding to the Pacific coast of South America. His further voyage does not concern us in these short notes of Antarctic discovery.

His book contains accounts of three other voyages, with many notes of what were then little known countries, describing the harbours and anchorages, climate and weather and the natives.

(To be concluded in April 1950 *Marine Observer*)



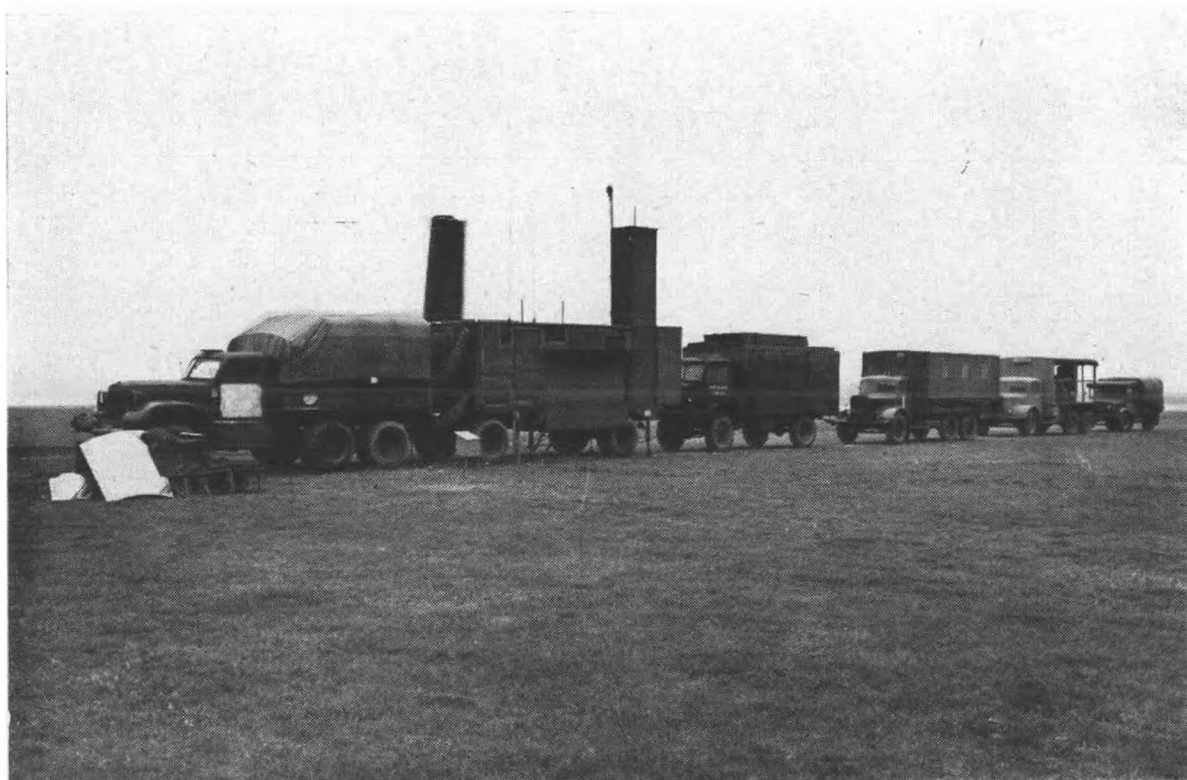
G.C.A. crew during talk-down.
(See page 26)

Crown copyright reserved

LANDING AIRCRAFT BY RADAR AND OTHER MEANS

BY D. D. CLARK, M.A.*

Radar is now widely used as an aid to navigation in conditions of poor visibility. The seaman is already familiar with the 3 cm. radar sets of the type approved by the Ministry of Transport installed aboard merchant ships for navigational purposes, and is making acquaintance with the use of radar from shore-based equipment for the benefit, and perhaps even for control, in certain cases, of shipping in narrow channels when visibility is poor.



Crown copyright reserved

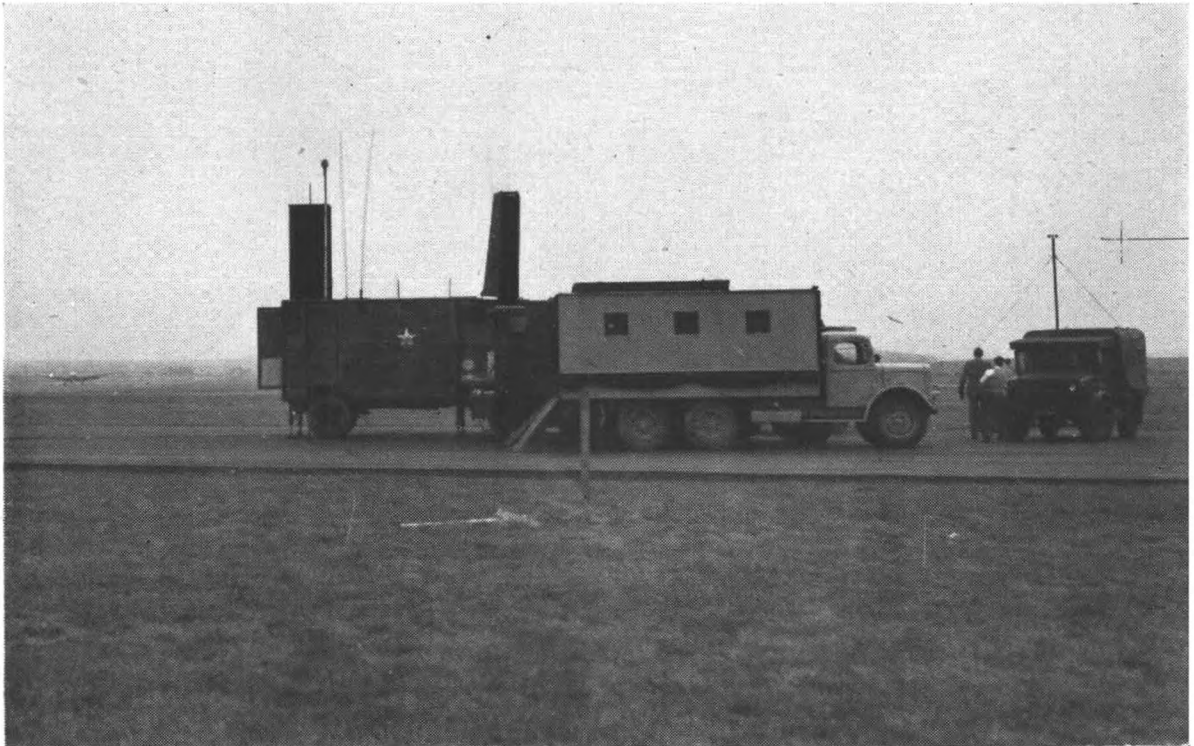
Fig. 1. View showing control cabin, power unit and attendant wagons.

This latter use of radar for shipping is new and has only been operating in the United Kingdom since 1948 in the Liverpool area. In the case of aircraft, however, where the need is perhaps more urgent, it has been in use for some time. Its development from the early trials in 1942 has been rapid, and today most of the principal aerodromes are equipped with G.C.A. (Ground Controlled Approach) as it has come to be called. Since it seems likely that marine navigators will be coming more and more into contact with shore-based radar as a guide to navigation, it may be interesting to study the form this aid has taken in the case of aircraft control.

The early attempts, using the ordinary 10 cm. radar, were not successful because of the lack of precision at short ranges. It was possible, however, with the 10 cm. equipment to locate the aircraft and to direct it into the best line of approach when it was still twelve to thirty miles distant. In this form

* Mr. Clark is a member of the scientific research staff of the Meteorological Office, Harrow, and has recently been engaged on questions affecting the landing of aircraft in fog.

the long-distance or " search " radar is still in use and operates as an essential part of the controlled approach scheme. With the search radar, when an aircraft asks for assistance it is first identified and its position found on a P.P.I. tube ; then it is directed by R/T into the beginning of the approach to the runway. The search radar has two P.P.I. tubes which give a picture of everything round the aerodrome for thirty miles, so that large numbers of aircraft can be dealt with at the same time. Fifteen aircraft can be handled in this way with landings every three or four minutes if necessary. When the aircraft approaches within ten miles of the runway the 10 cm. radar is not accurate enough to enable safe instructions to be given to the pilot. A more precise system of location is therefore required. As the aircraft is first of all directed into a chosen line of approach, precision of location is required only over a small solid angle. This is achieved by having a system of vertical and horizontal scanning, with two narrow radar beams, from a point beside the runway. The precision radar uses a 3 cm. wavelength and directs the two beams (each as narrow as that from a searchlight) towards the aircraft, scanning to right and left and above and below it, but keeping the aircraft, as it were, " in the centre of the cross " all the time. The equipment,



Crown copyright reserved

Fig. 2. The control cabin in position to direct operations. On the left an aircraft can be seen landing.

together with the operators and the controller, are carried in a trailer, which can be moved from one runway to another in a matter of minutes. The trailer is drawn by a six-wheeler which contains the power unit. When in use it is situated alongside the runway about a mile from the touch-down point and about a thousand feet from the edge. The scanning antennae, consisting of linear rows of dipoles, have cylindrical reflectors of parabolic section which extend, one vertically and the other horizontally, the full length of the side of the trailer. The " dish " for the " search " radar is also carried on the trailer and can be seen on the roof (Figs. 1 and 2).

The beam which scans vertically (elevation) has a divergence of about 3° in the horizontal and 0.4° in the vertical plane and scans through 7° from -1° to $+6^\circ$. The plane of the scan is rotated automatically by servomotors to keep it directed on the aircraft. The horizontal (azimuth) scan is performed by a beam of vertical divergence of $1\frac{1}{2}^\circ$ and horizontal divergence of 0.8° . It scans to right and to left of the aircraft by 10° either side, and in addition its centre of scan can be moved in both the horizontal and the vertical plane to keep it centred on the aircraft. In the horizontal the scanned arc can be traversed through 13° and in the vertical through 6° from 0° to $+6^\circ$. It may be asked why both following and scanning systems are necessary; would not one or the other be sufficient? The answer is probably that a scanning system is necessary to pick up the plane, after which it is simpler to direct the two scanning beams on to the spot than it would be to devise an overall parallel line scanner, after the manner of television.

In the trailer* two operators are watching on cathode-ray tubes the "spot image" of the approaching aircraft. The vertical or elevation scan shows the

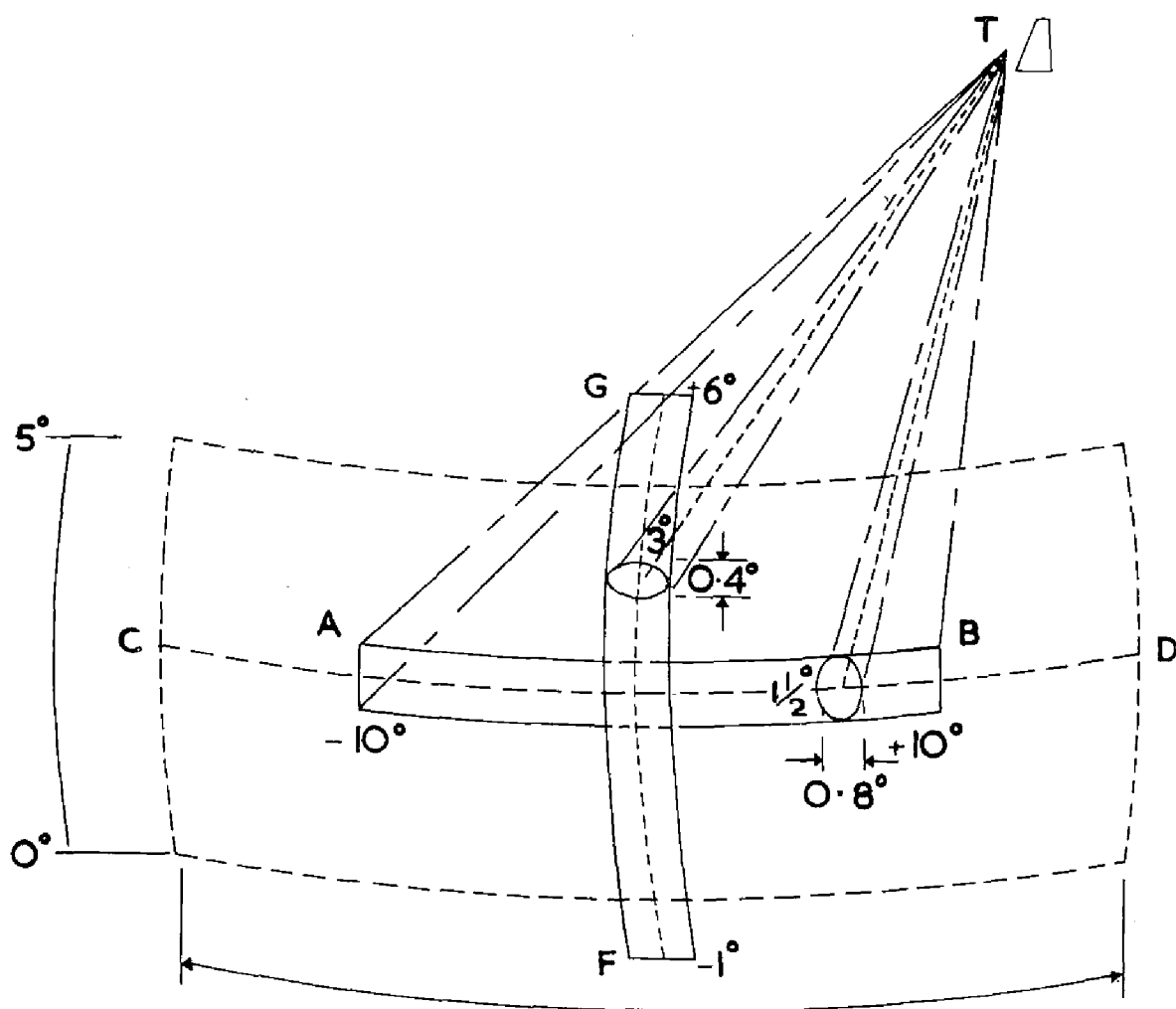


Fig. 3

The above diagram illustrates the method of scanning. The azimuth scan AB can be moved horizontally between C and D and vertically between the broken lines. The vertical scan FG is controlled to centre on the aircraft.

* See photo on p. 23.

aircraft as if the observer were situated some distance away on a flank and its motion in elevation can be observed. The vertical scale is magnified some ten times to make for precision and two tubes are employed, one covering the ten miles of approach and the other giving a close-up view of the last three miles. The observer, seated in front of this display, moves a cursor to cover the image spot of the aircraft. The movements of the cursor are resolved electrically and transmitted to the controller's table, where they operate a meter. This meter is designed to indicate "error only". To do this a best line of approach of an aircraft is selected beforehand and the meter is adjusted to give a zero reading when the aircraft is exactly following the correct path. Immediately a deviation occurs, however, the needle indicates the error by deflecting up or down as the case may be. The same system operates with the horizontal or azimuth scan. Two cathode-ray tubes are employed which give a picture of the approach as if seen from above, the scale at right-angles to the path being magnified three times. An observer keeps a cursor moving over the spot representing the aircraft, which as before operates an "error meter" at the controller's table, giving pointer indications to right or left according as the aeroplane is off course to one side or the other. The controller therefore has in front of him a continuous indication of the deviation of the aircraft from the selected "best line of approach". Besides indicating the errors, the movement of the cursors also controls the servo-motors, which cause the scan to follow the aircraft if it deviates.

It is obvious that an aircraft using G.C.A. does not require any special equipment of its own; all it needs, in fact, is a radio-telephone to keep in touch with the controller. After considerable experience with G.C.A. a system of talking to the pilot of the aircraft has been devised. On being located first of all and directed into the approach by the 10 cm. radar, the pilot follows normal procedure on the R/T. After coming into the sphere of the precision radar, however, he is controlled much more closely. After acknowledging the first message, he then leaves his R/T on "receive" and concentrates on flying on instruments according to the instructions which he receives from the controller. The controller talks to the pilot, keeping him informed of his progress and giving him instructions at regular intervals. If the pilot is off his course he is given the correction to apply to bring him back again. Reminders are also passed concerning routine cockpit drill. It is found that in this way the pilot is freed from all distracting influences and can concentrate on keeping the aircraft on its course.

The accuracy of the G.C.A. in locating aircraft is about ± 50 ft. vertically and about ± 20 ft. horizontally. Although pilots without any previous experience of G.C.A. can be brought in safely, and although it is possible to land aircraft by this means alone, it is nevertheless desirable that for the final approach to the runway, prior to landing, some visual aid be available. After the aeroplane has descended to about 200 ft. above the ground, which in the normal "glide path"* takes place about 3,000 ft. to 4,000 ft. from the runway, the radar is not considered to be effective, and from this point onwards the pilot should be able to see something to help him. If he can

* A glide path is the straight line of gradual decent which an aircraft would follow if making a normal approach in order to land. The path usually chosen is inclined $2\frac{1}{2}^\circ$ to the horizontal and meets the ground 1,000 feet down the runway.

see the ground he is all right, but in very thick fog this is not possible. To supply the necessary visual assistance a system of approach lights has been devised. These lights, which start at a point 3,500 ft. from the threshold of the runway, are arranged to show the pilot both his distance from the touch-down point, which is chosen 1,000 ft. down the runway, and whether he is at the correct height. A series of powerful lights at intervals of 100 ft. extend down the centre of the approach. The first fifteen are triple lights, the next ten are double and the last ten single, which conveniently divides the approach up into three sections. In addition there are seven cross-bars of sodium light at 500 ft. intervals set across the approach and arranged in a convergent pattern, forming as it were the rungs in a ladder which comes to a point at the touch-down. By keeping the cross-bars at the same apparent length as he advances the pilot can maintain the correct height of the glide path.

This lighting system is judged to be effective for a visibility better than 450 ft. Where visibility drops below this limit the best course is to divert the aircraft elsewhere ; otherwise, the only remaining method is to disperse the fog by heat, as is done in the system known as F.I.D.O., which employs lines of burners consuming petrol or fuel oil. This method is extremely costly and is only used in emergency. So costly is it, in fact, that its use is always followed by an enquiry. If it is shown that a real emergency did not exist, then the party which called for its use is obliged to foot the bill—needless to say F.I.D.O. is never used !

Since the problem of guiding aircraft in to land has been more closely studied than the similar problem of guiding shipping, are there any lessons from the G.C.A. that can be applied to shipping ? Radar control has already been used by the Mersey Control Board and by the Wallasey and Birkenhead ferries with marked success. Its importance can be seen from the figures published by the Mersey Control Board, which show that the three months of September, October and November, 1948, when fog would normally be expected to interfere with navigation, owing to the use of shore-based radar there was no noticeable decrease in tonnage handled in the Mersey Docks. In the case of the Wallasey and Birkenhead ferries it was possible to carry out the programme of sailings regularly throughout the winter, including one period of nine days when the visibility was only 50 ft. It is unlikely that the same degree of close control as is used in G.C.A. will ever apply to ships, except perhaps for small fast craft or maybe ferry boats following a defined course. Masters will necessarily continue to exercise full command of their ships, the shore-based radar merely giving him advice and assistance analagous to that afforded by a pilot, giving him warning by R/T or radio of dangers that lie ahead of him and advising him if he appears to be setting off his course or into danger. There is little doubt that the use of shore-based radar as an aid to the navigation of surface craft will be extended—for the benefit of commerce and as a contribution to the safety of shipping and of “ those who go down to the sea in ships ”.

WEATHER WISE

BY CDR. C. E. N. FRANKCOM, R.N.R.

PART I

This article is based upon a talk given to Navigation School instructors attending a "summer course" at Cranfield Aerological College, on 21st April, 1949.

The primary object of this article is to emphasise the practical importance of knowledge about the weather and its vagaries to a seaman. Meteorology, from the mariner's viewpoint, is not merely something academic with considerable nuisance value, owing to the fact that he has got to learn it, but a seaman, owing to the nature of his job, is not worthy of the name unless he is weather conscious. This is no less true now than it was in the days of the sailing ship. In fact, in this competitive age it is probably more so. Each invention we have for aiding the safety of navigation brings its problems with it, and as the speed and cost of ships increase there is all the more reason why the shipmaster should be alert, not only for the safety of his vessel but also for the care of his cargo.

Broadly, the reasons why a modern seaman needs to have knowledge of meteorology are : (1) for the safety of his ship, his shipmates and passengers ; (2) for the care of his cargo ; (3) so as to achieve as speedy and as economical a passage as possible ; and (4) for his general interest and for the pride of his profession.

As far as safety is concerned, speeds of ships increase, more navigational aids are provided and more is therefore expected of the master. Unless a man has a certain amount of weather sense and is also a sailor, he may risk driving his ship into heavy seas, or going at excessive speed in thick weather, or venturing where "angels fear to tread" when coasting in poor visibility. Marine casualties, which continue to be rather numerous, are very largely caused by the weather, either directly or indirectly. Direct weather casualties may include foundering, sea damage to hatches or structure, dragging into danger in an anchorage, drifting on to a lee shore, or even such items as burst cylinders on winches or windlasses in frosty weather. Indirect causes may be collisions or strandings in fog, jettisoning of rain-soaked deck cargoes, or even capsising due to an accumulation of ice on deck. Cargo damage will be discussed later.

The meteorological Services of the world, as a result of arrangements made by the International Meteorological Organisation, do their best to issue adequate weather information for shipping on the high seas and in coastal waters. It is for the master to interpret the information he receives and to act accordingly. For example, if a light ship of low power were intending to sail from the Tyne for London to load, and he got a warning of a south-easterly gale, it would be at the master's discretion as to whether he sailed or not. Similarly, if bound down channel in a low-powered ship in a light condition and virtually unballasted (as does occur on coastal voyages) for some Bristol Channel port, and a warning of a strong south-westerly gale is received, it might be prudent to seek shelter, say, in Falmouth Roads, rather than face a lee shore when rounding the Cornish coast. A vessel in the China Sea, on receipt of a typhoon warning, may be able to take early steps to avoid the worst of the storm, or at any rate see that

everything is shipshape aboard and avoid being caught on a lee shore. One can think of many other instances of the practical application of meteorological information.

The meteorological Services, in their radio weather bulletins for shipping, include reports of existing weather at selected stations ashore and at a selection of ships, and an analysis of the weather situation over a section of an ocean. The analysis includes such information as the position of isobars, location and movements of centres of disturbances and the location of fronts. The current weather situation is discussed in general terms and finally a forecast is given. The shipmaster can, if he wishes, plot this information on charts and thereby form a much better interpretation of the forecast than if he merely had the forecast alone.

It is appropriate at this stage to discuss the limitations of electronic aids to navigation from the meteorological viewpoint. First, radar, which is an admirable aid to navigation if used intelligently. It is important to bear in mind the limitations imposed by nature upon this instrument. It is similar to the human eye, with the difference that it can see as far in the dark as it can in daylight, and that it can also see through fog. It cannot, however, see through rain showers or certain forms of clouds, or at least it gets an echo back from these which impairs its effectiveness in picking up objects beyond. At the same time abnormal conditions can cause the radar to "see" extraordinarily great distances. In the Ocean Weather Ships we have records of vessels being "picked up" at 100 miles range on the radar screen. It is important that these facts be borne in mind.

The fact that radar can get an echo from rain showers and certain forms of clouds enables meteorological fronts to be located thereby, and it also provides a means whereby a ship might detect the position of the centre of a tropical disturbance. There are some remarkable photographs of the eye of a storm which was picked out on a radar screen in this way by an American warship in the China Sea during the last war. A specialised use to which radar is put is in determining the direction and rate of winds in the upper atmosphere, by means of echoes from targets carried by meteorological balloons, up to a height of about 40,000 ft. or more. This is done regularly aboard the Ocean Weather Ships in the North Atlantic.

The application of radar to ice detection has its meteorological significance. Reports seem to show that although some bergs are detectable at great distances, others of a similar size give no radar echo even when visible to the naked eye. Possibly this phenomenon is due to variation of the earthy content of the berg, or to the slope of the berg's surface.

It is helpful for a ship's officer to have some knowledge of the fact that certain meteorological conditions can adversely affect radio communications. I refer particularly to sunspot activity, which although not in itself strictly meteorological, tends to coincide with auroral displays and magnetic storms and certainly affects the chemical and electrical composition of the upper atmosphere. These disturbances chiefly affect short-wave radio, and will undoubtedly affect Consol and Loran bearings. The more local effects of ordinary atmospheric electricity upon medium and long-wave radio are fairly well known, but it should be appreciated that these can affect the receipt of D/F bearings.

The possible effect of magnetic storms and aurora upon the magnetic

compass are of interest and importance. Recently the compasses and chronometers of one of the Ocean Weather Ships were seriously affected by lightning striking the ship—a rather unusual event in the North Atlantic during winter-time.

Knowledge of upper winds, which was mentioned in connection with radar, has its value from the safety viewpoint in the fact that it assists us in making accurate forecasts. While on the subject of safety, it is appropriate to mention the recent International Convention on Safety of Life at Sea, which was drawn up last summer. The meteorological provisions contained therein recognise the value of meteorology from the safety viewpoint, and with this thought in mind it urges all maritime countries to encourage their ships' officers to take an interest in meteorology and to equip Selected Ships with the necessary instruments and instructions for carrying out meteorological observations at sea. Provision for transmission and reception of these messages by radio is also made. Meteorological Services are, in their turn, bound to issue adequate weather information for the benefit of shipping in the oceans bordering their shores.

If a shipmaster has adequate meteorological information, both of a climatological nature and in the form of a forecast, and also adequate information about ocean currents and tides, he can, by using his initiative and judgment, do much towards achieving a more economical and perhaps more speedy passage than if he did not have this information at his disposal. Maury had these ideas in mind when he first started the idea of merchant ships making meteorological observations in an organised manner back in 1854, but of course he was thinking largely of sailing ships, and there is no doubt that as a result of Maury's work sailing ships were enabled to save quite a lot of time on their passages. Without going into any details here, it will become fairly apparent that on certain voyages a steamship can similarly plan his voyage economically, in other words he can do a certain amount of "meteorological navigation".

Carriage of cargo is probably the prime purpose of a merchant ship, and one of the chief tasks of the shipmaster is to carry his cargo safely and deliver it to the consignee in similar condition to which it was loaded. The meteorological aspect of this question seems to be one which has been rather neglected in the past. It is important, particularly at present when we are engaged in an export drive, and when there is a world food shortage, to ensure that waste does not occur, and that British ships, at least, deliver their cargoes in good order. By an intelligent consideration of various simple meteorological principles, the ship's officer can do quite a lot to safeguard his cargo. Some ships, it is true, are fitted with air conditioning apparatus for the cargo space, and on that account it seems that risk of damage by sweating is fairly negligible, provided that ship's officers control the apparatus with judgment and intelligence. Even in these cases, however, some knowledge of meteorological principles is essential to the officers concerned. All ships can do quite a lot to control sweat and other moisture damage if the officers have an intelligent appreciation of humidity and the variations thereof, of the temperatures of sea and air, and of the temperature in their holds, both then and perhaps at some future time during the voyage, and of the properties of hygroscopic and non-hygroscopic cargoes and the liability of certain cargoes to damage by moisture. For example, one may think of a general

cargo in which some of the ingredients are unseasoned lumber, cotton and canned goods—the cases of canned goods being stowed near the lumber ; of cargoes of tin plates, of full cargoes of grain, or rice cargoes. In such cases an intelligent control of ventilation could do much to ensure a good “out-turn”. It is true that one can’t do much about refrigerated cargo, unless the refrigeration is by means of fans and air-ducts, but one can do a considerable amount of good with ordinary cargoes. The question the ship-master has to decide is should he continue ventilation when the humidity on deck is so and so, and the humidity and temperature in the hold is something else. In making his decision he probably has to consider what the conditions will be, say, the next day, or several days later.

I quote from two law cases concerning cargo damage.

First, before a U.S. court, a cargo of tea, stowed in a hold containing jute and jute products. During the voyage from Calcutta to Boston, via Cape of Good Hope, much bad weather was experienced and, as a result, during most of the voyage the ventilators had to be turned back to wind. Then came the time when the ship crossed the Gulf Stream when coming up the east coast of the U.S.A. Very rapid condensation took place, due to the sudden change from heat to cold, and this, combined with continued bad weather and the hygroscopic nature of the other cargoes, caused very considerable damage to the tea. Judgment was given against the ship.

Second, before a British court, a cargo of rice from Burma to British Columbia. Ventilators in this case had to be kept closed for long periods due to heavy weather, and the cargo was extensively damaged. A nice legal point arose as to whether the damage was due to peril of the sea or to the inherent vice of the commodity.

On this question of cargo damage and ventilation, I recommend a study of an interesting paper by Mr. S. J. Duly, read before the North-east Coast Institution of Engineers and Shipbuilders, 1947.

When loaded in rain, one cannot do much for the care of the cargo, except to ventilate with discretion after the ship gets away to sea. Talking of ventilation, one is surprised that there have not been more advances in the design of ventilators ; the physical effort of turning the cowl type ventilator back to wind and the greater difficulty of putting a canvas cover over it is well known.

Apart from these above-mentioned practical considerations, it is in the seaman’s own interest that he should know as much as he can about the elements which so much control his life and affect his comfort. It seems rather ludicrous to think of a seaman not taking an interest in weather and its vagaries ; in this scientific age, the applications of meteorology and allied sciences are so many and varied that to get on in his profession a ship’s officer *must* take an interest in this subject. For an understanding of such varied subjects as radio, radar and its problems, the corrosion of metal at sea, ocean currents and the visibility of lights, one certainly needs some meteorological knowledge.

By making meteorological observations at sea a mariner develops a sense of alertness, and if he carries out all the instructions which the Meteorological Office gives him, he should develop thoroughness and accuracy, both of which are of value to him in other directions. The modern seaman is not

like the sailing-ship man and he does not necessarily have to keep looking aloft ; in fact, in ships fitted with steel hatches he might even consider it unnecessary to glance around the deck at all. In a ship fitted with a very modern steering apparatus, he has not even to think about such details as relieving tackles in heavy weather. It is easy, therefore, for the modern mariner to get a bit careless about details, and I suggest the fact that he is mentally alert, at least as far as weather is concerned, does tend to make him alive in other directions. One only needs to read the accounts of casualties which occur to ships to appreciate how careless some shipmasters and officers can be, and how they neglect even the most elementary precautions. I think there is a fair chance that if a man is a keen meteorological observer at sea he will at least have a bit of sea sense.

Perhaps it would not be amiss to discuss here the scope of meteorology which might usefully be taught to ships' officers. In this connection I was asked to suggest a syllabus for an initial course in meteorology for students about the age of sixteen. This is chiefly in connection with pre-sea training, and it does seem that it is important to give students some early groundwork as it then makes their later approach to the subject somewhat easier.

The Ministry of Transport regulations cover the syllabus for second mates, masters and mates, but it does not seem that any guidance has been given to cover the younger type of student.

Pre-sea Training

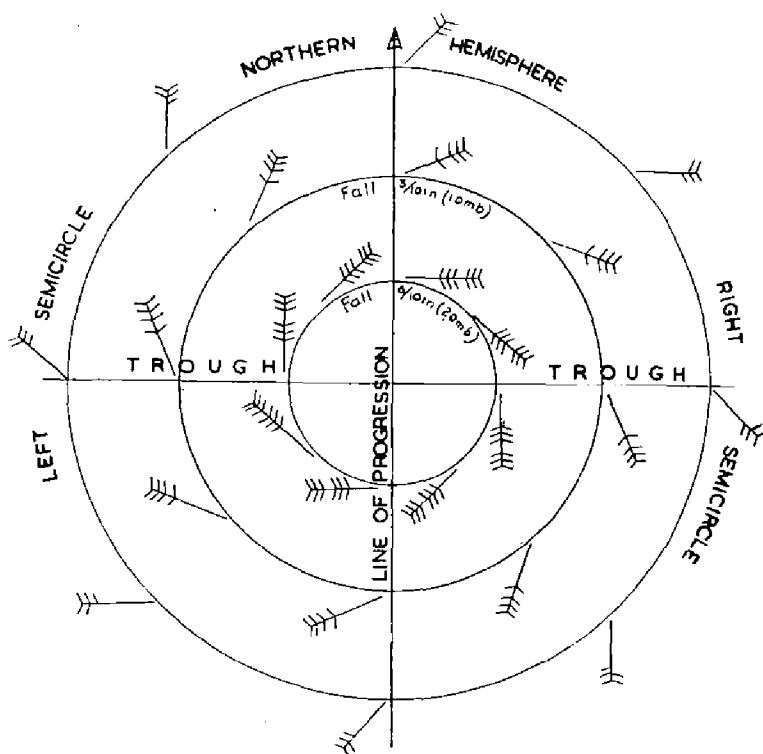
It seems to me that the best approach for the junior student is to concentrate on the general aspects of the subject, the proposed syllabus being briefly as follows :

- (1) The atmosphere and its composition, and particularly the effect of aqueous vapour.
- (2) The general properties of gases.
- (3) The effect upon gases of changes of pressure and temperature.
- (4) The relative effects of sea and land masses upon the atmosphere.
- (5) The effect upon the atmosphere of ocean currents of different temperatures, e.g. Gulf Stream, etc.
- (6) The causes of winds.
- (7) Very briefly, the causes of rain, cloud, snow, frost, fog, dew, etc.
- (8) How pressure and temperature are measured and the units used.
- (9) How to read the barometer and thermometer.
- (10) A brief outline of meteorological services, international meteorology and weather bulletins for shipping.

My idea is to give a boy some kind of a physical background and to awaken his interest in the subject.

Second Mates

I do not think it would be appropriate to change the *scope* of the syllabus as far as mates and masters are concerned, although it might usefully be brought up to date. The second mate's knowledge of meteorology, according to the syllabus, is purely practical and instrumental, and I see no real need to change this.



Sailors' Horn Card

First Mates

For the first mate's examination, I think it is desirable, within the wording of the syllabus, to make the teaching as modern as possible ; for example, he should know the general outline of the new international scales for wind, weather, visibility, etc., but there is no object in his knowing these in detail.



















As far as instruments are concerned, when we come to the use of the wet and dry bulb and sea-surface thermometers, it would be helpful if students were taught the application of these instruments to their job as a ship's officer. I refer to the question of ventilation and sweat and other moisture damage, and also to the forecasting of fog at sea. From the fog forecasting viewpoint, for example, if the sea-water temperature is much lower than the air and the air in contact with the water is tending to get cooled down towards its dew point, the risk of fog is very great.

As for ocean currents, the importance of knowledge about these to a mariner is obvious. Official enquiries into strandings show how often these are contributed to by some current or other. I think it would be a good thing to stress the vagaries of currents and the fact that they may be very much influenced by the wind, not only the wind blowing at the time, but

the wind at some previous time, and that caution is always necessary and that one can never really say that a current will be setting in a certain direction. For the calculation of set and drift it is desirable to encourage ships' officers when estimating their D.R. position to use engine revolutions and an estimated slip as well as log distance.

The current atlas produced by the Meteorological Office portray the ocean currents in three ways : (1) by means of current roses ; (2) by giving predominant direction and rate ; (3) by vector means. A study of these will emphasise the vagaries of these ocean currents. We have not, at present, been able to portray any direct relationship between winds and currents, but hope to be able to do so in due course. We need many more observations, however, before we will be able to advance from quarterly to monthly maps.

The law of storms does not change, but the summarised information on this subject and hints for ship handling which appear in the Admiralty Pilots have been brought up to date. It might be helpful when teaching this subject to emphasise the information which is provided by meteorological services concerning movements of tropical storms. The use of the familiar diagram shown opposite, which is based on the " Sailors' Horn Card ", is perhaps the easiest method of solving " law of storms " problems.

DAY SIGNALS	NIGHT SIGNALS
	
	
	
	
	
	
	
	
	
	
	

International storm-
warning signals

The visual storm-warning signals used in England are peculiar to this country, and there are in existence many other signals of a similar nature which are based upon an international system ; details are published in Admiralty Sailing Directions. The international system is illustrated here, but few countries actually conform to this in detail. (Under Night Signals, the plain circles represent white lights, the stippled circles represent red lights.)

When considering the fundamental types of pressure systems, I think it is appropriate to touch lightly upon the question of air masses, not in any detail, but merely to treat them broadly as homogeneous masses of air which assume certain properties owing to the length of time that they have resided in a certain region. It is helpful in the first case if one considers the mean positions of semi-permanent fronts which separate the different types of air masses. One should recognise the fact that where one air mass meets another air mass, a frontal zone exists, and one can then go on to talk about the theory of the formation of waves on these frontal zones and thence to the principles of the formation of depressions.

As far as the depression is concerned, I do not think there is any need to go into any very great detail, but a candidate for first mate should realise that a depression, when formed, has a warm sector, a cold front and a warm front, and that as it progresses across the oceans there is a natural tendency for the warm sector to gradually become occluded, and fairly soon after that the depression may gradually fill up. The secondary should be mentioned in connection with the depression, and the liability of secondaries to form

on the occluded front of a depression should be emphasised, and also the fact that a secondary can often become more important than its primary. The temporary clearing of sky and sudden shift of wind at passage of the cold front and squally and often violent wind in the cold sector, should be emphasised.

The anticyclone does not need any particular study, except to point out that there is a tendency, under certain circumstances, for fog to occur. However, the liability for very strong winds to occur when a depression impinges upon the edge of an anticyclone might be stressed. I do not think that the other weather types, as such, need any special mention, except that the term "V-shaped depression", being merely applicable to a form of trough, has recently fallen into disuse. We thus have only six fundamental types.

In considering the elementary principles of synoptic charts, most navigation schools have access to the daily weather reports issued by the Meteorological Office, on which the daily synoptic map is drawn. These are rather more detailed than the average candidate for mate needs, and one might question whether there is any practical need for him to know the meaning of the various symbols for indicating fronts, etc. My personal impression is that it is desirable that he should be able to read a synoptic map intelligently, and that he should know the meaning of the simple symbols such as fronts and wind arrows and the fact that the shading inside the station model indicates the state of sky, and that the small numbers by the side indicate temperature, visibility, etc.

Before discussing the weather map, it is necessary to consider quite briefly the principles of gases and the contraction and expansion thereof, accompanied by variations of temperature, and the fact that variations of pressure are the direct causes of wind. I think one should also consider briefly the properties of the atmosphere in vertical section and to have some idea about lapse rates of temperature and the significance of variations of this upon the weather, and particularly upon the formation of cloud and fog. Having explained the causes of clouds it is, perhaps, easier to explain their formation and description of cloud types.

I do not think the relationship between pressure distribution and wind gradient is particularly difficult, but it is, of course, necessary to explain in simple terms the reason why the wind does not directly flow from high pressure to low pressure but follows broadly the line of the isobars. It does not seem there is any need to worry mates about details such as the definition of the geostrophic and cyclostrophic winds—that is probably more appropriate to masters.

As far as the radio weather reports and the International Weather Code are concerned, the "Washington Code" is treated as a separate item a little later. The principles of drafting, coding and decoding weather messages are fairly straightforward and, I suggest, should not normally give any great trouble.

(To be concluded in April *Marine Observer*)

HURRICANES AT BARBADOS

BY A. H. GORDON, M.S.

(A member of the Marine Branch, Meteorological Office)

Day-to-day weather in the tropics normally follows a set pattern which may seem a little monotonous to the meteorologist more used to the ever-changing variety of the temperate zones. In the Windward Islands of the West Indies the passing of the morning hours is marked by an increase in the easterly trade breeze, accompanied by cumulus cloud development which may produce heavy showers by early afternoon. Such a recurring sequence occurs to a greater or less degree with almost unfailing regularity.

Only rarely is this pleasant sequence marred by a major weather change—and when it is, beware! for such a change may be caused by the approach of the dreaded tropical hurricane.

During a short period of duty in Barbados during the end of the hurricane season some years ago the writer's interest in these storms was aroused. The climate of Barbados is a very pleasant one, more so than many other islands in the West Indies, since it is relatively flat and thus allows the cooling trades to sweep across it unhindered. Under such conditions thoughts seldom turned to the analogy that this region was rather like the brink of a dormant volcano where disaster could arrive suddenly and with little warning. True enough, the chance of a severe storm hitting the island was remote, and nowadays an efficient hurricane warning service keeps careful watch on the development and tracks of these storms in this region.

The island of Barbados, by virtue of its position as the most easterly of the West Indies, necessarily becomes a key station to watch for the first signs of the formation or approach of tropical hurricanes, not so much for the concern of this particular island as for the concern of other islands to the west and north. A large number of hurricanes form initially in the vicinity of the Cape Verde Islands, from whence they travel westwards around the southern edge of the North Atlantic subtropical anticyclone. Eventually, either before or after reaching the West Indies, the paths of this type of hurricane curve northwards and then north-eastwards. It is hurricanes with paths of this nature that frequently influence the weather at Barbados. Numerous other hurricanes develop within the Caribbean Sea, but these may not influence the weather at Barbados at all.

The last hurricane reported to have actually visited Barbados occurred in 1898. Previously no hurricane had been reported there since 1831, during which year the island was devastated by one of the worst storms in its history. The tracks of the majority of hurricanes pass well to the north of Barbados, and it is a very unusual occurrence for a tropical storm to develop hurricane intensity at such a low latitude. The diagram on page 38 illustrates the tracks of tropical storms in the West Indies during the year 1948.

Tannehill* gives mention of thirty-nine hurricanes of various degrees of intensity since 1667 which have been recorded in the chronicles of the island. Five others have been noted as having visited Tobago or Trinidad; the most recent of these occurred in June, 1933, when considerable damage was done, strange to say, in the extreme southern part of the latter island. In Barbados the hurricanes have been distributed throughout the season as follows: July (5), August (14), September (12), October (8).

* Tannehill: *Hurricanes*, Princeton University Press.

Of the additional five storms of hurricane intensity which have been reported to have occurred south of Barbados, two have occurred in June, two in September and one in October.

In July, 1901, mention is made of a tropical storm which appeared in the vicinity of Barbados and caused high winds there, but which never developed into a full-fledged hurricane.

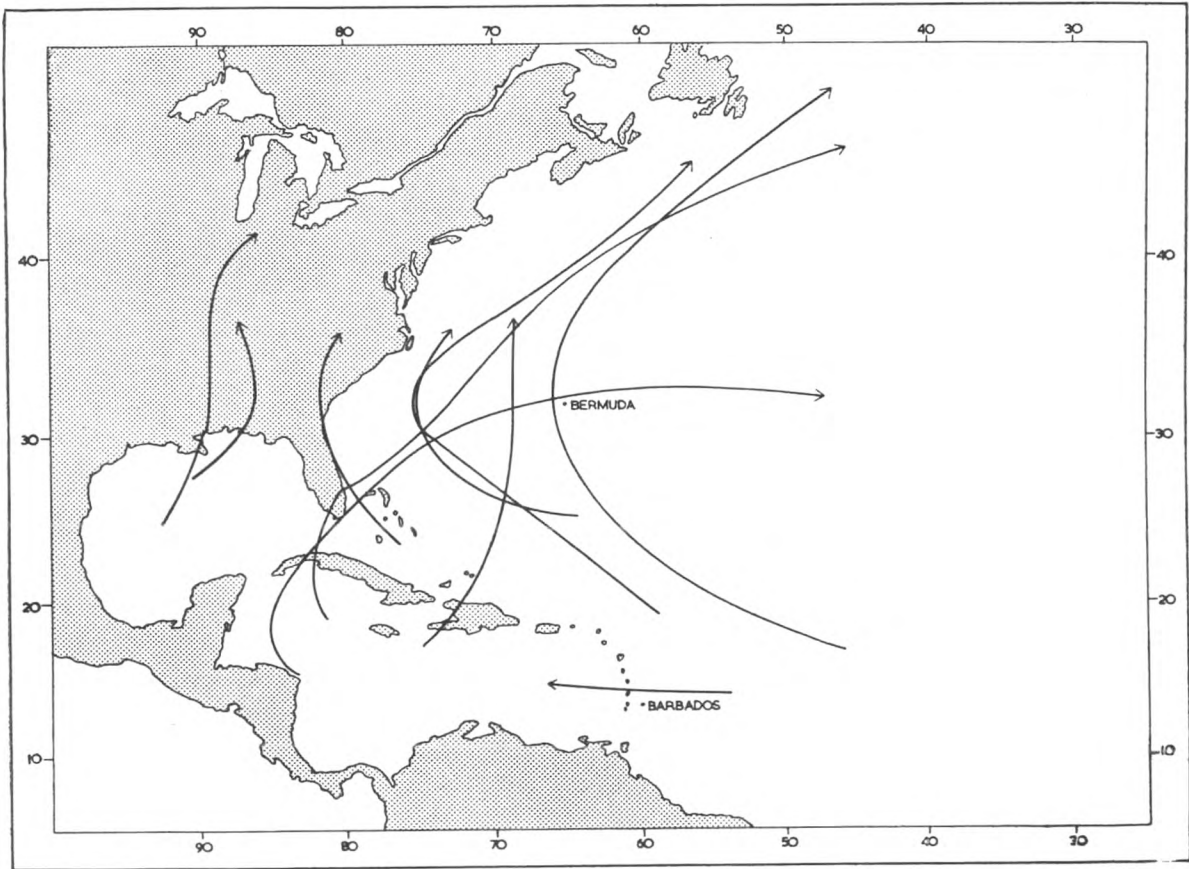


Chart showing paths of hurricanes in the North Atlantic during 1948.

Sir George Rodney, Admiral in command of a squadron of ships and frigates, wrote to Lady Rodney on 10th December, 1780, an account of the "Great Hurricane" of that year in Barbados. The following extract from his letter is quoted from Colonel Reid's *Law of Storms* :

"You may easily conceive my surprise, concern and astonishment, when I saw the dreadful situation of the island and the destructive effects of the hurricane. The strongest buildings and the whole of the houses, most of which were of stone, and remarkable for their solidity, gave way to the fury of the wind and were torn up to their foundation; all the forts destroyed, and many of the heavy cannon carried upwards of a hundred feet from the forts. Had I not been an eye-witness, nothing could have induced me to have believed it. More than 6,000 persons perished and all the inhabitants were entirely ruined."

During the same hurricane at Barbados, a Dr. Blake reported that the bodies of men and cattle were lifted from the ground and carried several yards. Trees were torn up by the roots and stripped of their bark. Another observer stated that neither trees nor dwellings were left standing and that the inhabitants, sheltering in their cellars, did not hear their houses falling above their heads because of the noise of the wind.

In 1674 at Barbados, on 10th August, a hurricane blew down 300 houses, killed 200 persons and wrecked eight ships. In 1675 Barbados was again devastated by a hurricane which came in August of that year.

In 1831 a hurricane of tremendous force struck the island. Colonel Reid was employed in re-establishing the Government buildings blown down in this hurricane, and its great violence, plentiful evidence of which he found on all sides, induced him to undertake a study of hurricanes. P. Mc. Donough, an observer of the Weather Bureau, who investigated records of this hurricane, reported that a piece of lead weighing 150 lb. was carried a distance of more than 1,800 ft. and another piece, 400 lb. in weight, was lifted up and carried 1,680 ft. There were many instances of shingles and pieces of tin being forced into the trunks of hardwood trees. Calamitous as were the numerous hurricanes from which Barbados had suffered up to that time the aggregate destruction caused by all of them combined was considerably unequal to that effected by that of 1831. The hurricane of 1780, fearful and tremendous though it was, is admitted to have been inferior in force and less destructive to property in Barbados. In 1831 more than 1,500 lives were lost and property damage was estimated at over \$7,000,000.

The truest indication of the approach of a tropical storm at Barbados is given by a change in the direction of the wind in the lower levels from prevailing east to a direction from north or any westerly point. An unusually heavy swell from an easterly direction also affords some indication to experienced observers of the approach of a hurricane. The appearance of tufted cirrus in the sky, even if it does travel from an easterly direction, is not a reliable guide that a storm is approaching. Such cirrus may be related to a semi-permanent trough or irregular area of low pressure covering areas which may be remote from Barbados. A general fall of barometric pressure frequently gives a good sign of the development of unsettled conditions. However, the very rapid fall of the barograph trace, normally associated with hurricanes, usually occurs when the storm is sufficiently close to have already caused abnormally strong winds.

The Barbados observations, or observations from ships to the east at about the same latitude or preferably a little to the north, are therefore of great importance to the forecaster who is engaged in a hurricane warning service. In the case of many hurricanes which have affected the West Indian Islands, the weather at Barbados has showed slightly abnormal features, particularly with regard to the surface-wind direction, some time before the storm could be recognised as such and located.

A careful watch of any abnormality that may appear in these observations may therefore afford the clue to the future development and track of a tropical hurricane.

Editor's Note. On the night of 31st August–1st September, 1949, a weak tropical storm which was passing to the north of Barbados suddenly changed its direction and passed directly over the island. The winds nowhere reached gale force, but from 6 to 8 in. of rain were recorded in different parts of the island during the night. In the subsequent flooding seven people were drowned and many houses swept into the sea.

RADAR IN OCEAN WEATHER SHIPS

BY K. MILBURN

(Extra Master, late of the Marine Branch, Meteorological Office.)

The North Atlantic Ocean, as the link or barrier between the New and the Old World, has long been the busiest shipping area in the world, and the atmosphere above it promises to predominate in air-borne traffic. It is unfortunate that it should have more than its share of disruptive weather but on the other hand the contest with the elements has fostered much of the spirit and virility of north-west Europe, from which so many of the world's scientific developments have emanated.

The Ocean Weather Service was born of the need for a greater knowledge of the changing weather conditions in the North Atlantic, for the information of meteorologists on both seaboard and the security of aircraft.

Aircraft crossing this wide ocean, devoid of any land-based navigational aids, find these floating sentinels invaluable in supplying navigational information and a great comfort in the knowledge that they are equipped and alert for air-sea rescue operations should that eventuality arise.

Since the introduction of the Ocean Weather Service there have been two major rescues carried out. The first was in 1947, when a trans-Atlantic flying-boat was "ditched" and the sixty-nine passengers and crew were rescued by the United States weather ship *Bibb*, and in January, 1948, the British ship *Weather Recorder* saved twenty-eight men from a Norwegian cargo ship which ran ashore in bad weather on Balach Rocks, off the Scottish coast.

The organisation for aircraft in distress is to home on the nearest Weather Ship, and if the necessity arises to "ditch" as close as possible. This was carried out very effectively in the case of the U.S.S. *Bibb*.

The mariner had long dreamed of a device to relieve his anxiety when fog deprived him of the value of the human eye in carrying out the first maxim of seamen, "to keep a good lookout", and radar is undoubtedly the greatest feature in navigational advancement since Harrison's chronometer. The credit for its development can be given to the British electronic engineers, and America gave it a name which was soon a familiar addition to the sailor's vocabulary.

When plans were being laid for the institution of Weather Ships and Great Britain had agreed to maintaining two stations, the problems were, what type of ship to use and the equipment they should carry, with an eye to economy consistent with efficiency. It was obvious that radar would be an essential part of the equipment :

- (a) For the purposes of tracking a radar target suspended below a free balloon to find force and direction of winds at various altitudes up to at least 40,000 ft. ;
- (b) to assist the navigation of aircraft passing the station ;
- (c) to help in locating aircraft or surface vessels requiring assistance ;
- (d) as an anti-collision device in thick weather ;
- (e) to assist in the navigation of the ship to and from station ;
- (f) to a limited degree for storm detection, or for the location of fronts.

Four "Flower Class" corvettes were obtained from the Royal Navy and converted in His Majesty's dockyards for use as Ocean Weather Ships, under the direction of the Meteorological Office. These vessels were ideally suited for the job, being sound and staunch and exceptionally sea kindly, although the limited space available meant that equipment must be reduced to the bare minimum to carry out the various duties effectively. One radar set was supplied which was called upon to be a "jack of all trades", and turned out to be a master of most. This was Type 277 Naval radar, with maximum aerial elevation increased from 40° to 70° to enable radar wind observations to be carried out.

This set gives azimuth, elevation and range up to 150,000 yards and



The radar antenna of O.W.S. *Weather Recorder*.

operates on a wavelength of 10 cm. with a 5° beam width, and was originally designed for aircraft detection.

When the set is operated on short pulse and with the aerial correctly stabilised, a minimum range of 250 yards is obtainable under good conditions and about 400 yards under average rough conditions. The angular discrimination is about 5° and the range discrimination in the order of 150 yards. When long pulse is used the minimum range and range discrimination is approximately trebled. The determination of direction and distance depends largely for its accuracy on the careful and skilled adjustment of swept gain and P.P.I. sensitivity. The radar is housed in a cabin under the bridge with an H.P.I. and P.P.I. display unit. There is an additional P.P.I. display unit in the chartroom for navigational purposes. The aerial scanner is sited on the tripod foremast.

Measurement of Upper Winds

Radio-sonde ascents are made from the Weather Ships at six-hourly intervals. Before the advent of radar it was the practice at shore stations to plot the path of the instrument from two or more direction-finding stations suitably placed. This system has been largely superseded by radar, and in Weather Ships it is the only system available, as a single D/F station would not serve the purpose.

The equipment comprises a radio-sonde and radar reflector, suspended from a free balloon to carry it aloft. When the balloon is released from the ship it is tracked, by the officer on the bridge, for azimuth by the compass, and altitude by sextant. A small light is attached to the equipment at night to facilitate the observations. This information in the early stages of the ascent is passed rapidly to the radar room to assist the operator in finding the target, after which the visual observations cease. To facilitate co-operation between the bridge, the meteorological office, which is aft, and the radar cabin, which is on the forecastle deck forward of the bridge, during radio-sonde ascents a three-way loudspeaker telephone system is fitted. As the target is carried aloft the azimuth, altitude and slant range are recorded at regular intervals of time, and from this information the wind directions and speeds at the various heights are calculated. The targets are frequently tracked to ranges of fifty miles, and sometimes are followed down to sea level again after the balloon has burst. The target (Mk. I) is constructed of metallised paper on a wooden framework, and in strong winds a nylon shroud reflector is used.

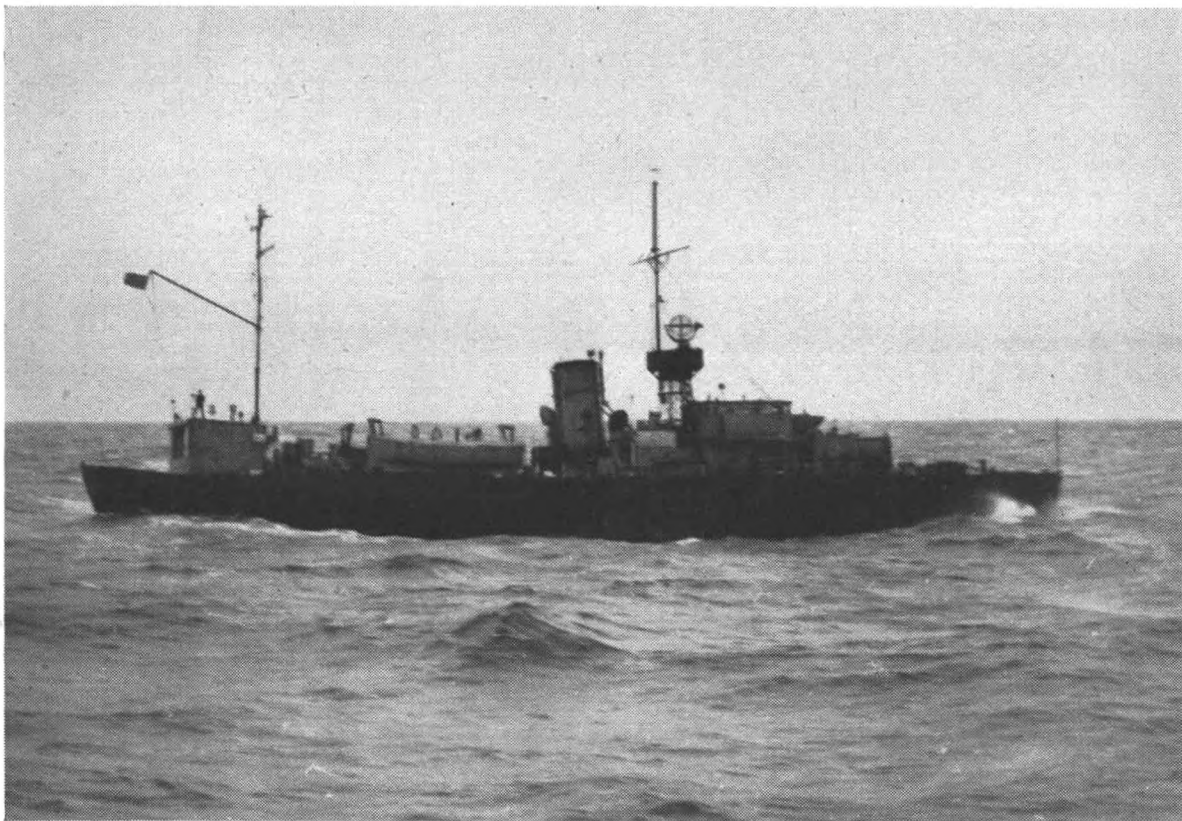
During these operations the ship is kept head to wind, to allow maximum scope for launching the equipment.

The rate of ascent of the balloon with attachments is approximately 1,000 ft. per minute, so that with surface winds of less than 4 knots it is necessary for the vessel to steam into the wind so as to keep the elevation of the target less than 70° , which is the maximum the 277 Naval radar will record. Also, it is prudent to allow a margin of elevation in case of reversal of direction of the upper winds. In strong winds the tendency is for the horizontal component of the balloon's path to be excessive, so that it might disappear out of range of the radar before gaining sufficient altitude. To obviate this the ship may, in such circumstances, be steamed down-wind after the balloon is released.

Fixing Aircraft by Radar

The two British Ocean Weather Stations are "Item", in 60°N. , 20°W. , and "Jig", $53^{\circ} 50'\text{N.}$, $18^{\circ} 40'\text{W.}$ Ocean Weather Ships endeavour to keep within the ten-mile square with the station at the centre. This is not always possible, and sometimes, owing to bad weather or a deviation for rescue or other purposes, a ship may be some distance from station but still in a position to provide meteorological and navigational services.

Positions within a 210-mile square with the station at the centre can be indicated relative to the station by a grid system. The square is subdivided into ten-mile squares and the subdivisions lettered horizontally and vertically. The latitude designator is given first when a position by this method is shown. This system is principally used for D/F service, in which case the characteristic signal of the station is preceded by the position letters.



O.W.S. Weather Observer Reproduced by courtesy of O. M. Ashford

The radar antenna is seen on the foremast just above the wheelhouse. The radar office is in the deckhouse forward of the bridge. The balloon shelter is situated abaft the mainmast and the balloons are launched from there.

An aircraft requiring a position communicates first by radio telephone and requests a radar "fix", whereupon the radar operator or perhaps the officer of the watch, searches until the aircraft is detected on the screen and then picks off her bearing and range. This is passed to the aircraft either with the position indicator letters of the ship or her latitude and longitude.

A continuous watch is kept on radio-telephone, but the radar is not kept operating continuously, and an aircraft requiring a position must give ten or fifteen minutes' notice so that the set can be allowed to "warm up".

Station "Jig" lies on the path of much North Atlantic air traffic, and *Weather Recorder* on voyage 16, during twenty-one days on station, reported 360 aircraft contacts, of which 235 were given radar fixes. The greatest range at which a fix was given on that voyage was 185,000 yards.

Station "Item" lies off the beaten track, and aircraft travelling on the Prestwick-Reykjavik route usually do not pass within radar range. *Weather Recorder* on this station on voyage 8 reported thirty-two aircraft contacted, of which three were given radar fixes at ranges of 91,000, 110,000 and 160,000 yards respectively.

As there is only one radar set on board the ships it is not possible to give an aircraft a radar "fix" while the radar is being used for an upper air observation. The primary function of the ships is for meteorological duties, however, unless an air-sea rescue operation develops, and the services of radar fixes for aircraft is subordinated to meteorological services. When radar "fixes" are not available the aircraft has the radio beacon or D/F bearings from the ship at his disposal.

Occasionally the presence of heavy rain cloud has blotted out the echo from the aircraft and prevented a "fix" being given.

Air-Sea Rescue

The rescue of the crew of the Norwegian S.S. *Veni* by the *Weather Recorder* (Captain A. W. Ford) on January 11th, 1948, was carried out under extremely hazardous conditions. The *Veni* was originally reported to be on Torran Rocks, but it was found by radar to be on Balach Rocks, about twenty miles farther south.

Captain Ford's report stated that, on approaching the wreck, "The night was pitch-black and the gale worse than ever. To make matters worse terrific heavy rain kept blotting out the only navigational light, that of Dubh Artach. Full use was made of the radar and the echo-sounding machine". The wreck was closed sufficiently to effect a rescue. The whole crew of the stricken ship were rescued, and the report concludes, "Without radar it would have been impossible to close the wreck".

So far the British Ocean Weather Ships have not participated in any rescue of air crews, but their presence out in the Atlantic, observing and promulgating surface and upper-air conditions and the navigational services they perform has aided the safe arrival of many aircraft with their passengers and crew. The value of radar for air-rescue operations can therefore only be conjectured. An aircraft in distress and unable to make shore base would home on the nearest Weather Ship and get as close as possible before "ditching". Radar would be invaluable in guiding the aircraft into the ship and keeping it advised of the closing ranges.

Similarly, to effect rescue operations from ships at sea or from lifeboats, radar could play an important part, although a wooden lifeboat is not a good target. The time may come when wooden lifeboats will be required to be fitted with suitable reflectors.

Pilotage

Type 277 Naval radar is neither designed, nor eminently suited, for blind navigation in confined waters, but experience has shown that it can be of considerable assistance when approaching land. An average range for picking up a navigational buoy is three miles, and the minimum range in average rough conditions is about 400 yards. The *Weather Observer* has been navigated entirely on P.P.I. from the Mull of Kintyre to Little Cumbrae without having sighted the land, but the masters of the Ocean Weather Ships in this respect treat its performance with reserve. Peaks of land have

(Continued on page 55)

THE DISAPPEARANCE OF THE "SAMKEY"

BY P. M. SHAW

(Of the Marine Branch, Meteorological Office)

The S.S. *Samkey* was a Liberty ship launched in 1943 as the *Carl Thusgaard*, and at the time of her loss she was under the management of the New Zealand Shipping Company, Ltd., on behalf of the Ministry of Transport. On 24th January, 1948, she sailed from London in ballast on a voyage to Cuba, and was last sighted at 11 a.m. on the 29th in $45^{\circ} 21' \text{N.}$, $19^{\circ} 17' \text{W.}$ by the *Innesmoor*. She transmitted a weather report for 1200 G.M.T. on the 31st (given below) at 1345 G.M.T. to Horta Radio Station, and that was the last that was heard of her. Her position then was lat. 41.8°N. , long. 24.0°W.

We do not know, and probably never shall know, exactly what happened to the *Samkey* during the night of 31st January–1st February, 1948. But though actual knowledge of the event was lacking, the circumstantial evidence was thoroughly examined by experts and the Court of Enquiry, which was set up in July, 1948, to investigate the loss of the vessel, found that "The S.S. *Samkey* was lost with all hands due to a sudden shift of solid ballast in the 'tween decks during heavy weather".

It should therefore be of interest to examine the development of the weather around the time of the disappearance of the *Samkey*. The synoptic chart for 1200 G.M.T. on 31st January is reproduced as Fig. 1. Detailed observations taken by the *Samkey* and reporting ships and stations nearest to her were as follows :

S.S. *Samkey* (41.8°N. , 24.0°W.); SW wind, force 6; partly cloudy; visibility 10–30 nautical miles; pressure 1019 mb.; air temperature 58°F. .

M.V. *Sacramento* (43.3°N. , 20.3°W.); WSW wind, force 5; cloudless; visibility 10–30 n. miles; long heavy W'ly swell; pressure 1019 mb., risen 2.8 mb. in past 3 hours; air temperature 59°F. , dew point 47° , sea $58\text{--}59^{\circ}$; cloud 1/10 small Cu., base 2,000 ft.

M.V. *Robert F. Hand* (43.1°N. , 21.9°W.); WSW wind, force 4; partly cloudy; visibility 10–30 n. miles; long moderate swell; pressure 1018 mb., risen 2.2 mb. in past 3 hours; air temperature 59°F. , dew point 47° , sea $58\text{--}59^{\circ}$; cloud fair weather Cu. and Sc., base 3,000 ft.

S.S. *Lafayette* (40.6°N. , 24.7°W.); W wind, force 5; partly cloudy; visibility more than 30 n. miles; long low W'ly swell; pressure 1022 mb., risen 2.0 mb. in past 3 hours; air temperature 58°F. , sea $57\text{--}58^{\circ}$; cloud 2–3/10 anvil Ci.

French O.W.S. *Le Brix* (39.0°N. , 17.0°W.); NW wind, force 3; cloudy; visibility 5–10 n. miles; short or average length low W'ly swell; pressure 1026 mb., risen 3.4 mb. in past 3 hours; air temperature 61°F. , sea $61\text{--}62^{\circ}$; cloud trace St., base 600–1,000 ft., 4–6/10 banded Ac.

Horta (Azores) ($38^{\circ} 32' \text{N.}$, $28^{\circ} 38' \text{W.}$); SSW wind, force 7; cloudy; visibility $12\frac{1}{2}\text{--}31$ statute miles; pressure 1017.4 mb., risen then fallen in past 3 hours, net fall 2.4 mb.; air temperature 59°F. , dew point 52° ; cloud 7–8/10 large Cu base 2–3,000 ft.

S.S. *Fort Caribou* (39.1°N. , 30.5°W.); SSW wind, force 6; cloudy; visibility 10–30 n. miles; short or average length low W'ly swell; pressure 1011 mb., fallen 1 mb. in past 3 hours; air temperature 61°F. , dew point 53° , sea $60\text{--}61^{\circ}$; cloud 2–3/10 Sc., base 4,000 ft., 9/10 thin As.

M.V. *Santander* (41.7°N. , 32.5°W.); SSW wind, force 7; squally weather; visibility 2–5 n. miles; short heavy SW'ly swell; pressure 1003 mb., fallen 5 mb. in past 3 hours; air temperature 58°F. , dew point 58° , sea $55\text{--}57^{\circ}$; cloud 10/10 Sc., base 4,000 ft.

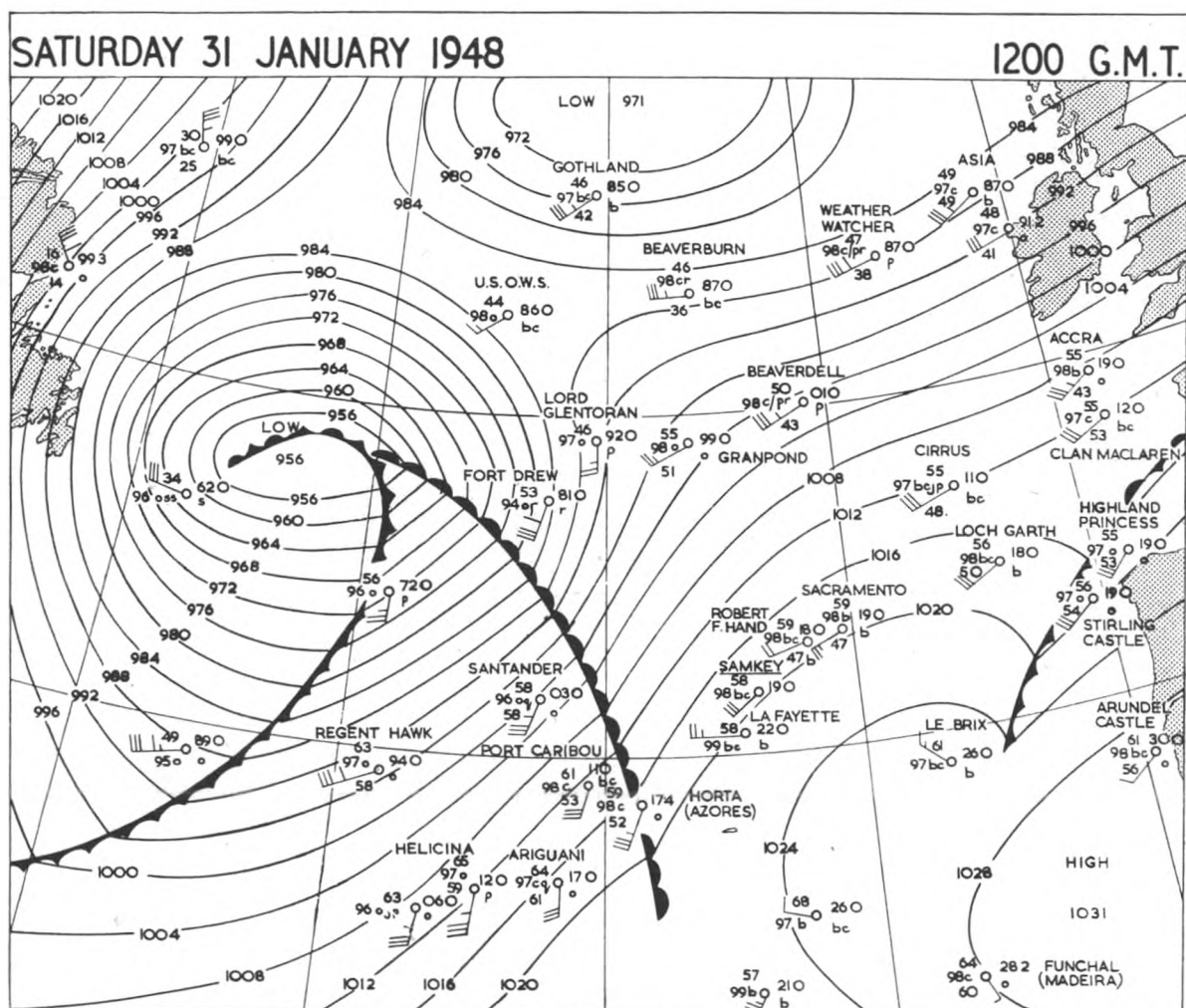


Fig. 1

From these observations alone it is clear that the *Samkey* was moving from an area of fair weather and rising pressure, though with an ominous increasing swell, towards an area of stronger, squally winds, overcast weather, poorer visibility and falling pressure. The chart shows that this deterioration was due to a deep depression centred at about 48°N ., 43°W .. Its associated fronts show that the system was not much occluded and hence the depression could be expected to deepen still further, intensifying the winds and weather in its circulation as it moved quickly east or north-east. In fact the Atlantic Weather Bulletin broadcast at 0930 that morning mentioned a "Complex depression south of Newfoundland moving rapidly east", and the forecast for the next twenty-four hours for the area 35° – 53°N ., east of 40°W ., was: "Winds between south and west, gale force generally with severe gales at times. Rain or squally showers in many places. Good visibility."

At 1800 G.M.T. it was blowing a gale (force 8) at Horta, and by midnight this had increased to force 9. The deepening depression was by then moving slowly north-east and absorbing the old depression shown at the top of the chart in Fig. 1.

The synoptic chart for 1200 G.M.T. on 1st February is reproduced as Fig. 2. The depression was then centred at about 53°N ., 32°W ., and had deepened to 940 mb. Even for the North Atlantic this was very low. Winds were very strong and squally in the circulation round it, force 9 being common, and the *Granpond* (49.3°N ., 23.0°W .) reported "hurricane 12". Farther south, conditions in the area of the *Samkey*'s last known position

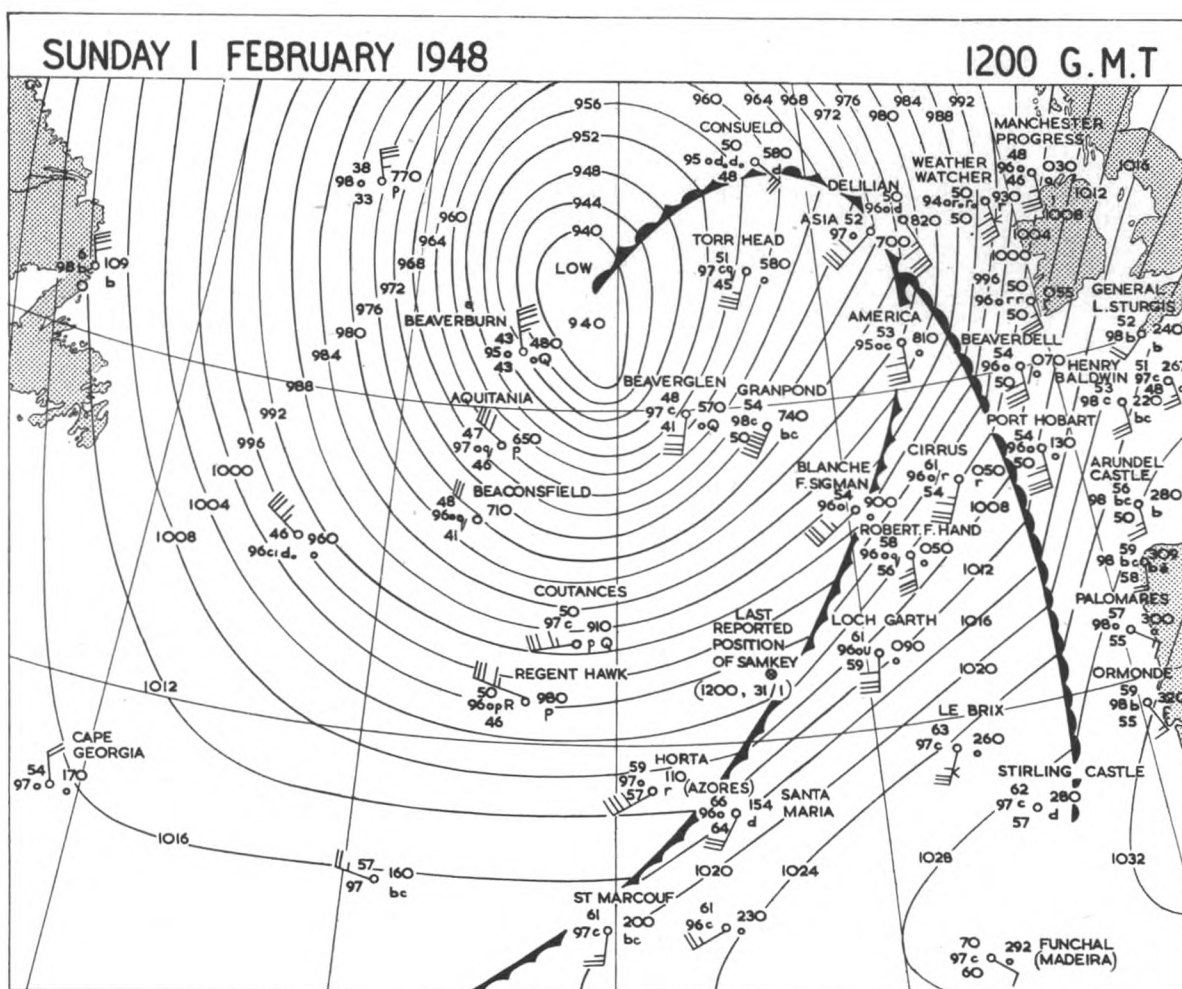


Fig. 2

were little better, as is shown by the following detailed reports from ships and stations nearest to that point :

M.V. *Robert F. Hand* ($43^{\circ}1'N.$, $21^{\circ}9'W.$) ; S wind, force 9 ; squally weather ; visibility 2-5 n. miles ; short heavy SW'ly swell ; pressure 1005 mb., risen then fallen in past 3 hours, no net change ; air temperature $58^{\circ}F.$, dew point 56° , sea 55-57' ; cloud 10/10 Fb., base 2,000 ft.

S.S. *Loch Garth* ($42^{\circ}2'N.$, $19^{\circ}3'W.$) ; SW wind, force 8 ; ugly threatening sky ; visibility 2-5 n. miles ; average length heavy SW'ly swell ; pressure 1009 mb. fallen 1.4 mb. in past 3 hours ; air temperature $61^{\circ}F.$, dew point 59° , sea 58-60' ; cloud 10/10 Fb., base 1,500 ft.

French O.W.S. *Le Brix* ($39^{\circ}0'N.$, $17^{\circ}0'W.$) ; SSW wind, force 7, gusty ; cloudy ; visibility 5-10 n. miles ; average length moderate S'ly swell ; pressure 1026 mb. ; air temperature $63^{\circ}F.$, sea 57-60' ; cloud trace Sc., base 2,100 ft., 9/10 anvil Ci.

Santa Maria (Azores) ($36^{\circ}55'N.$, $25^{\circ}10'W.$) ; SSW wind, force 6 ; cloudy, drizzle in past 6 hours ; visibility $2\frac{1}{2}$ - $6\frac{1}{2}$ st. miles ; pressure 1015.4 mb. ; air temperature $66^{\circ}F.$, dew point 64° ; cloud 10/10 Sc., base 1-2,000 ft.

Horta (Azores) ($38^{\circ}32'N.$, $28^{\circ}38'W.$) ; SW wind, force 8 ; cloudy, rain in past 6 hours ; visibility $6\frac{1}{4}$ - $12\frac{1}{2}$ st. miles ; pressure 1011.0 mb., fallen then risen in past 3 hours, net rise 2.8 mb. ; air temperature $59^{\circ}F.$, dew point 51° ; cloud 2-3/10 Cb., base 2-3,000 ft., 10/10 Ac. and As.

S.S. *Regent Hawk* ($41^{\circ}2'N.$, $33^{\circ}7'W.$) ; WNW wind, force 9 ; heavy rain shower, showers in past 6 hours ; visibility 2-5 n. miles ; long heavy W'ly swell ; pressure 998 mb., risen 6 mb. in past 3 hours ; air temperature $50^{\circ}F.$, dew point 46° , sea 53-56' ; cloud 7-8/10 Fb., base 2,500 ft., 10/10 thin As.

S.S. *Coutances* ($43^{\circ}0'N.$, $31^{\circ}5'W.$) ; WSW wind, force 9 ; showers and line-squall in past 6 hours ; visibility 5-10 n. miles ; long heavy SW'ly swell ; pressure 991 mb., risen 4.8 mb. in past 3 hours ; air temperature $50^{\circ}F.$, sea 56-59' ; cloud 9/10 total Sc. and thin As.

In the extreme south-east of this area the wind was below gale force, with a correspondingly lower swell ; but otherwise the wind was a mean force 8 or 9, squally and gusty even in the warm sector, and raising a heavy sea. There can be no doubt that the *Samkey*, if she was then afloat and anywhere near her original course, had been subject to these, or worse, conditions for at least twelve hours, and probably longer. To quote again from the report of the Court of Enquiry, " the worst weather [was] probably being experienced between midnight on the 31st January and 4 a.m. on the 1st February ".

The report continues : " The Court is of opinion that in such weather the ballast, uncontrolled as it was, was very likely to shift and probably did so with a run. Such a shift, coupled with two or three big waves and the wind, might well have caused the *Samkey* to have been overwhelmed. It is pointed out that a sudden disastrous shift would account for no distress signals having been heard, and for the absence of floating wreckage such as lifejackets, oars, hatchcovers and the like."

It is clear that, whatever the primary cause, the heavy weather she encountered was an important factor in the loss of the *Samkey* ; and from the foregoing discussion of the weather situation there arise three points of general interest. First, the absolute necessity of ships' observations for the preparation of accurate charts and forecasts. Even the *Samkey*, though not a regular observing ship, volunteered her weather reports, and the charts reproduced here show how her and all other ships' observations enabled the position, movement and future development of important weather systems to be fully documented.

Secondly, the importance of a good forecast service for shipping is demonstrated. In the Atlantic Weather Bulletin broadcast at 0930 on the 31st, warning was given of the type of weather to be expected in the next twenty-four hours, and subsequent developments were practically as forecast. Although the *Samkey* was unable to avoid disaster, despite the precautions that her master as an experienced seaman presumably took, there are many cases where a ship receiving a forecast of heavy weather can take timely steps to avoid the worst of the weather or, failing that, to ensure that all reasonable precautions have been taken to encounter same. In this particular case, in which the sudden shifting of several hundred tons of 'tween deck ballast probably occurred, it seems that there is little that those aboard could have done.

Finally, the value of supplementing forecasts by plotted charts is well illustrated. Even the simplest descriptions of present or future weather are easier to understand if the appropriate charts can be examined with them, and these can be plotted by any ship from data broadcast in the Atlantic Weather Bulletin for Shipping. In this particular case, the reasons for the expected and actual severity of the weather are clearly indicated in Figs. 1 and 2. Also, the area of fair weather and lighter winds to the south-east of the *Samkey* is plainly shown, and this might well have been vital information for a partly disabled but still navigable ship.

The loss of the *Samkey* is one of the tragedies of the sea. It is hoped that the meteorological aspect as discussed in this article may contribute in some small measure to the assistance of seamen in their age-long battle with the elements.

METEOROLOGICAL SERVICE OF CANADA

“ Excellent Awards ” for Weather Observing at Sea

A large proportion of the sea-going merchant ships of the major maritime nations have been enlisted by their own national meteorological services to report weather conditions by radio several times daily while on the high seas. This work is on a voluntary basis. It is internationally organized ; reports are transmitted free to the nearest nation and collected ship reports are exchanged between national meteorological services. These reports are essential for the preparation of weather forecasts for areas of the seas, and contribute to the accuracy of forecasts for land areas.

The officers of Canadian ships listed below have been presented with an award by the Meteorological Division, Department of Transport, for “ excellent ” weather observations carried out during 1948. The award was a book, *Wind Waves at Sea, Breakers and Surf*, by Henry B. Bigelow and W. T. Edmondson, published by the U.S. Hydrographic Office. Each copy was provided with an illuminated bookplate signed by Andrew Thomson, Controller of the Meteorological Division.

Th. L. Arnold	S.S. <i>Waitomo</i>
E. M. Bieneman	M.V. <i>Aorangi</i>
A. G. Bradshaw	S.S. <i>Lake Kootenay</i>
Alan F. Carter	S.S. <i>Fort Amherst</i>
C. P. Chouinard	S.S. <i>Imperial Quebec</i>
S. G. Goodyear	S.S. <i>Fort Townshend</i>
T. Goodyear	S.S. <i>Fort Amherst</i>
A. W. Hodder	S.S. <i>Fort Amherst</i>
J. Kennedy	S.S. <i>Waikawa</i>
S. J. Lavis	S.S. <i>Fort Townshend</i>
A. Lefebvre	S.S. <i>Victoria County</i>
J. C. Matthews	S.S. <i>Imperial Toronto</i>
W. P. Murphy	S.S. <i>Imperial Toronto</i>
J. C. Robinson	S.S. <i>Waihemo</i>
F. Simpson	S.S. <i>Waihemo</i>
John C. Smith	S.S. <i>Imperial Winnipeg</i>
Cornelius Stephenson	S.S. <i>Fort Townshend</i>
G. H. Tozer	S.S. <i>Lake Minnewanka</i>
E. M. Willkie	S.S. <i>Imperial Toronto</i>

In conformity with resolutions of the International Meteorological Organisation, Canada is expanding the list of ships selected for weather observing on the high seas. The system of having Selected Ships report weather regularly in the official weather code is expressly approved in the International Convention for the Safety of Life at Sea. Further, the 1948 Convention recommended that *other ships*, in addition to those specially selected, should be encouraged to report weather while at sea, especially in the less frequented areas. Masters of foreign-going ships are invited to get in touch with the Dominion Public Weather Office in any major Canadian port, to get details of the world-wide weather reporting system.

WEATHER AND PACK-ICE ENCOUNTERED DURING THE SEASON 1948/49 IN ANTARCTIC WATERS

LT.-CDR. C. MINCHIN, R.N.

The Antarctic season 1948-49 in the Falkland Islands Dependencies area has proved to be an exceptionally bad one, both for pack-ice and weather.

Throughout the period, December-April, there were no reasonable spells of fine weather, and it is fair to state that during *John Biscoe's* voyages there were only two consecutive days during which the sun was visible for more than ten hours. One's impression of the season is of a monotonous succession of dull, cloudy or overcast days, with frequent blizzards and snowstorms. The percentage of days with wind force 7 or more was about 20 per cent, and these winds were mainly NE-ENE. The natural result of these weather conditions was abnormally low sea and air temperatures throughout the season.

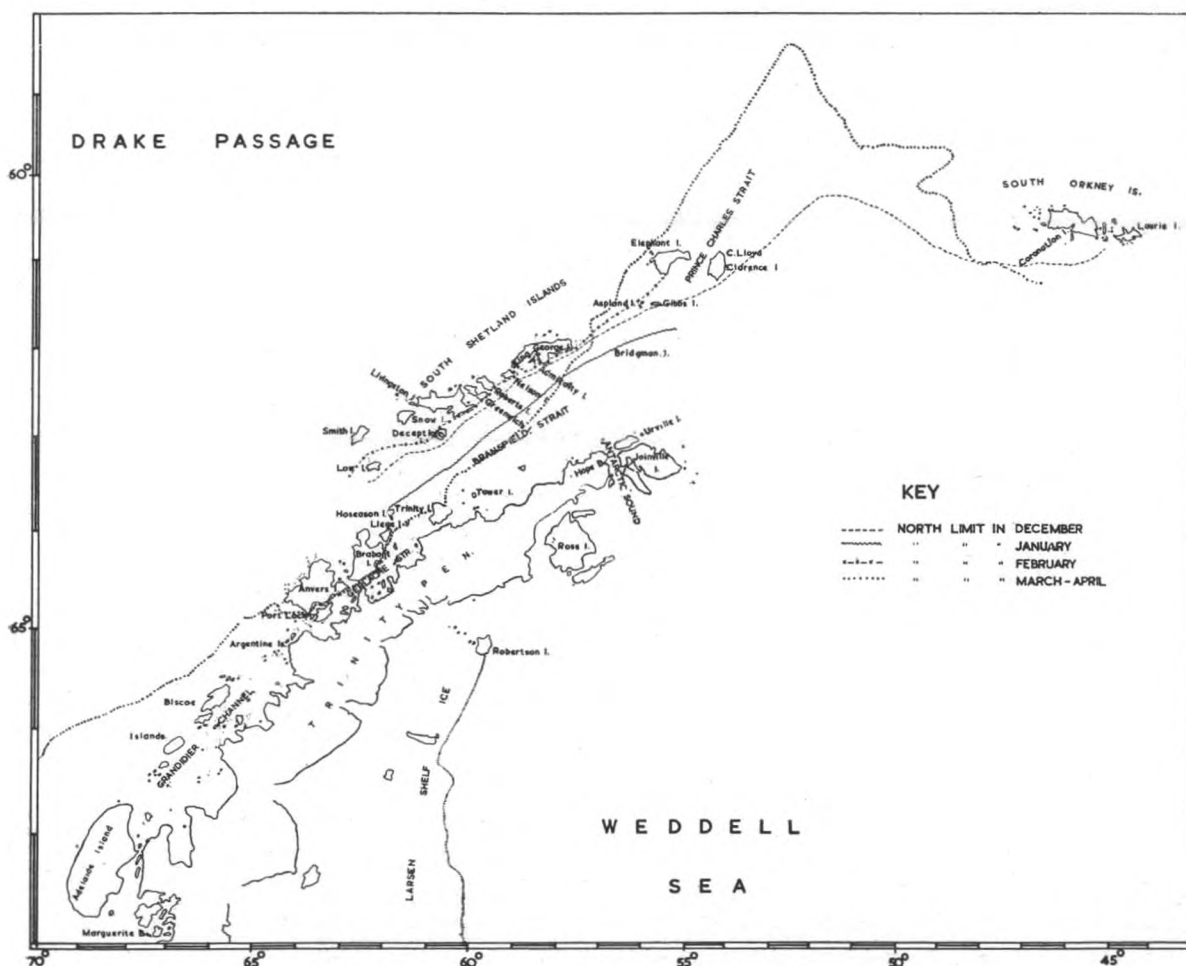


Chart showing the approximate mean monthly north limit of pack-ice in the Antarctic section of the Falkland Islands Dependencies during the summer months 1948-49, as found by the F.I.D.S. survey vessel *John Biscoe*.

It had been reported from Hope Bay (F.I.D.S. Base D) that there was a fifty-mile break-off from the Weddell Sea Barrier at the end of the 1947-48 season. This enormous ice mass, moving with the north-west drift from the Weddell Sea, eventually moved into the Bransfield Strait round Joinville Island, and produced the severest ice conditions for over twenty years.

The normal Bransfield Strait drift to the north-east was completely nullified due to the sustained periods of strong north-easterly winds. The winds also intensified the drift from the Weddell Sea into Bransfield Strait, with the result that the Strait has been an area of heavy pack throughout the whole season, except for narrow strips of open water along its southern or northern shores following a day of northerly or southerly winds, which have been rare. This has made navigation in this area dangerous, difficult and at times impossible when combined with poor visibility.

Farther north the pack-ice has laid between the South Orkneys and South Shetlands during the whole season, and extended as far north as $58^{\circ} 30'S$. in March, 1949.

To the southward the weakening of the north-easterly drift, allied to the poor season and low temperatures, have caused an early closing of the area by pack-ice and newly-formed sea-ice. *John Biscoe* was nearly beset in the Argentine Islands on 1st April, 1949, when the Penela Strait, Lemaire Channel, Peltier and Neumeyer Channels and de Gerlache Strait were impassable due to pack-ice, and the open sea to westward of the Graham Land peninsula was covered with pack to a depth of forty miles.

BOOKS RECEIVED FOR REVIEW

The Application of Radar to Seamanship and Marine Navigation. By Captain E. M. Robb, Extra Master, M.I.N. 8vo. 9 in. \times 5½ in. viii + 92. *Illus.* Charles Birchall and Sons, Limited, Liverpool, 1949. Price, 12s. 6d.

Captain Robb deserves congratulation for having produced a useful little book for masters and navigating officers of merchant ships, in which he has dissected the marine radar problem very neatly and explained the practical value of the apparatus and its idiosyncrasies and pitfalls in a clear and straightforward manner. At 12s. 6d., however, I think the price is a bit on the high side.

The book is quite well illustrated with drawings and P.P.I. photographs; photographs of various types of apparatus might have been advantageous, but perhaps this would have seemed like advertising. His comments on the avoidance of screening by masts, etc., makes one think that the best place for the radar is out of the middle line of the ship. The important meteorological aspect of radar is treated clearly and simply, and he suggests an ingenious idea of automatic control of rain interference by harnessing the interval between rain drops. In the section on ice he is perhaps a little too sure that radar will detect ice; there are always growlers to be considered.

The "rule of the road" question is treated in a practical manner, rightly emphasising the complications involved in acting solely on radar advice. One wonders, however, if his suggested early course alteration, with a crossing vessel on his port bow, is wise. He rightly advises the navigator to "back up" his radar with every other navigational facility at his disposal.

The three appendices include the text of an illuminating lecture on radar as applied to navigation, by Lt.-Cdr. Satow, as well as the Ministry of Transport's *Marine Radar: Performance Standards*.

C. E. N. F.

SOUTHERN ICE REPORTS

During the year 1948

JANUARY

Reported by M.V. *Haparangi*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
29	56 37S	135 14W	1 small iceberg.	Flat-topped at North end, pinnacle at South with sea-level chasm between. By sextant angles; diameter, 240 ft., pinnacle 50 ft.
29	56 58S	134 23W	1 small iceberg.	Wedge shaped in section. Mean height, 30 ft., diameter 180 ft.
29	Between 56 51S and 56 36S	134 13W	6 large icebergs.	The largest a long plateau of ice visible, with vertical edges. Uniform height, 130 ft., maximum diameter 4,500 yds.
29	56 45S	133 57W	7 small icebergs.	Remainder of proportionately declining dimensions.
29	Between 56 45S and 56 45S	133 42W	1 small iceberg.	Smooth rounded top with waves breaking over; length 190 ft., height 30 ft.
29	56 45S	133 40W	12 icebergs.	Dimensions of icebergs unknown—observed on radar scan only.
29	56 45S	132 20W	2 bergy bits.	Bergy bits sighted visually. Estimated dimensions: height 15 ft., length 50 ft.
29	In same vicinity		10 growlers and bergy bits.	Interspersed amongst the large bergs. Resembling two very small bergs joined by a narrow isthmus of ice, with two pinnacles outstanding on South side. Height 100 ft., diameter 300 ft.
29	55 31S	128 55W	1 small iceberg.	
29	55 20S	128 00W	1 iceberg.	Not sighted—contacted on radar scan.
30	55 00S	122 39W	1 iceberg.	Not sighted—contacted on radar scan.

During the year 1949

JANUARY

Reported by M.V. *Athelchief*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
23	52 34S	36 53W	Bergs and growlers.	
23	52 52S	36 42W	Large berg.	
27	53 40S	36 31W	2 small bergs.	

Reported by S.S. *Ketos*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
1	58 45S	03 20W	Pack ice.	Large belt extending from horizon to horizon.
4	60 05S	08 45W	Icebergs.	Number of bergs varying in size, all in line bearing N and S.
7	60 18S	15 40W	Icebergs.	Number of average size bergs.
10	59 41S	17 54W	Icebergs.	Many large bergs. Average size estimated 5 miles by 2 miles by 100 ft. (All with flat tops.)
21	61 05S	10 11W	Icebergs.	Number of average size bergs.
22	60 58S	10 05W	Icebergs.	Number of average size bergs.
26	60 56S	7 55W	Icebergs.	Number of average size bergs.
28	61 35S	9 10W	Icebergs.	Number of average size bergs.

Reported by S.S. *Saluta*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
1	62 04S	90 53E	Icebergs.	Numerous large tabular bergs.
	62 03S	to 91 15E	Iceberg.	One berg, approximately 5 miles long.
	62 07S	91 10E		
2-3	62 07S	to 91 10E	Icebergs.	Numerous large tabular bergs.
	62 10S	91 30E		
3	62 15S	91 30E	Bergs and growlers.	Very numerous.
3	62 45S	92 15E	Icebergs.	
4-6	62 45S	to 92 00E	Icebergs.	
	62 02S	93 07E		
8	62 00S	93 40E	Icebergs.	Numerous large tabular bergs.
9-11	62 01S	to 93 35E	Icebergs.	Numerous.
	61 50S	91 50E		
11-12	62 10S	to 92 00E	Icebergs.	Few.
	62 18S	91 35E		
12-15	62 22S	to 91 30E	Icebergs.	Numerous large bergs.
	62 28S	87 55E		
16-17	62 22S	to 88 10E	Icebergs.	Numerous.
	61 19S	85 40E		
17	62 20S	85 00E	Bergs and pack-ice.	Numerous bergs, pack-ice scattered.
19	60 12S	to 84 30E	Bergs, growlers, pack-ice.	Numerous.
	60 05S	80 34E		
20-21	60 05S	to 80 04E	Bergs.	Few.
	60 04S	71 40E		
24-28	60 00S	to 53 20E	Icebergs.	Occasional.
	59 38S	30 00E		
29-31	59 38S	to 28 04E	Icebergs.	Numerous.
	59 43S	7 14E		

Reported by S.S. *Southern Venturer*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
3	58 40S	28 15W	Pack-ice.	Vessel lying inside pack-ice.
3	58 22S	28 51W	Pack-ice.	Vessel steaming out of pack-ice.
5	58 14S	31 30W	Pack-ice.	Vessel lying in lee of pack.
5	58 06S	31 27W	Pack-ice.	Vessel lying in lee of pack.
6	59 04S	32 50W	Pack-ice.	Some shelter from distant ice-pack.
17-20	60 04S	to 36 16W	Pack-ice.	Some scattered pack to windward (SW wind).
	58 37S	37 00W		
23	59 57S	32 48W	Pack-ice.	Vessel approaching edge of pack.
27	61 19S	27 41W	Pack-ice.	Vessel lying in shelter of pack.
28	61 59S	23 54W	Pack-ice.	In lee of pack.

FEBRUARY

Reported by M.V. *Athelchief*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
9-10	49 00S	to 36 00W	Huge bergs and many growlers.	At 11.50 p.m. A.T.S. Dark clear night, wind WSW 4, a luminous patch on the starboard bow was observed. Vessel was turned to reverse course, and at 00.20 a.m. A.T.S. 10/2/48, stopped until daylight. Sea Temp. 43°F.
	50 20S	36 00W		
				At 3.50 a.m. A.T.S. (daylight) vessel resumed her course and about 4.30 a.m. commenced to pass numerous icebergs and growlers. Most of the bergs were of huge dimensions, flat-topped, and one end higher than the other. About 8 miles to starboard were seen what looked like ice islands and were no doubt several miles long.
				Noon. A.T.S. Vessel cleared the belt of icebergs which was about 80 miles deep, laying in an E and W direction. Sea Temp. through the ice, 38°F.

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
10	50 50S 51 20S	to 36 00W 36 00W	Large bergs and many growlers. Small bergs and growlers.	4.30 p.m. A.T.S. Vessel entered a second belt of bergs and growlers, more compact than the first belt, the vessel's course having to be altered frequently. 8.35 p.m. A.T.S. Vessel cleared the belt of bergs and was stopped until daylight. Sea Temp. between the two ice belts 41°F. and 38° in the second belt.
11				Several large bergs were passed during the day and at 8.50 p.m. vessel was stopped until daylight.
12				Vessel passed several large bergs until arrival off South Georgia. 7 a.m.
17				2.30 p.m. 17/2/48 vessel commenced voyage, steering 345° True and passed some small bergs during the afternoon. Vessel stopped during the night.
18				Vessel passed several bergs and growlers during the day. Vessel stopped during the night.
19	50 00S 49 00S	to 38 00W 38 05W		6.30 a.m. A.T.S. 19/2/48. Vessel commenced passing through belt of small bergs and growlers and passed the last berg at 1 p.m. Further ice was not seen north of 49° 00'S and vessel was put on direct course 006° True. Vessel passed about 80 miles west of outward course to South Georgia and nothing was seen of the belt of bergs between 51° 20'S and 50° 50'S.

Reported by S.S. *Ketos*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
4	62 13S	8 39W	Icebergs.	Number of large bergs. Average size estimated 3 miles by 1 mile by 100 ft.
6	62 53S	12 33W	Icebergs.	Number of average size bergs.
9	62 44S	15 15W	Icebergs.	Number of average size bergs.
9	62 55S	16 04W	Icebergs.	Number of average size bergs.
10	63 57S	17 53W	Icebergs.	Number of average size bergs.
12	63 30S	24 40W	Icebergs and pack-ice.	Many large bergs, also belt of very thick pack-ice. Very difficult to pass through. Impassable for small vessels.
16	61 12S	23 56W	Icebergs.	Number of average size bergs.
17	59 09S	24 00W	Icebergs.	Large berg estimated 5 miles by 3 miles by 150 ft., flat top.
18	56 58S	23 38W	Icebergs.	Number of small bergs.
18	55 28S	23 38W	Icebergs.	Number of small bergs.
19	54 40S	23 38W	Icebergs.	Large number of small bergs.
19	52 15S	24 45W	Iceberg.	Average size berg. The last to be sighted.

Reported by S.S. *Saluta*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
3-5	59 20S 58 09S	to 00 15E 11 00W	Bergs and growlers.	Occasional.
6	58 07S 57 04S	to 12 10W 15 30W	Bergs and bergy bits.	Numerous.
7-8	56 50S 56 20S	to 16 55W 19 00W	Icebergs.	Occasional.
8-10	56 18S 55 04S	to 20 25W 28 27W	Glacier bergs.	Numerous.
10-11	54 56S 54 26S	to 30 08W 32 54W	Tabular bergs.	Numerous.

Reported by S.S. *Southern Venturer*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
6-9	61 32S to 61 20S	37 46W } 36 25W }	Pack-ice.	Vessel lying inside strips of pack-ice.
16	61 06S	39 37W	Pack-ice.	Some scattered pack to windward.
17	62 02S	40 00W	Pack-ice.	Some scattered pack to windward.
18	62 05S	39 18W	Pack-ice.	Vessel in lee of large pack-ice.
18	61 34S	39 50W	Pack-ice.	Vessel working through ice-pack.
18	61 11S	39 50W	Pack-ice.	Vessel outside ice-pack.
19	61 05S	40 20W	Pack-ice.	Steaming along edge of ice-pack trending NW-SE with numerous shallow bays.
19	61 03S	40 10W	Pack-ice.	In lee of ice-pack.
21	62 15S	43 35W	Pack-ice.	In lee of ice-pack.
23	62 00S	45 53W	Pack-ice.	Large ice-pack to southward.
24	61 56S	46 06W	Pack-ice.	Several ice strips in vicinity. Blink from large pack to southward.
25	62 01S	46 28W	Pack-ice.	Bay of pack 10 miles distant.
26	62 20S	46 12W	Pack-ice.	Some shelter from pack-ice.

MARCH

Reported by S.S. *Southern Venturer*

DATE	POSITION		DESCRIPTION	REMARKS
	LATITUDE	LONGITUDE		
2	62 43S	44 20W	Pack-ice.	Vessel to lee of ice-pack.
3	63 00S	43 45W	Pack-ice.	From NE to NW through S.
4	62 59S	43 20W	Slab-ice.	Large amounts.
7	63 00S	43 28W	Pack-ice.	Vessel in lee of ice-pack.
9-10	61 58S to 61 51S	46 16W } 45 20W }	Pack-ice.	Vessel in lee of ice-pack with strips of pack around.
14	62 14S	44 30W	New ice.	Forming on sea.
15	62 00S	45 28W	Pack-ice.	Drifting through ice-pack.
15-18	61 56S to 61 20S	45 50W } 45 14W }	Heavy pack-ice.	In lee of heavy ice-pack.
25	62 24S	44 34W	Pack-ice.	Scattered pack all round.

Reports of ice for January, February and Month previous to 1949 will be found in the *Marine Observer*, Vol. xix, No. 143, page 16.

RADAR IN OCEAN WEATHER SHIPS (continued from page 44)

been detected up to seventy-five miles, and at close ranges a good picture is painted with a fair degree of accuracy.

When relieving on station the rendezvous is usually made by radar, which has the advantage over homing by direction-finder, as both bearing and distance is indicated. Homing by D/F alone in bad visibility would involve risk of collision and is not favoured, but is useful to combine with radar for identification purposes.

Storm Detection

The fact that radar responds to precipitation has its nuisance value, particularly when attempting to "fix" an aircraft, but it can also be extremely useful for short-range forecasting. Synoptic forecasting in the North Atlantic is limited in detail, because of the relatively small number of observations available in the 3,000,000 square miles of ocean, but the detail can be extremely important to aircraft, particularly the location of fronts and the presence of thunderstorms. There is no difficulty in distinguishing echoes due to precipitation, as they are much larger and not so clearly defined as echoes from solid targets, and their shape and size may change rapidly. The range at which precipitation can be detected depends on the power of the set, and the intensity and height of the precipitation, but under favourable conditions high-level precipitation may be detected up to ranges of 150 miles.

The 10 cm. wavelength on which Type 277 Naval radar operates is ideal for long-range detection, but does not give the best detail. As general-purpose sets, however, they have proved satisfactory, and the navigational services they perform have undoubtedly contributed materially towards the safe and economic operation of transoceanic aircraft.

PERSONNEL

RETIREMENT.—CAPTAIN W. G. HIGGS, O.B.E. Commodore of the Port Line, retired from that company's service in August, 1949, on the completion of the first voyage of the new ship *Port Brisbane*.



William Gordon Higgs, a native of Norwich, made his first voyage to sea in 1902 at the age of 16, when he joined the full-rigged ship *Celtic Monarch*, owned by Hughes, Jones & Co. Ltd., of Liverpool. He completed his four years time in this ship and was Third Mate of her until 1906, when he obtained his Second Mate's certificate and joined another full-rigged ship, the *Bay of Biscay*, as Second Mate. In September, 1907, he joined the Tyser Line (later amalgamated with others into the Commonwealth and Dominion Line, now the Port Line), and after promotion through the usual ranks was given his first command, the *Port Macquarrie*, in 1919. He subsequently commanded the *Port Stephens*, *Port Pirie*, *Port Sydney*, *Port Hunter*, *Port Gisborne* (for 8½ years), *Port Chalmers*, *Port Jackson*, *Port Victor*, *Empire Treasure*, *Port Caroline*, *Port Wellington* and finally *Port Brisbane*.

Captain Higgs was awarded the O.B.E. for his work in one of the Malta convoys in July, 1941. His ship, the *Port Victor*, was torpedoed and lost in April, 1943.

His association with the Meteorological Office dates from 1910, excellent logs having been returned from his ships throughout most of that period. In recognition of this, he was in 1948, together with three other captains, presented with a suitably inscribed barograph by the Director of the Meteorological Office.

Before sailing on his last voyage Commodore Higgs had the great honour of a visit to his ship by Her Majesty the Queen.

We wish him all happiness in his retirement.

C. H. W.

FLEET LIST (Great Britain)

VOLUNTARY OBSERVING SHIPS

The following is a list of British ships, voluntarily co-operating with the Marine Branch of the Meteorological Office.
 The names of the Captains, Observing Officers, and Senior Radio Officers are given as ascertained from the last written return received. The date of receipt of the last return received is given in the last column.
 All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent.
 The Port Meteorological Officers and Merchant Navy Agents at the ports will make personal calls on the Captains and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired. (See under Notices to Marine Observers.)
 Excellent awards are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published in a special list in the *Marine Observer*.
 It is requested that prior notification of changes of service, probable periods of lay up, transfer of Captains, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to the appropriate Port Meteorological Officer or Merchant Navy Agent.
 Captains are requested to point out any errors or omissions which may occur in the list.

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Accra</i>	GJSW	A. Smith	J. R. Smith, L. Austin, C. Morrison, T. A. Holson	J. A. Stuart	Elder Dempster Lines, Ltd.	18.1.49
<i>Afghanistan</i>	GNVB	W. A. Chappell	R. L. Cain, J. Linton, K. J. Evans	T. D. Sullivan	F. C. Strick & Co., Ltd.	3.1.49
<i>Ajax</i>	GJXM	W. T. Spencer	E. B. Bertelsen, C. M. Best, A. S. Curry	C. Calvey	A. Holt & Co.	20.5.49
<i>Akaroa</i>	GMPL	J. Steele	P. S. Yeoman, R. Munro, T. de M. Ogier	J. W. Soulsby	Shaw, Savill & Albion Co., Ltd.	22.3.49
<i>Alcantara</i>	GLQR	B. K. Berry, R.D., R.N.R.	M. Sherwood, P. Driver, — Larrive	R. E. Hammond	Royal Mail Lines, Ltd.	..
<i>Alcyone Fortune</i>	MAQC	T. Bowen-Rees	J. A. Leech	..	..	..
<i>Amatrua</i>	GYDD	M. A. Neeves	D. G. Roberts, C. Eastwood, D. Martin	P. Coghlan	Anglo-Saxon Petroleum Co., Ltd.	8.3.49
<i>Amersham</i>	GNTQ	A. Spence	G. Halliday, E. T. Ward, W. Gray	J. Paullley	Thompson S.S. Co., Ltd.	12.8.49
<i>Andes</i>	GQCV	D. A. Casey, C.B.E., D.S.O., D.S.C., R.D., Cmde., R.N.R.	W. B. Avison, F. M. Dickenson, D. Keefe, E. O'Keefe	W. Smith	Royal Mail Lines, Ltd.	30.9.49
<i>Apapa</i>	MACE	I. J. Smith	J. Jackson, F. P. Garbutt, T. A. Nicholson	R. F. Barrett	Elder Dempster Lines, Ltd.	24.2.49
<i>Aquitania</i>	GLRZ	R. B. G. Woollatt, R.D., R.N.R.	E. E. Willis, J. Springall, — Hunt	M. Doyle	Cunard White Star, Ltd.	28.10.48
<i>Arabia</i>	GLKF	G. H. Morris	D. H. Shinnun, R. Jones	B. H. Long	Cunard White Star, Ltd.	6.1.49
<i>Arabistan</i>	GCKK	J. H. Metcalfe	R. W. Ruddock, R. P. Aske, J. Curtis	A. Hitchen	F. C. Strick & Co., Ltd.	10.3.49
<i>Araby</i>	GMZL	C. E. Mason	K. M. Cutler, P. J. Robinson, W. Mortimer	P. Corbishley	Royal Mail Lines, Ltd.	24.5.49
<i>Arakaka</i>	GDVN	J. A. Carter	D. Douglas-Kerr, C. Nolan, H. Adler	J. A. Davis	Booker Bros., McConnell & Co., Ltd.	5.8.49
<i>Argentina Star</i>	GTKF	D. R. Macfarlane, D.S.O., O.B.E.	K. White, D. G. Hastie, J. Reeve	C. Hastie	Blue Star Line, Ltd.	7.9.48
<i>Argyll</i>	GBWB	J. Dodds	A. Fielding, T. R. Rowe, V. J. Johnsen	J. Downey	B. J. Sutherland & Co., Ltd.	7.6.49
<i>Arguani</i>	GMBL	G. Gracie	R. D. Phillpotts, J. A. Cruickshanks, A. C. P. Brading	A. N. Taylor	Elders & Fyffes, Ltd.	4.1.49
<i>Artisan</i>	MAFK	H. Coates	C. A. V. Dalyn, J. Cubbin, P. O. Donnell, N. Acon	A. O'Connor	T. & J. Harrison	20.4.49

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Asahia</i>	GKNJ	J. Chapman, R.D., R.N.R.	G. H. Griffiths, G. H. Drinkwater, J. B. Clennison	M. A. Kempe	Cunard White Star, Ltd.	17. 4. 47
<i>Ashburton</i>	GNJN	F. W. Mould	C. F. Woodcock, D. A. Keats, J. Browne	J. S. Buchanan	Trinder Anderson & Co.	..
<i>Asia</i>	GLIV	J. L. Crossdale	C. A. Roy, D. S. Lomax, D. J. Steff	W. J. Rainey	Cunard White Star, Ltd.	18. 3. 48
<i>Asturias</i>	GLQS	G. A. Barnister	F. Williams, —, Chitral, P. Sykes	— Hunt	Royal Mail Lines, Ltd.	..
<i>Athelchief</i>	GCRG	A. W. Pegg	J. P. Coffey, J. W. Carruthers, T. C. Bennett, R. V. Parhiss, N. Jones, A. Green	W. Bradbury	Tankers, Ltd.	27. 6. 49
<i>Athelregent</i>	GQWL	C. Ray	D. Waite, A. Sugden, E. Peers, C. J. E. Mayers	G. H. McClelland	Athel Line, Ltd.	24. 2. 49
<i>Athenic</i>	GBLS	D. Aitchison	J. N. Carroll, J. W. Webster, J. W. Wood, J. R. F. Abbey	D. Haggart	Shaw, Savill & Albion Co., Ltd.	28. 9. 49
<i>Athlone Castle</i>	GYTK	R. Wren, D.S.O.	W. B. Fletcher, J. Toogood, M. W. Williams, R. C. Neal	J. H. Summers	Union Castle Mail S.S. Co., Ltd.	27. 6. 49
<i>Atlantis</i>	GLTM	A. R. Osberine	R. Phillips, M. Bialowski, G. Dudley, B. Baxter	H. Matthews	Royal Mail Lines, Ltd.	3. 8. 49
<i>Auricula</i>	GKPV	H. Sangster	C. K. Powell, C. Close, G. Blackwood	J. Casey	Anglo-Saxon Petroleum Co., Ltd.	20. 8. 49
<i>Australia Star</i>	GYCS	G. M. Duff, G.M.	J. Stevenson, J. B. McCowan, R. Mattingley	H. J. Griffiths	Blue Star Line, Ltd.	12. 8. 48
<i>Australind</i>	GJKF	J. F. Wood	J. Mitchell, W. Sturrock, G. L. Fraser	P. E. Goggin	Trinder Anderson & Co.	26. 4. 49
<i>Avondane</i>	MAWG	F. A. C. Thacker	E. E. R. Roberts, R. E. G. Simmons, —, Davies	C. James	Dene Shipping Co., Ltd.	4. 1. 49
<i>Balantia</i>	GBNM	G. E. Thomas	T. Burke, G. Dunn, R. Rutherford	J. Spicer	Royal Mail Lines, Ltd.	..
<i>Baltara</i>	GTXM	E. Bursby	J. H. Jones, T. L. Harcus	J. Freel	United Baltic Corporation, Ltd.	4. 1. 49
<i>Bariff Park</i>	GPYZ	T. Forrest	R. Pollock, J. Baxter, R. Gunn	W. Maclaren	Ohlson S.S. Co., Ltd.	27. 5. 47
<i>Barjama</i>	MNCS	A. Campbell	J. Lungley, —, Knight, P. T. Dennison	G. Shilson	Barline Transports, Ltd.	23. 2. 49
<i>Baron Macleay</i>	GKXW	J. Pearson	F. Smith, J. Peck, J. B. Harbord	A. Garden	H. Hogarth & Sons	28. 9. 49
<i>Baron Yarborough</i>	GNJD	E. Pugh, O.B.E.	J. W. Gardener, D. Dickson, M. King	T. Ainsworth	Runciman (London), Ltd.	12. 1. 49
<i>Basterville</i>	GPVF	D. B. Ramsbottom, D.S.C.	S. Fieldhouse, T. F. Hercus, A. Aikman	J. A. McAskill	Ellerman's Wilson Line, Ltd.	28. 9. 49
<i>Bassano</i>	GNXK	G. Grist	P. F. Williams, R. D. P. Gillett, R. A. Jones	L. Norton	Watts, Watts & Co., Ltd.	14. 1. 49
<i>Beaconsfield</i>	GNNQ	J. B. Smith, O.B.E.	R. W. Savage, W. Williams, G. Lawson	W. Peingdestre	Canadian Pacific S.S. Ltd.	26. 1. 49
<i>Beaverburn</i>	MAGB	C. E. Duggan, R.D., R.N.R.	E. R. Connerton, E. R. Shaw, D. Wallace	R. Burch	Canadian Pacific S.S. Ltd.	5. 1. 49
<i>Beavercove</i>	GNLX	S. W. Keay, O.B.E.	L. Kirns, D. Bryce, J. Mackay, R. A. Jones	A. P. Humphries	Canadian Pacific S.S. Ltd.	11. 1. 49
<i>Beaverdall</i>	GBBS	R. A. Leicester, O.B.E.	G. W. Bateman, G. Palmer, J. Waling	J. Brennan	Canadian Pacific S.S. Ltd.	11. 1. 49
<i>Beaverford</i>	MOIG	J. Soame	J. W. Gardiner, E. Peirce, J. L. Kirby	R. Dixon	Watts, Watts & Co., Ltd.	21. 9. 48
<i>Beaverglen</i>	GBCP	R. D. de H. Bell, D.S.C., R.D., Capt., R.N.R.	A. King, A. Addison, J. Amos	B. J. Kemp	W. Thomson & Co.	7. 12. 48
<i>Beaverlake</i>	GBCQ	D. G. Martin	R. Winn	B. J. Saltwell	W. Thomson & Co.	12. 8. 49
<i>Beckenham</i>	GCGK	D. S. Sinclair	R. M. Drummond, T. P. Barr, J. Scott	I. M. Fraser	W. Thomson & Co.	20. 9. 49
<i>Benarty</i>	GZZZ	A. P. Paterson	L. C. Finn, R. M. Snowie, N. Mackie	J. L. Wells	W. Thomson & Co.	6. 8. 48
<i>Bendoran</i>	MYSF	J. B. Hastie	W. O. Atkinson, J. Clements, I. Bruce, A. J. King	R. G. Thomson	W. Thomson & Co.	13. 5. 49
<i>Benedi</i>	GDBJ	W. C. Wilson	E. N. Stone, G. Speirs, G. K. Harrison	..	W. Thomson & Co.	12. 10. 49
<i>Benrooch</i>	GDJT	K. Hardie	E. F. Cole, C. H. Long	..	W. Thomson & Co.	26. 1. 49
<i>Benrachie</i>	GBTZ	J. R. Faulkner	..	..	West Dock Steam Fishing Co., Ltd.	9. 3. 49
<i>Benwayis</i>	MYPW	G. Clixby	..	..	United Whalers, Ltd.	..
<i>Bibury</i>	GIFC	F. A. Gjertsen	..	..	Blue Star Line, Ltd.	12. 1. 49
<i>Boynston Wyke</i>	GBZV	G. Duff, G.M.	..	..	..	..
<i>Bransfield</i>	GDRK	..	..	..	..	..
<i>Brasil Star</i>	GTLF	..	..	..	..	..

<i>Bravo</i>	..	GLDZ	E. Tyler ..	..	C. Everingham, J. McAndrew, J. H. Spandler	F. E. Smith ..	Ellerman's Wilson Line, Ltd.	..
<i>Brisbane Star</i>	..	GZCJ	S. Foulkes	..	R. H. Stark, M. R. Bremberg, G. Munro, H. Maddocks	D. J. Eastwood	Blue Star Line, Ltd.	19.5.48
<i>Britannic</i>	..	GDXF	C. I. Thompson	..	M. J. Dodds, R. McDougall, J. Rawlinson	.. Kidson ..	Cunard White Star, Ltd.	4.9.48
<i>British Colonel</i>	..	GFDB	E. L. Miller	..	W. S. Jaegar ..	R. A. MacLeod	British Tanker Co., Ltd.	16.4.47
<i>British Endeavour</i>	..	GFCN	J. E. Stead	..	J. Irvine ..	..	British Tanker Co., Ltd.	..
<i>British Endurance</i>	..	MLZM	W. Watkin-Thomas, O.B.E., D.S.C.	..	A. D. Millar, S. H. Falconer, P. C. Coyne	A. E. Adams	British Tanker Co., Ltd.	29.12.47
<i>British Energy</i>	..	GLBK	I. G. Hill ..	..	D. Mackay, D. MacKinnon, N. J. Price	O. G. Winship	British Tanker Co., Ltd.	27.6.49
<i>British Escort</i>	..	GCRB	H. G. Jeary ..	..	J. A. G. Millar, R. Weston, I. McKay	A. Murray ..	British Tanker Co., Ltd.	15.6.49
<i>British Lancer</i>	..	MAGS	F. S. Hall ..	..	K. W. Nicholls, E. G. Freeman, C. G. Cowdry, C. Onslow	C. R. A. Ball	British Tanker Co., Ltd.	20.9.49
<i>British Marquis</i>	..	GWVL	G. W. Kemp	..	E. L. Mitchinson, S. E. Banyard, G. Lawrence	H. Davies ..	British Tanker Co., Ltd.	26.4.49
<i>British Patience</i>	..	GUFF	H. J. Pope	..	J. H. Picken, S. B. Wade, P. Budge, C. Herbert	R. Stevenson	British Tanker Co., Ltd.	25.8.49
<i>British Pilot</i>	..	GCQT	J. H. Nelson	..	L. McRitchie, T. McDonald, W. Charsville	L. Bulmer ..	British Tanker Co., Ltd.	12.9.49
<i>British Piper</i>	..	GDNN	J. P. M. Samson	..	A. F. Bowan, B. H. Moore, D. J. Woodfield	M. A. H. Kenneison	British Tanker Co., Ltd.	13.7.49
<i>British Power</i>	..	GZGG	K. M. Mitchell	..	A. Fraser, P. F. Mason, E. C. Ford	F. G. Rummington	British Tanker Co., Ltd.	15.10.48
<i>British Prestige</i>	..	GMBF	J. H. Wilson	..	J. A. Macleod, T. Horne, G. A. Gee	E. Guller ..	British Tanker Co., Ltd.	24.2.49
<i>British Resolution</i>	..	GZPF	J. Bolger ..	..	T. Giffard, D. Battel ..	K. Morris ..	British Tanker Co., Ltd.	2.10.47
<i>British Resource</i>	..	GFCD	J. C. Lee	..	R. Maybourn	W. I. Briggs	British Tanker Co., Ltd.	28.9.49
<i>British Respect</i>	..	MAGU	J. C. W. G. Stook	..	B. Halvorsen, T. J. Taylor, A. C. Robinson	G. Mitchell ..	British Tanker Co., Ltd.	23.2.49
<i>British Statesman</i>	..	GINR	W. G. Philpin	..	I. Fox, J. Kavanagh, A. N. Brook	N. W. Hodgson	Royal Mail Lines, Ltd.	13.5.49
<i>British Swagfish</i>	..	GQOV	H. A. Wright	..	F. W. Gant, J. H. Looker	..	Walter Runciman & Co., Ltd.	..
<i>Brittany</i>	..	GMZS	D. J. Jones	..	L. A. Savers, Lt.-Cdr. W. T. Pitcher, B. E. Cole	T. J. Kelly ..	Lampport & Holt Line, Ltd.	18.9.48
<i>Brackley Moor</i>	..	GDWP	J. Whayman, D.S.C. and bar, R.D., R.N.R.	..	F. Gribben, J. Roberts, R. Garcia	T. Scambler	Henriksen & Co., Ltd.	7.3.49
<i>Bronte</i>	..	GSKW	E. Drinkall	..	C. Sutherland, C. Percy, J. Holland	W. P. Greaves	Lampport & Holt Line, Ltd.	10.10.49
<i>Brontes</i>	..	GWPS	I. G. Foster	..	J. Hogg, W. Errington, J. Baxter, R. Campbell	E. Johnston	Cairns, Noble & Co.	12.10.49
<i>Byron</i>	..	GNFL	N. E. Forth	..	J. W. Outhbertson, T. D. Ridley	R. Young ..	Cairns, Noble & Co.	16.12.48
<i>Carnarvon</i>	..	GCKR	J. H. Brown	..	T. L. Langlands, J. W. L. Garrie, C. Milne	S. J. D. Taylor	Anchor Line, Ltd.	19.1.49
<i>Cairnesh</i>	..	GDDY	G. Stable ..	..	G. S. Gordon-Christian, J. M. Donkin, C. E. R. Waller	J. R. C. Johnson	P. & O. Steam Navigation Co.	14.12.48
<i>Cairngalona</i>	..	GOKM	W. J. Jonsen	..	R. N. Dixon	R. N. Dixon	Hudson Bros. Trawlers, Ltd.	13.2.47
<i>Caledonia</i>	..	GZFY	H. S. Tedd	..	D. E. Cornack, G. O. Lambert, I. Thomson	S. Gracie	Lyle Shipping Co., Ltd.	14.6.48
<i>Canton</i>	..	GCZS	W. D. Roach	..	D. Jones, —, Taylor, R. Kelso	J. Gilbert	Union-Castle Mail S.S. Co., Ltd.	20.4.49
<i>Cape Mariato</i>	..	GKGM	W. D. Roach	..	A. Dodd, W. A. Morris, A. A. Abdullah	H. Butler	J. Marr & Son, Ltd.	20.4.49
<i>Cape York</i>	..	GRRV	K. Wardale	..	I. C. Borland, P. F. Drake, R. Ibbertson, J. A. Matthews	J. Park ..	R. Chapman & Son	..
<i>Capetown Castle</i>	..	GIFE	D. W. Sorrell	..	D. Parsons, P. J. Passmore, D. T. Bolas	J. Parsons	Cunard White Star, Ltd.	4.1.49
<i>Caradonia</i>	..	GYKS	S. H. French	..	T. C. Crane, C. D. Abbott, N. Knott	W. H. Chick	Runciman (London), Ltd.	21.1.49
<i>Carthage</i>	..	GRNX	J. M. Cherry	..	F. Hamilton, R. Crawford, J. G. Wilson	A. E. Morton	Elders & Fyffes, Ltd.	19.1.49
<i>Caslon</i>	..	MCJR	S. A. Sapsworth	..	E. C. Muir ..	A. Austin ..	Runciman (London), Ltd.	19.3.48
<i>Cavina</i>	..	GKFW	R. E. Richardson	..	..	..	Raeburn & Verel, Ltd.	..
<i>Caxton</i>	..	GCDX	R. L. Barr ..	..	..	..	..	..
<i>Celtic Monarch</i>	..	GSRF	..	..	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Ceramic</i> ..	GFLM	A. V. Richardson ..	P. Goodson, A. H. N. Pugh, H. M. Hignett	H. Littlecot ..	Shaw, Savill & Albion Co., Ltd.	24.9.49
<i>Cernifus</i> ..	GCRM	J. F. Auld ..	W. Slater, B. P. Payling ..	M. Ward ..	Houlder Bros. & Co., Ltd.	6.1.49
<i>Cheshire</i> ..	GLXV	P. H. Potter ..	D. Hine ..		Bibby Bros. & Co.	
<i>Chinese Prince</i> ..	GDJC	F. S. Thornton, O.B.E.	M. Musson, H. Jennings, H. Bragg, C. Farmer, M. Howell ..	T. Bailey ..	Prince Line, Ltd.	25.7.49
<i>Chitral</i> ..	GLKN	D. G. H. O. Baillie ..	D. Parsons, I. Newlands, — Stephenson, B. B. Jones ..	A. R. Porter ..	P. & O. Steam Nav. Co. ..	15.9.47
<i>Chupra</i> ..	GDZV	J. D. Woods ..	R. W. Allerton, H. S. F. Strawbridge, W. L. Hillcoat ..	R. C. Whiting ..	British India Steam Nav. Co. Ltd.	13.10.48
<i>Cilicia</i> ..	GDGL	R. Blake ..	D. McDiarmid, R. Ballantyne, A. Mac-Kendrick ..	J. Malcolm ..	Anchor Line, Ltd.	10.10.49
<i>City of Barcelona</i> ..	GTKR	E. M. Jenkins ..	A. M. Bowman, R. J. Binnie, E. V. Williams, P. Seiffert ..	J. O'Brian ..	Ellerman Lines, Ltd.	5.1.49
<i>City of Bristol</i> ..	GCPN	E. Garner ..	W. E. James, N. A. C. Smith, R. A. Reid, V. Y. Dymock ..	K. P. Grocock ..	Ellerman Lines, Ltd.	17.5.49
<i>City of Calcutta</i> ..	GLYX	H. A. Hazeel ..	D. J. Ingalls, I. McDermid, N. Dalziel, A. J. Bickerton ..	T. H. Murray ..	Ellerman Lines, Ltd.	12.7.49
<i>City of Capetown</i> ..	GBBQ	W. S. Coughlan, O.B.E.	W. E. Fletcher, P. Redhead, A. Ramsden	D. S. Crombie ..	Ellerman Lines, Ltd.	15.8.49
<i>City of Carlisle</i> ..	GBJK	L. E. Smith, M.B.E.	J. Irvin, W. Taggart, B. Pickering ..	P. I. McKean ..	Ellerman Lines, Ltd.	19.12.47
<i>City of Chester</i> ..	MAHN	W. A. Rogerson, O.B.E.	R. Frame, S. D. Kirk, P. J. Thomas ..	C. Haggerty ..	Ellerman Lines, Ltd.	12.8.49
<i>City of Delhi</i> ..	GLBW	A. M. Hamilton ..	G. Stewart, J. Wharry, J. Porter ..	A. E. Adams ..	Ellerman Lines, Ltd.	25.2.49
<i>City of Derby</i> ..	GFWC	W. A. Hannah ..	R. Tyrrell, J. Twomey, R. Huntingdon ..	R. Macdonald ..	Ellerman Lines, Ltd.	30.8.49
<i>City of Dreppa</i> ..	GSVQ	H. S. Field ..	A. J. Tyrrell, J. Hughes, H. G. M. Lloyd ..	R. M. Jones ..	Ellerman Lines, Ltd.	1.7.49
<i>City of Dundee</i> ..	GDPY	F. M. Womersley ..	R. Jones, J. A. Wheldon, L. G. Powell ..	H. M. O'Gorman ..	Ellerman Lines, Ltd.	26.1.49
<i>City of Durham</i> ..	GBJM	T. H. Speakman ..	D. S. Taylor ..	W. B. Noonan ..	Ellerman Lines, Ltd.	21.3.49
<i>City of Evansville</i> ..	GJNF	F. W. Woods ..	A. Fry, J. Tattersall, J. Checkley ..	I. Ellison ..	Ellerman Lines, Ltd.	11.11.48
<i>City of Exeter</i> ..	GQZW	R. P. Longstaff, D.S.C.	T. Lovell, J. W. Terris, H. McL. Farquhar ..	G. S. Creighton ..	Ellerman Lines, Ltd.	20.9.49
<i>City of Hereford</i> ..	GMXC	G. A. Ring ..	T. Rigg, J. F. Mason ..	S. C. Ombler ..	Ellerman Lines, Ltd.	25.1.49
<i>City of Johannesburg</i> ..	GBKW	A. G. Freeman ..	H. Routledge, H. Lewis, C. Craddock ..	A. R. Henderson ..	Ellerman Lines, Ltd.	4.1.49
<i>City of Khartoum</i> ..	GBZC	I. A. Beynon ..	D. L. Cox, W. Folder, D. A. Appleton ..	J. Dolan ..	Ellerman Lines, Ltd.	5.11.48
<i>City of Lille</i> ..	GSLN	E. Scrymeour ..	R. B. May, H. M. Steele, G. S. Garner ..	A. Julius ..	Ellerman Lines, Ltd.	12.2.49
<i>City of Lyons</i> ..	GMCN	H. Johnson ..	A. R. Horam, R. Clark, J. Morrison ..	W. Anderson ..	Ellerman Lines, Ltd.	29.3.49
<i>City of Paris</i> ..	GFQM	H. Percival, O.B.E., R.D., Cdr. R.N.R.	G. G. Francis, M. A. Perry, R. N. Caldwell ..	W. Rouffinac ..	Ellerman Lines, Ltd.	24.2.49
<i>City of Pretoria</i> ..	GBLN	R. F. Jefferies ..	R. Bushell, F. Braddick, W. Taggart, E. Ridge ..	J. Booth ..	Ellerman Lines, Ltd.	
<i>City of Swansea</i> ..	GBZT	G. Vickers ..	T. C. Dickinson, P. Seiffert, K. Haslam ..	W. Lupton ..	Ellerman Lines, Ltd.	25.5.48
<i>City of Sydney</i> ..	GSFM	J. B. MacLaren ..	B. Walker, J. Blanch, E. E. Cooper ..	H. D. Smythe ..	Ellerman Lines, Ltd.	24.8.49
<i>City of Tokio</i> ..	GFMW	R. L. Stewart ..	E. Bonfield, R. H. Bellhouse, E. Redshaw ..	—, McTigue ..	Ellerman Lines, Ltd.	
<i>City of Windsor</i> ..	GJVR	W. S. Doidge ..	T. Rigg, M. Graham, E. F. Brick ..	A. C. Macaulay ..	Ellerman Lines, Ltd.	5.11.48
<i>Clan Brodie</i> ..	GKPD	B. Vernon-Browne ..	W. Kendal, S. F. Nicholson, E. J. E. Owen ..	W. M. Morrison ..	Cayzer Irvine & Co., Ltd.	4.1.49
<i>Clan Buchanan</i> ..	GKNM	T. W. Inman, O.B.E.	J. H. Wright, F. King, L. G. Woolger ..	W. Harper ..	Cayzer Irvine & Co., Ltd.	11.2.49
<i>Clan Campbell</i> ..	GDZK	J. A. Forster ..	D. S. Tosh, E. M. Crawley, J. Beynon, J. Hay ..	R. F. Cole ..	Cayzer Irvine & Co., Ltd.	4.1.49
<i>Clan Chaitan</i> ..	GFBX	H. C. Simpson, O.B.E.	F. Turton, J. W. Ward, D. R. Godfrey ..	J. Shillabeer ..	Cayzer Irvine & Co., Ltd.	5.3.49
<i>Clan Chisholm</i> ..	GFBY	C. Crellin ..	R. S. Russell, A. G. Allison ..	J. A. Gray ..	Cayzer Irvine & Co., Ltd.	26.4.49
<i>Clan Davidson</i> ..	MAWU	H. J. Anchor, O.B.E., R.D., R.N.R.				

Clan Forbes ..	GPGB	H. S. Pengelly	F. C. Doyle, A. T. Campbell, C. J. Abbott	W. H. Saville	Cayzer, Irvine & Co., Ltd.	4.1.49
Clan Macaulay ..	GZCS	A. G. Storkey	T. R. Halliday, M. P. R. Turner, D. S. Clark	J. Ormerod ..	Cayzer, Irvine & Co., Ltd.	12.7.49
Clan Mac Donald ..	GCPG	H. Cater ..	J. P. Dunphy, F. Lionnet, D. Milner ..	G. Martyn ..	Cayzer, Irvine & Co., Ltd.	7.12.48
Clan MacDougall ..	GFBQ	P. McMillan	G. Bagnall, J. C. Montgomery, R. C. Pearce	C. E. C. Crew	Cayzer, Irvine & Co., Ltd.	5.11.48
Clan McLaren ..	GSSC	E. H. O. Stone	T. O. Marr, J. A. Baxter, D. Richards ..	R. W. Moore	Cayzer, Irvine & Co., Ltd.	11.10.49
Clan Macnair ..	GFNK	E. W. Jenkin	L. W. Gibbins, A. Graham, P. L. Leslie ..	R. Dingley ..	Cayzer, Irvine & Co., Ltd.	4.1.49
Clan Macneil ..	GFWP	T. N. Soane	J. S. Catterall, J. L. Easton, G. H. Lewis	J. Lamb ..	Cayzer, Irvine & Co., Ltd.	5.5.49
Clan Macrae ..	MAHP	T. W. Ellis, O.B.E.	J. D. W. Chapple, R. E. Heywood, J. Nichols	W. Bryce ..	Cayzer, Irvine & Co., Ltd.	7.3.49
Clan Macreish ..	GUBB	R. P. Galer, C.B.E., R.D., R.N.R.	W. Graham, M. N. Ure, T. N. Geesin	A. F. MacIntyre	Cayzer, Irvine & Co., Ltd.	8.3.49
Clan Urquhart ..	GFBB	C. C. Parfitt	G. Radcliffe, I. Isaak, A. Pringle	R. R. Bromham	Cayzer, Irvine & Co., Ltd.	..
Clearpool ..	MAHQ	J. Whamond	G. A. Gregory, A. R. Howson, E. A. D. Vargas	A. G. Roberts	Andrew Weir & Co., Ltd.	25.2.49
Chydebank ..	GKLM	J. W. Greig	P. B. Goudie, J. C. Wheeler	J. Layton ..	Hunting & Son, Ltd.	28.7.49
Clydefield ..	GSNK	A. S. Reid	L. Teestier, A. G. Smith, B. Edginton	J. Lovelock ..	Blue Star Line, Ltd.	16.7.48
Columbia Star ..	GQGT	C. J. W. Jones	J. Bean, L. Broadbent, A. Waring	J. Pye	T. & J. Harrison ..	13.10.48
Comelham ..	GFTJ	H. T. Wells	A. J. Whiston, A. Brown, E. J. Stoddart	R. Holding ..	Andrew Weir & Co., Ltd.	1.6.49
Comelshank ..	GKLI	I. Robertson	R. Tinnmouth, S. Edginton, D. Parkin	J. Bishop	Furness-Houlder Argentine Lines, Ltd.	6.9.49
Condesa ..	MAHU	H. Heal ..	C. Everingham, H. Riley, A. D. Hutchinson, N. Blitch ..	J. R. Eastwood	Ellerman's Wilson Line, Ltd.	12.10.49
Consuelo ..	GCGQ	H. Greenhill	B. E. Mahy, J. W. Woodbridge ..	B. O. Baxter	Shaw, Savill & Albion Co., Ltd.	30.9.49
Corfu ..	GRNW	C. S. Parker	R. Allan, C. Martin, R. Aitken, I. H. Stark	J. Couchman	Donaldson Bros. & Black, Ltd.	13.7.49
Corinthiac ..	GZYL	G. M. Robertson, D.S.C.	W. F. Kelly, T. F. Tuomey, J. Ridley ..	R. Andrews	Lambert Bros., Ltd.	16.12.48
Corrientes ..	GFPT	W. Anderson	T. W. Kent, G. Cubbin, C. J. Hurrenshaw	R. J. Francis	T. & J. Harrison	6.9.49
Coulsburn ..	MAHZ	G. Robinson	T. W. D. John, P. H. Banks, A. M. Robson	G. Lowe ..	Federal Steam Nav. Co., Ltd.	..
Craftsman ..	GPZT	W. F. O'Neill	W. Tressider, V. A. Sutton, J. C. Derby ..	A. Broadbent	Sir William Reardon Smith & Sons, Ltd.	3.8.49
Cumberland ..	GPPY	H. E. Reilly, D.S.C., R.D., R.N.R.	G. T. Clarke, R. Clarke, D. C. Broome, A. H. Pickles	A. A. Macpherson	Royal Mail Lines, Ltd.	24.2.49
Dallas City ..	GCLS	D. W. Butcher	K. Maguire, P. Leighton, D. Simpson	J. Stowers ..	Andrew Weir & Co., Ltd.	28.3.49
Darro ..	MAID	W. H. Grimshaw	B. M. Metcalfe, L. J. Roberts, C. T. Skrastin	J. Care ..	Lampport & Holt Line, Ltd.	30.8.49
Debrett ..	GRPR	J. King	R. S. Macaulay, J. S. M. Rodgers, J. Wainwright	W. J. Reid ..	Lampport & Holt Line, Ltd.	11.1.49
Deebank ..	GTDB	B. Rivett ..	W. Jones, A. Bennett, B. Walker	R. Pryer ..	Donaldson Bros. & Black, Ltd.	23.6.49
Defoe ..	GNWF	W. C. Blake	E. G. Painter, L. Henshall, M. Webb ..	G. Heapy ..	Lampport & Holt Line, Ltd.	5.10.49
Delane ..	MMNW	H. Pratt ..	E. T. Padon, D. Kingsland	G. Williams ..	Glen Line, Ltd.	2.6.49
Delitiam ..	GJSQ	R. McNie ..	W. B. Avison, R. D. Jones, B. A. Wood, N. F. Seaton, P. C. T. Davies	W. Devereux	McCowen & Gross, Ltd.	13.6.49
Delius ..	GZSY	H. W. Underhill	D. H. Cadova, G. Shackleton	L. Brazil ..	Royal Mail Lines, Ltd.	20.9.49
Denbighshire ..	GQGW	W. F. Dark	J. Bryant, H. Cubitt, M. Shaw, W. Smith	A. Williams ..	Lampport & Holt Line, Ltd.	9.7.48
Derryclare ..	GCKN	G. Smith ..	J. Farrow, R. Driver, F. Hughes	J. Fletcher ..	Federal Steam Nav. Co., Ltd.	23.5.49
Desaado ..	MAIH	S. J. G. Hill	H. B. Cray, D. P. Hancock, P. S. Gardner	S. J. Taylor ..	Bibby Bros. & Co. ...	12.2.49
Devils ..	GFKT	T. J. Sweeney	— Clarke-Lens, — Beaumont-Jones, H. A. Howe	— McMurray	British India Steam Nav. Co., Ltd.	9.9.49
Devon ..	GDRF	A. Hocken	..	..	..	..
Devonshire ..	GFTV	J. E. Cullen, O.B.E.	..	..	..	..
Dilwara ..	GYQV	F. L. Sampson, D.S.C.	..	..	..	..
Dominion Montarch ..	GRGG	Sir Henry Gordon, K.B., D.S.C.	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Dorelian</i> ..	GJTL	D. MacQueen ..	A. Dougal, J. Hendry, E. H. Knox ..	J. Cooper ..	Donaldson Bros. & Black, Ltd. ..	3.1.49
<i>Doris Clunies</i> ..	MSLB	J. G. Stevenson ..	J. B. Whyte, K. M. Hamilton, W. D. Blingow ..	G. M. Hargreaves ..	Clunies Shipping Co. ..	4.11.48
<i>Drina</i> ..	GDSF	A. N. Anderson ..	C. A. Miller, M. Mortimer, P. C. T. Davies ..	A. Allen ..	Royal Mail Lines, Ltd. ..	20.9.49
<i>Dromore</i> ..	MOFT	C. S. Fryer ..	I. McCool, W. Thomas, B. Douglas ..	R. Malsom ..	Furness, Withy & Co., Ltd. ..	20.9.49
<i>Dryden</i> ..	GMYS	J. A. Little ..	K. Quirk, M. Fair, W. Overhill ..	J. Gerrity ..	Lampert & Holt Line, Ltd. ..	28.9.49
<i>Duke of Athens</i> ..	GBBR	J. G. Lomas, A.I.N.A. ..	T. Walton, L. Labistour, J. G. Perrin ..	D. R. Uglow ..	Trent Maritime Co., Ltd. ..	24.2.49
<i>Dutera</i> ..	GUF8	A. A. Kay ..	G. Pugh, C. R. S. Monk, A. Ford ..	A. McCartney ..	British India Steam Nav. Co., Ltd. ..	
<i>Dunkery Beacon</i> ..	GCSD	A. C. E. Green ..	J. D. B. Wylie ..	I. S. Humphrey ..	Phs. Van Ormeren (London), Ltd. ..	8.3.49
<i>Dunster Grange</i> ..	MAIM	R. S. Grigg, O.B.E. ..	H. Neal, A. Gibbs, T. C. Mullings ..	W. Ferguson ..	Houlder Bros. & Co., Ltd. ..	
<i>Durango</i> ..		P. M. Burrell ..	E. Card, J. Postill, J. A. Martin, W. L. D. Bayley ..	H. A. Liggins ..	Royal Mail Lines, Ltd. ..	20.9.49
<i>Durban Castle</i> ..	GPGP	J. B. McReynolds, D.S.C. ..	—, Freer, —, Hutchings, R. G. Patterson ..		Union-Castle Mail S.S. Co., Ltd. ..	18.1.49
<i>Durenda</i> ..	GFSL	R. Stone ..	E. F. H. Allen, J. K. Thomas, I. Batley, D. E. Moran ..	C. Robinson ..	British India Steam Nav. Co., Ltd. ..	
<i>Durham</i> ..	GWWK	R. J. Dunning ..	D. Simon, D. Elkington, D. Grant ..	E. C. Bouel ..	Federal Steam Nav. Co., Ltd. ..	20.8.49
<i>Eastern</i> ..	GFTV	H. C. G. Stratford ..	G. D. Attwood, W. G. Shaw, J. W. Rogers ..	J. Hodgson ..	Eastern & Australian S.S. Co., Ltd. ..	28.3.49
<i>Edinburgh Castle</i> ..	GOHN	T. W. McAllen ..			Union-Castle Mail S.S. Co., Ltd. ..	28.9.49
<i>Edenard East</i> ..	GYXZ	J. A. Whittleton ..			H. Croft Baker & Sons, Ltd. ..	
<i>El Gallo</i> ..	MAIP	E. H. Richardson ..			C. T. Bowring & Co., Ltd. ..	7.12.48
<i>Empire Brent</i> ..	GLBX	J. Cook ..	W. Swan, A. C. Bramble, T. M. Webber ..	L. Sutton ..	Donaldson Bros. & Black, Ltd. ..	13.1.49
<i>Empire Halladale</i> ..	GPVQ	E. Stormont, M.B.E. ..	J. Short, A. McCallum, S. Ewing ..	L. Hooper ..	Anchor Line, Ltd. ..	30.8.49
<i>Empire Martaban</i> ..	GBSV	E. Longster ..	G. Ramage, W. A. Brownlie, W. Marshall ..	D. Thompson, M.B.E. ..	Bolton S. S. Co., Ltd. ..	19.6.47
<i>Empire Pride</i> ..	MAJB	R. Cumming, D.S.C. ..	R. D. Fielder, R. Hammond, A. Cameron ..	T. M. Keddie ..	Bibby Bros. & Co., Ltd. ..	5.8.49
<i>Empire Star</i> ..	GCDP	S. J. C. Phillips, C.B.E. ..	M. R. Bremberg, F. P. McGuckin, J. D. Breyer ..	A. Mallett ..		
<i>Empire Touy</i> ..	GDKL	M. L. Thomas ..	D. G. Grest ..	J. Hyndes ..	Blue Star Line, Ltd. ..	28.10.48
<i>Empire Viceroy</i> ..	MAJN	J. B. S. Bland ..	A. C. Cable, A. Purvis, D. L. Jardine ..	G. R. Stuart ..	Fenton S.S. Co., Ltd. ..	5.8.49
<i>Empress of Australia</i> ..	GFSB	J. P. Dodson, D.S.C., R.D., Cnde., R.N.R. ..		R. Porter ..	Pandelis Shipping Co., Ltd. ..	4.11.47
<i>Empress of Canada</i> ..	GSVR	E. A. Shergold ..	A. G. Ingram ..	W. Campbell ..	Canadian Pacific S.S., Ltd. ..	15.12.48
<i>Empress of France</i> ..	GNTV	B. B. Grant ..	F. Granger, R. Walgate, J. H. Fraser, B. Snell ..	J. M. Butterworth ..	Canadian Pacific S.S., Ltd. ..	4.1.49
<i>Epsom</i> ..	GCYD	R. D. Griffiths, O.B.E. ..	R. A. Jones, R. D. Williams ..	T. Murphy ..	Canadian Pacific S.S., Ltd. ..	19.1.49
<i>Eros</i> ..	GYSB	R. C. Vigurs ..	G. T. Sharpe, R. M. King, E. M. Thomson ..	R. T. Jones ..	Watts, Watts & Co., Ltd. ..	20.7.49
<i>Esperance Bay</i> ..	GSMP	T. V. Roberts, R.D., Cdr., R.N.R. ..	V. Irving, C. P. Turquand, S. Langsford, H. Beyer ..	H. Lannas ..	Steamship Eros, Ltd. ..	16.6.49
<i>Essex Trader</i> ..	GCMS	C. Arundell ..	I. K. Wyles, J. F. Scott, D. M. Bradley ..	M. J. Sheehan ..	Shaw, Savill & Albion Co., Ltd. ..	20.9.49
<i>Eso Glasgow</i> ..	GTXC	H. C. Fellingham ..	W. Kemp, F. Stamps, D. Harris ..	A. B. Pilkington ..	Trader Navigation Co., Ltd. ..	27.6.49
<i>Eso Manchester</i> ..	GWCD	P. M. Glover ..	R. Davies, J. C. Young, D. Harrison ..	P. J. Everett ..	Eso Transportation Co., Ltd. ..	12.7.49
<i>Explorer</i> ..	GYJX	W. F. O'Neill ..	J. L. Williams, G. Cubbin, R. H. Soar ..	G. A. Bart ..	Eso Transportation Co., Ltd. ..	6.1.49
<i>Fenad Head</i> ..	GNOQ	W. A. Haddock ..	A. Fee, J. Harper, C. R. Wilson ..	A. J. Thomson ..	T. & J. Harrison ..	20.4.49
<i>Finland</i> ..	MIYZ	A. Wilson, O.B.E. ..	J. S. Drynan, J. W. Phinister ..	A. J. Thomson ..	G. Heyn & Sons, Ltd. ..	18.3.48
<i>Fordsdale</i> ..	GSMW	T. Oliver ..	R. Welch, P. H. Carden ..	J. Knight ..	Currie Line, Ltd. ..	5.11.48
<i>Fort Cadotte</i> ..	MAKS	J. C. Dawson ..	K. D. A. Lamb, N. MacAlister, D. Calvert ..	E. S. Pillow ..	Shaw, Savill & Albion Co., Ltd. ..	11.10.49

<i>Fort Musquarro</i>	..	MXLF	J. D. Armstrong, D.S.C., I. Johnson	A. P. Warral, R. H. Arnott, W. E. Rawson A. M. Allan, R. F. Leithead, A. S. Kelly..	J. Maclaren .. J. K. McCormack ..	Cunard White Star, Ltd. J. & J. Denholm, Ltd. ..	24.2.49 16.8.48
<i>Fort Nakasley</i>	..	MAMM	W. T. Fitzgerald, R.D., R.N.R.	R. G. McClymont, D. H. Lee, —, Ogilvy P. T. Drake, A. M. Thomson, I. Millington S. S. Jones, W. P. Davis, M. Keewill ..	Norton .. G. M. Parsons ..	Cunard White Star, Ltd. ..	30.8.49 24.6.48
<i>Fort Spokane</i>	..	MXLY	C. S. Williams .. H. Fisher ..	L. Richardson, M. Wardle, W. Owen D. Aubrey, F. Eastman, S. M. Garside G. H. Drinkwater, A. R. M. Graham, T. O'Sullivan ..	T. H. Owen Ffoulkes .. M. H. Whitehead .. J. Everitt ..	Cunard White Star, Ltd. .. Sir William Reardon Smith & Sons, Ltd. ..	24.2.49 6.1.49 28.3.49
<i>Francia</i>	..	GBRQ	A. E. Jackson .. R. A. Swan, O.B.E.	R. G. Edwards, F. A. S. Millar, H. Bell .. C. Lorimer, J. B. Mothersill ..	..	T. & J. Harrison ..	24.2.49 6.1.49
<i>Fresno City</i>	..	GBYD	R. Sell, R.D., R.N.R.	W. Murphy, D. V. Hoskins C. C. J. Neaves, C. J. Sawle, J. F. Parry ..	..	Esso Transportation Co., Ltd.	28.3.49
<i>Geologist</i>	..	GJMR	J. Macarthur .. W. E. Coates ..	..	..	Cunard White Star, Ltd.	28.9.49
<i>Geo. W. McKnight</i>	..	GCQM	T. Fraser .. C. Houghton ..	..	..	A. Holt & Co. ..	31.12.47
<i>Georgie</i>	..	GRUJ	H. D. Horwood, R.D., R.N.R.	..	..	Glen Line, Ltd. ..	11.2.49
<i>Glaucus</i>	..	GDYZ	J. Macarthur .. W. E. Coates ..	..	..	Andrew Weir & Co., Ltd.	7.12.48
<i>Glenartney</i>	..	GBLG	T. Fraser .. C. Houghton ..	..	..	Glen Line, Ltd. ..	25.1.49
<i>Glenbank</i>	..	GKLC	H. D. Horwood, R.D., R.N.R.	..	..	Federal Steam Nav. Co., Ltd.	20.4.49
<i>Glenorchy</i>	..	GBLL	J. Macarthur .. W. E. Coates ..	..	..	Donaldson Bros. & Black, Ltd.	20.8.49
<i>Gloucester</i>	..	MANK	E. C. I. Morgan .. C. R. Filcher, O.B.E.	..	..	Goulandris Bros., Ltd. ..	..
<i>Gracia</i>	..	MANN	A. R. Phelps .. J. F. Rumbellow ..	..	..	New Zealand Shipping Co., Ltd. ..	22.7.49
<i>Graford</i>	..	MOGC	W. A. Short .. H. Davies ..	..	..	J. & C. Harrison, Ltd. ..	17.10.49
<i>Haparangi</i>	..	GJYX	H. D. Harper, O.B.E. G. A. Bannister ..	..	..	Anglo-Saxon Petroleum Co., Ltd.	22.8.49
<i>Harmatris</i>	..	GTWP	B. C. Dodds, O.B.E.	..	..	T. & J. Harrison ..	..
<i>Helicina</i>	..	GKBC	P. Cooper .. J. Binns ..	..	..	Bibby Bros. & Co. ..	12.10.49
<i>Herdsmen</i>	..	GPZX	S. Wilson, O.B.E.	..	..	Royal Mail Lines, Ltd. ..	4.3.49
<i>Herefordshire</i>	..	GOFG	C. R. Laing .. A. E. Taylor, R.D., Cdr., R.N.R.	..	..	Royal Mail Lines, Ltd. ..	8.1.49
<i>Highland Brigade</i>	..	GJKN	D. Dickson .. G. G. Roberts ..	..	..	Royal Mail Lines, Ltd. ..	18.8.49
<i>Highland Chieftain</i>	..	GCTY	F. Loughheed .. G. A. Moore ..	..	..	Royal Mail Lines, Ltd. ..	7.10.49
<i>Highland Monarch</i>	..	GMZF	A. F. King .. G. E. M. Jenkins ..	..	..	Booth S.S. Co., Ltd.	14.12.48
<i>Highland Princess</i>	..	GFMN	I. Williams .. R. E. Holland ..	..	..	Stott, Mann & Fleming, Ltd.	7.2.49
<i>Hilary</i>	..	GQVM	Cdr. H. Kirkwood, D.S.C., R.N.	..	..	New Zealand Shipping Co., Ltd.	20.4.49
<i>Hopecrown</i>	..	GZZG	J. Shaw ..	..	..	Currie Line, Ltd. ..	7.7.48
<i>Hopepeak</i>	..	GKGJ	..	..	..	Booth S.S. Co., Ltd.	23.6.49
<i>Hororata</i>	..	MANZ	..	..	..	New Zealand Shipping Co., Ltd.	15.12.48
<i>Horsa</i>	..	MPEJ	..	..	..	G. Heyn & Sons, Ltd. ..	5.1.49
<i>Hubert</i>	..	GENW	..	..	..	Andrew Weir & Co., Ltd.	21.7.49
<i>Humui</i>	..	GJZF	..	..	..	Kay, Son & Co., Ltd.	11.3.49
<i>Inishowen Head</i>	..	MAOC	..	..	..	Sir Wm. Reardon Smith & Sons, Ltd.	30.9.49
<i>Inverbank</i>	..	GKML	..	..	..	Furness, Withy & Co., Ltd.	28.3.49
<i>Jamaica Producer</i>	..	VPLM	..	..	..	Government of the Falkland Islands John Holt & Co. (Liverpool), Ltd.	12.10.49
<i>Jersey City</i>	..	GIGA	..	..	..	..	..
<i>Jessmore</i>	..	MAOF	..	..	..	..	..
<i>John Biscoe</i>	..	GFLF	..	..	..	..	..
<i>John Holt</i>	..	GNFD	..	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Kaipaki</i> ..	GQGI	T. Fenwick..	D. M. Steven, J. R. Suffren, F. Le Messurier ..	F. Matthews ..	Trinder Anderson & Co. ..	21.8.48
<i>Kaipara</i> ..	GZPY	G. P. Parkinson	C. F. Turner, J. Milne, J. Newing ..	T. Herbert ..	Trinder, Anderson & Co. ..	20.8.48
<i>Katuna</i> ..	GQGG	R. F. Hellings	T. W. C. Ryland, J. Gall, R. B. Dales ..	W. G. Fitzgerald ..	Trinder, Anderson & Co. ..	4.1.49
<i>Kano Palm</i> ..	GYSM	H. Coffey, R.D., R.N.R.	J. K. Mumford, J. H. Drummond, I. Bigham ..	..	United Africa Co., Ltd. ..	30.6.49
<i>Kenilworth Castle</i> ..	MQLP	L. H. Farrow	..	..	..	..
<i>Kent</i> ..	GPDC	N. A. Thomas	B. Linklater, A. Stalker, R. Herbert ..	C. Robinson ..	Union-Castle Mail S.S. Co., Ltd.	24.2.49
<i>King Robert</i> ..	MAON	G. Craze ..	W. Keith, G. Griffiths, P. Kidd ..	L. Roberts ..	Federal Steam Nav. Co., Ltd. ..	29.6.49
<i>King William</i> ..	GNVF	A. B. Drever ..	J. C. Davies, G. F. Hogg, A. J. Moore ..	W. Fielding ..	Dodd, Thomson & Co., Ltd. ..	10.10.47
<i>Kohistan</i> ..	GSEZ	A. N. Henderson	W. G. Smith, J. E. Belt, P. H. Alexander ..	P. Kelly ..	Dodd, Thomson & Co., Ltd. ..	7.12.48
<i>Laguna</i> ..	GKIC	S. E. Aylard	R. H. Scaiff, W. Johnston, L. J. Nurse ..	P. Goss ..	F. C. Strick & Co., Ltd. ..	24.8.49
<i>Lambrook</i> ..	MAOS	H. F. McInnes	J. Orr, A. Sillars, R. F. Arnold ..	K. W. Baddeley ..	Pacific Steam Nav. Co. ..	20.9.49
<i>Lancashire</i> ..	GCTC	C. E. O'Byrne	A. Marr, M. T. Morton, W. W. S. Arnott ..	J. W. Fulton ..	Galbraith, Pembroke & Co., Ltd.	1.6.49
<i>Lancashire</i> ..	GLZC	A. Beharrel	W. H. Malley, J. C. Priest, B. MacKinnon ..	A. Jones ..	Turnbull, Martin & Co., Ltd. ..	12.7.49
<i>Lassell</i> ..	GFND	D. Roberts ..	S. Dickenson, J. Bicknell, P. V. des Landes ..	N. Moore ..	Bibby Bros. & Co. ..	25.4.49
<i>Latia</i> ..	GLCF	R. S. Walker	A. P. S. Jackson, N. Morganti, R. J. Stanley ..	J. Brownlee ..	Lampport & Holt Line, Ltd. ..	1.6.49
<i>Leicester</i> ..	GBTG	H. M. Lawson, R.D., R.N.R.	C. R. Eaddy, C. G. Watterson, J. M. Whitridge, L. Anderson ..	..	Anglo-Saxon Petroleum Co., Ltd.	12.10.49
<i>Leverbank</i> ..	GLPZ	D. Gillies ..	..	..	Federal Steam Nav. Co., Ltd. ..	..
<i>Linguist</i> ..	GOBC	A. H. Frew..	F. Methan, J. Williams, J. Beer ..	W. C. Doyle..	Andrew Weir & Co., Ltd. ..	12.7.49
<i>Livorno</i> ..	GPWF	E. S. Green	H. D. Lawton ..	K. W. Baddeley ..	T. & J. Harrison ..	..
<i>Llangibby Castle</i> ..	GPLV	C. C. Page ..	H. L. Halcrow, D. W. Verniers, A. H. Benson ..	J. Eager ..	Ellerman's Wilson Line, Ltd. ..	1.6.48
<i>Lloydcrest</i> ..	MAOY	T. Walker ..	J. H. Allenby, J. H. Kelly, G. E. Mitchell ..	M. Riley ..	Union-Castle Mail S.S. Co., Ltd.	4.11.48
<i>Lobos</i> ..	GDXL	A. I. Litherland	G. E. Leech, D.S.C., W. M. Morton, J. V. Bradbury, J. M. Ashworth ..	J. J. Glynn ..	Crest Shipping Co., Ltd. ..	25.2.49
<i>Loch Avon</i> ..	GMZT	W. W. Lowe	E. A. E. Littlewood, J. W. Kavanagh, J. M. Barber, P. Campbell ..	M. R. Littlejohn ..	Pacific Steam Nav. Co. ..	..
<i>Loch Garth</i> ..	GNZY	D. R. Miller	D. R. Bryden, R. C. Hummsett, V. Charles ..	..	Royal Mail Lines, Ltd. ..	18.3.48
<i>Loch Ryan</i> ..	MAOZ	A. R. Osburn	A. H. Treikelder, J. Janczak, J. S. Armstrong ..	D. Morgan ..	Royal Mail Lines, Ltd. ..	12.7.49
<i>Lord Gladstone</i> ..	MAPA	P. J. Kenny	..	D. Douglas ..	Royal Mail Lines, Ltd. ..	12.2.49
<i>Lord Glenloran</i> ..	GRMK	W. J. Leinster	W. R. Nelson, A. F. James, D. Philpotts ..	J. Saidler ..	Ships Finance & Management Co., Ltd.	4.3.49
<i>Lord O'Neill</i> ..	GRLZ	R. A. Ferguson	R. M. Hall, R. Harper, C. R. Wilson ..	D. O'Callaghan ..	G. Heyn & Sons, Ltd. ..	12.3.48
<i>Loriga</i> ..	GCML	J. E. Evans, D.S.C., R.D., Capt. R.N.R.	A. S. Maclean, H. Riding, R.D., R.N.R., R. O. Walters ..	C. A. Murphy ..	G. Heyn & Sons, Ltd. ..	20.4.49
<i>Losada</i> ..	GDXM	P. L. Hockey	F. J. Leicester, W. Jenkins, J. G. Galston ..	J. S. Wilson ..	Pacific Steam Nav. Co. ..	18.3.49
<i>Luminous</i> ..	MAPB	S. Weatherston	A. W. Banks, R. M. Chalmers ..	E. O'Neill ..	Pacific Steam Nav. Co. ..	29.7.49
<i>Machoon</i> ..	GDPS	J. L. W. Johnston	J. Anderson, J. Cook, E. Hill ..	D. Whiting ..	H. E. Moss & Co. ..	20.6.49
<i>Macharda</i> ..	GKKF	R. A. Penston	—, Jackson, L. J. S. Saxty, —, Kirkham, —, Ralli ..	W. Ogilvie ..	A. Holt & Co. ..	20.7.49
<i>Magdabur</i> ..	GBJX	H. E. MacGregor ..	N. H. Embleton, G. W. Sinclair, R. J. Ryding ..	—, Fisher ..	T. & J. Brocklebank, Ltd. ..	14.12.48
				E. Halton ..	T. & J. Brocklebank, Ltd. ..	10.3.49

<i>Mahanada</i>	..	GOFM	J. W. B. Robertson, R.D., R.N.R.	..	J. Brand, J. C. Long, P. Greenall, G. P. Hurns	T. Williams ..	T. & J. Brocklebank, Ltd.	..	4.1.49
<i>Mahia</i>	..	GNZV	G. Campbell	..	N. E. Wood, H. P. M. Lawrence, D. A. C. Adams	I. Nolan .. C. W. Jacobs	Shaw, Savill & Albion Co., Ltd.	..	12.7.49
<i>Mahout</i>	..	GDZN	H. F. Scoins	..	D. L. Campbell, E. G. Anderson, L. Burn	..	T. & J. Brocklebank, Ltd.	..	4.3.49
<i>Mahseer</i>	..	GZSV	L. T. Owen, O.B.E.	..	J. W. Ross, J. H. Moore, E. McAulley ..	..	T. & J. Brocklebank, Ltd.	..	6.9.49
<i>Mahsud</i>	..	GSCP	L. E. Jeans	..	C. S. W. Gray, E. Watkins, R. F. Holland	B. Pinn ..	T. & J. Brocklebank, Ltd.	..	12.7.49
<i>Makalla</i>	..	GOFN	T. A. Eddy ..	..	J. P. Pembroke, M. H. Taylor, D. L. des Landes	G. Caddy ..	T. & J. Brocklebank, Ltd.	..	5.5.49
<i>Maitar</i>	..	GSCL	J. R. Paisby	..	I. P. Jackson, A. B. Davies, G. Pari Huws	A. G. Lea ..	T. & J. Brocklebank, Ltd.	..	28.9.49
<i>Malakand</i>	..	GQFP	I. Owen ..	..	J. Clarke, J. R. Kemp, D. J. Evans	A. N. Orum ..	T. & J. Brocklebank, Ltd.	..	9.9.49
<i>Malancha</i>	..	GZRD	S. Broughton	..	E. Roberts, I. J. Sladen, K. Slapp ..	B. J. Smith, M.B.E.	Prince Line, Ltd.	..	18.1.49
<i>Malayan Prince</i>	..	GFVW	J. D. Fraser	..	P. J. Leech, A. Jewers ..	W. Humphries	Houlder Bros. & Co., Ltd.	..	25.4.49
<i>Malmesbury</i>	..	MAQE	W. McMellin	..	R. M. Sinclair, G. E. Howe, J. C. Jenkins	A. Macbeth	Ellerman's Wilson Line, Ltd.	..	13.6.49
<i>Malmoe</i>	..	GQCN	I. W. Calvert	..	W. Hine, J. A. McCarren, J. Rushworth, L. Pound	A. J. S. Broadbent	Manchester Liners, Ltd.	..	29.7.49
<i>Maloloja</i>	..	GFBD	E. J. Parry ..	..	W. E. Quick, J. E. Askew, R. Wadsworth	A. R. Evans ..	Manchester Liners, Ltd.	..	8.6.48
<i>Manchester City</i>	..	GBBP	F. L. Osborne	..	M. F. Robinson, C. Cuird, T. H. Lynn	P. Cummins	Manchester Liners, Ltd.	..	2.2.48
<i>Manchester Commerce</i>	..	GKMY	H. Hancock	..	F. Lewis, L. Taylor, C. Marchant ..	W. C. Critchley	Manchester Liners, Ltd.	..	5.1.49
<i>Manchester Division</i>	..	GBYR	E. W. Espley	..	W. L. McLaren, J. E. Askew, F. Jones	A. Reid ..	Manchester Liners, Ltd.	..	19.10.49
<i>Manchester Port</i>	..	GYNF	F. Downing	..	F. Lewis, D. Heaton, T. H. Lynn	E. Ambler ..	Manchester Liners, Ltd.	..	14.1.47
<i>Manchester Progress</i>	..	GFGD	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>	..	GBRD	J. D. Struss, O.B.E., D.S.C.	..	D. A. Morris, A. W. Wiltshire, F. P. Attwood	G. W. Hazel ..	T. & J. Brocklebank, Ltd.	..	11.1.49
<i>Manchester Shipper</i>	..	MAPC	J. Barclay ..	..	E. Edwards, R. Tutty, C. Main ..	G. Camm ..	Ellerman's Wilson Line, Ltd.	..	12.8.49
<i>Manchester Trader</i>	..	GMWG	E. W. Raper	..	J. E. Thompson, A. Skelton, K. Garrett ..	J. McFarlane	Kaye, Son & Co., Ltd.	..	5.8.49
<i>Mandasor</i>	..	GBNY	L. E. Jeans	..	L. D. Forster, R. H. Jenkins, C. Jacob ..	A. Hadden ..	Dalhousie S.S. Co.	..	24.2.49
<i>Marengo</i>	..	GLFW	F. Ellison	..	I. A. McLaren, J. Ritchie, R. N. Bonny	D. Owen ..	T. & J. Brocklebank, Ltd.	..	7.2.49
<i>Margay</i>	..	GBQJ	J. G. F. Brighy	..	R. J. Sinclair, W. Allen ..	K. C. Wright	Chr. Salvesen & Co.	..	27.8.48
<i>Marietta Dal</i>	..	GTFFZ	W. Hill, O.B.E.	..	J. Cush, T. Liddle, D. Parker ..	D. H. Butterworth ..	Kaye, Son & Co., Ltd.	..	4.1.49
<i>Markhor</i>	..	MILPK	J. Nelson	..	H. Jones, J. Tiers, L. Marsell ..	P. McDonnell	T. & J. Brocklebank, Ltd.	..	15.1.49
<i>Marna</i>	..	CQVY	F. C. Jennings	..	E. L. Jones, P. A. Litherland, W. H. Clifford Hicks	L. Boyce ..	Kaye, Son & Co., Ltd.	..	13.5.49
<i>Marquita</i>	..	GBKB	M. Ferguson	..	M. G. Stevens, P. A. Kelly, D. Johnstone	P. Neeson ..	Shaw, Savill & Albion Co., Ltd.	..	20.9.49
<i>Marsdale</i>	..	GTGG	T. Fox-Lloyd	..	H. G. Moss, J. G. Beck, R. McL. Munro	D. Knights ..	T. & J. Brocklebank, Ltd.	..	13.5.49
<i>Martland</i>	..	GNQT	H. Bunn .. R.D., Capt., R.N.R.	..	G. M. Roberts, M.B.E., B. Hodges, H. G. Cresswell	F. Clarke ..	Elders & Fyffes, Ltd.	..	9.6.49
<i>Martara</i>	..	GCSV	R. G. James	..	J. A. B. Munro, R. A. Eider, C. H. Cooke	J. MacArdle, M.B.E.	Cunard White Star, Ltd.	..	10.11.48
<i>Matheran</i>	..	GOFQ	A. B. Bannatyne, O.B.E.	..	T. S. McGregor, J. Allan, C. Hayward ..	J. Clarke ..	Cunard White Star, Ltd.	..	20.7.48
<i>Matina</i>	..	GSZX	H. Roberts, O.B.E.	..	J. Edgar, D. S. Leicester, A. B. Baines ..	J. Williams ..	Blue Star Line, Ltd.	..	27.7.49
<i>Mauretania</i>	..	GTTM	— Dixon ..	..	R. E. Small, P. B. Henderson, C. E. Burrill	J. Crouch ..	Lampport & Holt Line, Ltd.	..	14.10.49
<i>Media</i>	..	GSWR	F. N. Williams	..	G. Hardy ..	E. Robinson	Cable and Wireless, Ltd.	..	5.12.47
<i>Melbourne Star</i>	..	GDFZ	F. N. Riley, D.S.O.	..	G. Buckley, J. W. Owen, P. Jeffries, M. Phepys	G. P. Carey ..	General Post Office	..	18.7.47
<i>Militais</i>	..	MAPH	A. R. Bibby, O.B.E.	..	A. T. Jonston, R. S. Hopkins ..	R. H. Hallum	P. & O. Steam Nav. Co.	..	19.8.49
<i>Mirror</i>	..	GDFL	S. A. Garmon	..	I. Owen, W. J. Neill, D. Halzall ..	R. Diamond	Donaldson Bros. & Black, Ltd.	..	12.2.49
<i>Monarch</i>	..	GBDF	J. P. F. Betson	..	G. G. Hodgson, J. T. Duncan, F. J. Adamson ..	N. Kehoe ..	Lampport & Holt Line, Ltd.	..	5.5.49
<i>Mooltan</i>	..	GFBC	C. H. Baxter	..			Andrew Weir & Co., Ltd.	..	12.7.49
<i>Moneria</i>	..	GKYW	J. McMillan	..					
<i>Murillo</i>	..	MAPM	W. Gillespie	..					
<i>Myrtlebank</i>	..	GLQB	F. Hale	..					

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Nabier Star</i>	MAPN	C. Horton, D.S.C.	P. Prince, M. Rideout, J. Reeve ..	R. Mills	Blue Star Line, Ltd.	12.8.49
<i>Naticina</i>	GIGH	F. Mansfield	P. Kendall, M. Goddard, L. Stephens ..	J. E. Conway	Anglo-Saxon Petroleum Co., Ltd.	4.1.49
<i>Nestar</i>	GPYX	E. W. Powell, M.B.E.	J. Lloyd-Jones, E. H. Davies, B. C. Pays	J. D. Floris	A. Holt & Co.	20.9.48
<i>Newfoundland</i>	GNMC	A. T. Church, O.B.E.	J. B. Stewart, J. Sheffield, L. Rooney ..	T. Cahill	Furness Withy & Co., Ltd.	5.5.49
<i>New Zealand Star</i>	GYCR	G. Owen, O.B.E., R.D., Cdr., R.N.R.	R. Stewart, G. Munro, F. Wood	C. J. Carter	Blue Star Line, Ltd.	15.12.48
<i>Norfolk</i>	GJLV	A. I. Robertson, R.D., Capt., R.N.R.	S. G. Robinson, A. B. Moss, J. G. Glover	J. Heath	Federal Steam Nav. Co., Ltd.	20.8.49
<i>Northumberland</i>	GBSJ	A. E. Williams	J. Cubitt, C. Mason, J. Wittchell	J. Charter	Federal Steam Nav. Co., Ltd.	7.12.48
<i>Norwegian</i>	GDMC	C. Low	J. Downie, J. Hunter, J. Clarke	J. Lennox	Donaldson Bros. & Black, Ltd.	..
<i>Nova Scotia</i>	GNK	J. E. Wilson, O.B.E.	J. D. P. Williamson, E. Cunningham, K. Rowland	W. C. Brock	Furness, Withy & Co., Ltd.	5.1.49
<i>Novelist</i>	GMLG	T. E. Steel	D. O. Percy, G. A. Cain, G. K. Watson	D. Wills	T. & J. Harrison	20.9.49
<i>Orari</i>	GJKX	F. Loughheed	M. D. Holden, J. A. Edmondson, R. S. Hales	J. W. Bundlewood	New Zealand Shipping Co., Ltd.	19.10.49
<i>Orbita</i>	GLTQ	J. Sutherland	E. G. Shephard, G. E. Mitchell, P. Whelbourn	J. Stone	Pacific Steam Nav. Co.	29.7.49
<i>Orcades</i>	MABA	C. Fox, C.B.E.	—, Hardy, —, Kingswood, —, Finch, O. F. W. Pitts	N. A. Boon	Orient Steam Nav. Co., Ltd.	24.9.49
<i>Ordana</i>	GLTS	J. Whitehouse	T. Wilcockson, W. Singleton, J. Owen ..	J. Clarke	Pacific Steam Nav. Co.	14.6.49
<i>Orion</i>	GYKL	Sir A. Baxter, K.B.E., D.S.C., R.D., R.N.R.	M. R. Wilmshurst, A. Murray, D. K. Kinloch ..	T. Shannon	Orient Steam Nav. Co., Ltd.	11.1.49
<i>Ormonde</i>	GLYC	I. E. Goldsworthy, R.D., R.N.R.	C. S. Thomas, R.D., Lt.-Cdr., R.N.R., L. C. Kingswood, P. J. Collier	R. Oakley	Orient Steam Nav. Co., Ltd.	7.12.48
<i>Orontes</i>	GBXM	N. A. Whinfield	R. F. Underwood, F. W. Woolley, D. R. Ward	F. Murphy	Orient Steam Nav. Co., Ltd.	4.1.49
<i>Otranto</i>	GFKV	T. L. Shurrock, O.B.E.	E. V. Harris, —, Thomas, R. E. Field ..	C. T. Seaton	Orient Steam Nav. Co., Ltd.	14.5.48
<i>Pacific Exporter</i>	GBJC	W. F. Swann	D. MacDonald, M. J. Brown, A. Pringle	A. Cary	Furness, Withy & Co., Ltd.	23.6.49
<i>Pacific Fortune</i>	GBFM	E. O. Evans	G. Cook, A. Linden, G. Williams	V. Ash	Furness, Withy & Co., Ltd.	8.12.48
<i>Pacific Importer</i>	GDKV	B. M. Collard	B. A. Newcomb, P. S. Taylor, E. H. Gregson	A. G. Williams	Furness, Withy & Co., Ltd.	20.7.49
<i>Pacific Liberty</i>	GDFQ	N. Conbrough	J. Clarke, D. R. Gibson, —, Keene	S. Vincent	Furness, Withy & Co., Ltd.	21.1.49
<i>Pacific Nomad</i>	GCRZ	E. A. Kemp	—, McKinley, W. H. Davis, R. Budson..	R. McCarthy	MacAndrews & Co., Ltd.	14.12.48
<i>Pacific Shipper</i>	GKBY	E. V. Richards	M. A. Frenfield, G. T. Page, J. A. Lefevre	H. Olding	P. & O. Steam Nav. Co.	28.6.49
<i>Pacific Stronghold</i>	GNSQ	F. H. Perry	K. E. McClure, C. W. Williams, K. R. Jones	J. Stone	MacAndrews & Co., Ltd.	..
<i>Pacific Unity</i>	GUAN	H. S. Reveley	I. V. Batley, T. Train, T. A. Bennett	H. Booth	Royal Mail Lines, Ltd.	12.8.49
<i>Palacio</i>	GNIW	I. P. Harris	R. Luly, J. Hedley, W. Dan	H. Hare	New Zealand Shipping Co., Ltd.	20.7.49
<i>Palana</i>	MMBF	F. R. Spurr	G. A. Gibbons, D. Davies, M. Blackman	W. Sykes	New Zealand Shipping Co., Ltd.	27.6.49
<i>Palomares</i>	GIGN	D. L. Thomas, M.B.E.	C. G. M. Smith, M. Hawkins, J. M. Barber	P. Goulden	Royal Mail Lines, Ltd.	21.1.49
<i>Pantpas</i>	GCGL	T. Powell	J. T. Jones, R. C. Hunnisett	R. A. Turner	Royal Mail Lines, Ltd.	20.4.49
<i>Papanui</i>	GDJW	B. Evans	P. C. Reed, R. Elenor, A. W. Dallas	N. H. Crocker	Royal Mail Lines, Ltd.	21.3.49
<i>Paparoa</i>	GB CZ	E. Hopkins	E. F. Ferraby	B. S. Magennis	P. & O. Steam Nav. Co.	12.2.49
<i>Paraguay</i>	MAQS	H. V. Todd	..	..	..	..
<i>Pardo</i>	GMNZ	R. N. Fletcher	..	..	..	..
<i>Parina</i>	GCLO	J. Smith, R.D., Cmde.	..	..	..	..
<i>Paringa</i>	MMBD	R.N.R.	..	..	..	..

<i>Parthia</i>	..	GSWQ	G. H. G. Morris	..	K. T. Jones, F. Watts, P. Walton	A. O'Sullivan	..	Cunard White Star, Ltd.	..	2. 12. 48
<i>Pegu</i>	..	GFGP	S. Thomson	..	J. Walker-Brown, I. S. MacColl, A. Crozier, T. A. Hood	R. Wilson	..	P. Henderson & Co.	..	23. 6. 49
<i>Perim</i>	..	GCEB	J. M. Peter	..	P. J. Jackson, P. Hewitt, R. T. Neve	F. Groves	..	P. & O. Steam Nav. Co.	..	7. 10. 49
<i>Perthshire</i>	..	GYWK	A. J. Hogg	..	J. Browne, C. Stonehouse, D. G. Geddes, M. J. Skillington	F. Rayner	..	Turnbull, Martin & Co.	..	8. 6. 49
<i>Philomel</i>	..	GYPV	H. M. Selmer	..	D. P. Warren, P. Anthony, J. Egan	P. Hampson	..	General Steam Nav. Co., Ltd.	..	4. 1. 49
<i>Philosopher</i>	..	MAQV	H. Coates	..	P. M. Busby, D. G. Seward, A. W. Finch	L. P. Sayer	..	T. & J. Harrison	..	1. 6. 49
<i>Pilcomayo</i>	..	GBZX	R. Davies	..	G. W. Sigsworth, G. G. Robins	—, Gagney	..	Royal Mail Lines, Ltd.	..	23. 2. 49
<i>Pipiriki</i>	..	GDRQ	T. G. Rees	..	J. Gilman, E. Smith	..	..	T. & J. Harrison	..	..
<i>Planter</i>	..	GZSS	J. Harnden	..	..	..	..	Chr. Salvesen & Co.	..	..
<i>Polar Maid</i>	..	MAQX	H. Leask	..	..	..	..	Port Line, Ltd.	..	..
<i>Port Auckland</i>	..	GWRB	W. G. Enright, O.B.E., Cdr., R.N.R.	..	G. K. Morris, J. F. Barratt, W. M. Crossman	J. Griffiths	..	Port Line, Ltd.	..	18. 8. 49
<i>Port Brisbane</i>	..	GWRC	—, Steele	..	P. A. N. Thomas, I. H. Stewart, V. A. Hunt	E. G. Gunner	..	Port Line, Ltd.	..	24. 8. 49
<i>Port Chalmers</i>	..	GWQR	E. T. W. Lawrey	..	..	B. Morley-Evans	..	Port Line, Ltd.	..	16. 12. 48
<i>Port Hobart</i>	..	GKGC	T. F. Kippins, O.B.E., D.S.C.	..	A. J. Braund, J. D. Aitchison, R. G. Gilling	R. C. Crompton	..	Port Line, Ltd.	..	23. 2. 49
<i>Port Jackson</i>	..	GZKR	F. W. Bailey, M.B.E.	..	C. Guest, D. M. MacKeith, R. E. C. Harris	P. T. McKeon	..	Port Line, Ltd.	..	28. 6. 49
<i>Port Lincoln</i>	..	GFZK	L. Copeland	..	G. G. Carter, G. Manley, M. W. Raggett	R. Robertson	..	Port Line, Ltd.	..	23. 2. 49
<i>Port Macquarie</i>	..	MAQY	E. E. Roswell	..	R. M. Liley, F. Lascelles, H. A. Sprout	B. McGovern	..	Port Line, Ltd.	..	6. 1. 49
<i>Port Phillip</i>	..	MAQZ	J. G. Lewis, O.B.E.	..	F. M. Barton, E. G. Gilling, H. R. Long	W. Miller	..	Port Line, Ltd.	..	25. 1. 49
<i>Port Pirie</i>	..	GLVQ	H. Steele	..	A. McClouenan, R. C. Matthews, J. T. Martyn	J. S. Macpherson	..	Port Line, Ltd.	..	27. 7. 49
<i>Port Wellington</i>	..	GDNJ	E. J. Syvret	..	J. M. Bedwell, D. Sinclair, P. L. Hollings, G. Blundell	J. N. Coutts	..	Port Line, Ltd.	..	20. 4. 49
<i>Port Wyndham</i>	..	GYCW	H. W. Hazlewood	..	P. R. Lewis, P. G. Heneker, C. M. Watkins	T. J. Berry	..	Royal Mail Lines, Ltd.	..	11. 5. 48
<i>Potaro</i>	..	GNLJ	D. R. Miller	..	R. D. Jones, R. R. Thompson, J. T. Price	H. Oliver, M.B.E.	..	Union Castle Mail S.S. Co., Ltd.	..	12. 8. 49
<i>Pretoria Castle</i>	..	GOAE	J. C. Brown, C.B.E., R.D., Capt., R.N.R.	..	D. N. Kernick, A. Peers-Jones, C. J. Willis	R. V. Gregory	..	New Zealand Shipping Co., Ltd.	..	30. 9. 49
<i>Rakaia</i>	..	GFGW	J. Oxnard	..	B. Crust, T. Wadie, A. Sims	P. J. Smyth	..	P. & O. Steam Nav. Co.	..	18. 1. 49
<i>Ranchi</i>	..	GLKW	A. G. Jenkins	..	E. R. Rose, J. Clayton, —, Lightly	..	..	New Zealand Shipping Co., Ltd.	..	3. 11. 48
<i>Rangitata</i>	..	GSZN	G. Kinnell, O.B.E.	..	M. Drake, N. Ethernon, C. Single	S. Peeling	..	New Zealand Shipping Co., Ltd.	..	18. 1. 49
<i>Rangitiki</i>	..	GSXW	P. B. Clarke, M.V.O., O.B.E., D.S.C.	..	G. C. Simpson, R. E. Baker, J. E. Crewdson	F. Toye	..	New Zealand Shipping Co., Ltd.	..	24. 5. 49
<i>Rangitoto</i>	..	GLMV	A. E. Lettington, D.F.C.	..	P. A. Leighton, P. B. Dilleigh	R. W. Jones	..	Trinidad Leaseholds, Ltd.	..	12. 7. 49
<i>Recorder</i>	..	GTPV	R. F. Longster	..	T. Farrar, W. R. Elliott, C. Friskney	J. Butler	..	Pacific Steam Nav. Co.	..	23. 6. 49
<i>Regent Hawk</i>	..	GMND	I. Ward	..	J. A. Greenwood, J. B. Olsson, W. J. Campbell	W. Keogh	..	Galbraith, Pembroke & Co., Ltd.	..	17. 6. 49
<i>Reina del Pacifico</i>	..	GMPS	W. A. Hearle	..	D. M. Muir, F. L. James, G. R. Watts	R. C. Wilde	..	Blue Star Line, Ltd.	..	12. 9. 49
<i>Repton</i>	..	GPFL	D. Cowrie	..	R. H. Jones, P. J. Ellett, A. S. Frier, R. B. Escreet	P. Sharpe	..	Ellerman's Wilson Line, Ltd.	..	6. 12. 48
<i>Rhodesia Star</i>	..	GUAX	C. H. Watson	..	C. Arenz, C. J. Willis	J. Scott	..	Union-Castle Mail S.S. Co., Ltd.	..	..
<i>Rialto</i>	..	GBLV	G. Hodgson	..	S. Sloan, K. D. William, L. Gellie	C. L. Lambe	..	Counties Ship Management Co., Ltd.	..	..
<i>Richmond Castle</i>	..	GCSJ	J. A. Sowden	..	..	..	..	..	..	..
<i>Richmond Hall</i>	..	GMIJ	J. P. Allen	..	..	..	..	..	..	..
<i>Rimutaka</i>	..	GFBJ	T. L. Maltby	..	D. L. Willmott, J. M. Heeley, F. I. Christall	..	..	P. & O. Steam Nav. Co.	..	12. 10. 49

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Ripplingham Grange</i> ..	GIGP	R. Owen ..	H. Butler, W. Backhouse, A. G. Bray, A. H. Fawcett ..	R. G. J. Alton ..	Houlder Bros. & Co., Ltd. ..	29.8.49
<i>Robert F. Hand</i> ..	GWML	C. G. B. Broughton, M.B.E. ..	A. Denton, J. L. M. Leney, J. Donald ..	S. Ribee ..	Anglo-American Oil Co., Ltd. ..	12.8.49
<i>Rochester Castle</i> ..	GZQF	J. M. Rayner, R.D., Cdr., R.N.R. ..	G. D. Fowler, R.D., Lt.-Cdr., R.N.R., J. V. H. Drummond, A. F. George ..	G. Mein ..	Union-Castle Mail S.S. Co., Ltd. ..	25.4.49
<i>Rockside</i> ..	VGDN	H. L. Holland ..	L. McEwan, G. E. Smith ..	H. E. Robinson ..	Andros Shipping Co., Ltd. ..	17.10.49
<i>Roslin Castle</i> ..	GVIZ	R. A. D. Cambridge, D.S.C., R.D., Cdr., R.N.R. ..	K. M. Knight, H. D. Lawton ..	T. M. K. Knowles ..	Union-Castle Mail S.S. Co., Ltd. ..	14.6.48
<i>Rowallan Castle</i> ..	GDFT	J. D. B. Fisher ..	— Charnley, — Eckford, M. Kenshole ..	L. W. Bettinson ..	Blue Star Line, Ltd. ..	20.7.49
<i>Roxburgh Castle</i> ..	GBGS	G. Aldridge ..	T. G. Hughes, M. Rideout, M. Drummond ..	M. Cahill ..	Navigation & Coal Trade Co., Ltd. ..	11.1.49
<i>Royal Star</i> ..	MARJ	E. J. Griffiths ..	J. A. Williamson ..	J. Macfarlane ..	Currie Line, Ltd. ..	8.1.47
<i>Rubystone</i> ..	MARK	W. Thom ..	A. Mathison, J. T. Hibbert ..	H. Holdridge ..	Bolton S.S. Co., Ltd. ..	18.3.49
<i>Rutland</i> ..	GTCP	D. E. Norie ..	H. Edwards, C. W. Fox, J. Ryley ..	W. Parratt ..	Ellerman's Wilson Line, Ltd. ..	10.12.47
<i>Ruydael</i> ..	MAQP	J. Robinson, M.B.E. ..	D. L. Verity ..	D. L. Verity ..	St. Andrews Steam Fishing Co. ..	3.1.49
<i>Sacramento</i> ..	GKCN	J. H. Ellis ..	H. Tock, W. R. Vickers, H. Harrison, J. A. Woolven ..	W. Flood ..	South American Saint Line, Ltd. ..	4.1.49
<i>St. Apollo</i> ..	GBEZ	A. E. Hall ..	G. M. Clark, R. S. Macaulay, I. MacGregor ..	J. Wilson ..	Donaldson Bros. & Black, Ltd. ..	16.7.48
<i>St. Merriel</i> ..	GWDC	F. Menlight ..	R. B. Bryant, W. P. Duguid, T. Riley ..	J. Slater ..	Pacific Steam Nav. Co. ..	18.1.49
<i>St. Roman</i> ..	GBFJ	A. Robinson ..	A. Powell, R. Scaiff, R. R. Williams ..	F. J. Fitzgerald ..	Pacific Steam Nav. Co. ..	27.6.49
<i>Salacia</i> ..	GZRN	H. McLachlin ..	J. Brown, J. T. Fyfe, E. H. Booth ..	H. MacKay ..	W. Thomson & Co. ..	16.12.48
<i>Salamanca</i> ..	GLSC	D. W. Hutchinson ..	R. Manson ..	A. Hatfield ..	Pacific Steam Nav. Co. ..	20.4.49
<i>Salaverry</i> ..	GBLQ	J. D. Richards ..	T. Magee, D. P. Carroll, D. Frazer ..	E. P. Bishop ..	Cunard White Star, Ltd. ..	3.1.49
<i>Saltinas</i> ..	GLLK	J. Williams ..	T. B. Wright, R. G. Scarey, D. A. Ward ..	M. Palin ..	Eagle Oil & Shipping Co., Ltd. ..	17.5.49
<i>Salmonier</i> ..	GDVV	J. D. Wilson ..	A. F. Walliser, J. Dixon, B. T. Orange ..	D. W. Powell ..	Eagle Oil & Shipping Co., Ltd. ..	28.3.49
<i>Samanco</i> ..	MARQ	A. Lyall ..	J. Norman, W. J. Campbell ..	W. L. Radcliffe ..	Eagle Oil & Shipping Co., Ltd. ..	12.9.49
<i>Samaria</i> ..	GICF	A. B. Fastang, R.D., R.N.R. ..	J. Munday, W. D. Hepworth, R. B. Taylor ..	J. C. Tomlinson ..	Pacific Steam Nav. Co. ..	4.1.49
<i>San Adolfo</i> ..	GVKK	L. Mays ..	M. Holdron, D. Kennedy, J. Thomas ..	S. H. Wilson ..	Eagle Oil & Shipping Co., Ltd. ..	20.4.49
<i>San Cirilo</i> ..	GZMR	M. A. Connell, M.B.E. ..	W. E. Hunt, J. D. Nash, P. Johnson ..	I. Timmons ..	Eagle Oil & Shipping Co., Ltd. ..	14.10.49
<i>San Felix</i> ..	GFJZ	C. Summers ..	T. Hiatt, F. Nuttall, T. A. Ireland ..	B. Kimble ..	Eagle Oil & Shipping Co., Ltd. ..	3.5.49
<i>Santander</i> ..	GBNR	T. J. Naylor ..	H. Tomsett, L. Evans, G. Irving ..	N. Roberts ..	Pacific Steam Nav. Co. ..	5.3.49
<i>San Veronico</i> ..	GCNY	H. C. Archer, O.B.E. ..	D. T. English, R. E. Harvey, J. M. Doran ..	R. Watson ..	Blue Star Line, Ltd. ..	10.6.49
<i>San Vulfrano</i> ..	MASQ	J. Thomson, O.B.E. ..	D. R. Rosling, A. R. Graham, R. R. Conway ..	B. Netacher ..	T. & J. Harrison ..	11.2.49
<i>Sarmiento</i> ..	MARW	G. H. Rice ..	W. McInnes, W. Owens, O. T. Jones ..	W. Blanchard ..	Cunard White Star, Ltd. ..	5.1.49
<i>Saxon Star</i> ..	MARX	J. D. W. Davies ..	W. Baker, W. D. Atken, R. Crenall ..	J. Clerk ..	T. & J. Harrison ..	3.3.49
<i>Scholar</i> ..	GDCC	D. Wolstenholme ..	J. H. Tomlinson, M. Rowson-Duke, D. Paget-Clarke ..	A. Brett ..	T. & J. Harrison ..	12.7.49
<i>Scythia</i> ..	GDYP	W. M. Stewart, O.B.E. ..	N. W. Rothwell, D. M. Lamont, N. C. Jones ..	T. Coughlan ..	Silver Line, Ltd. ..	20.4.49
<i>Selector</i> ..	MARZ	W. H. Slaughter ..	F. E. Godley, K. A. Wise, P. R. Miller ..	R. Burrow ..	Silver Line, Ltd. ..	10.11.48
<i>Settler</i> ..	GTTX	R. F. Phillips ..	P. C. Palmer, K. Allen, G. Stobo ..	D. Will ..	Silver Line, Ltd. ..	8.9.48
<i>Silverbriar</i> ..	GDWM	T. S. Morgan ..	E. Reed, A. R. Moore, M. J. S. Beaumont, M. A. A. Oldakoski ..	— Arthurs ..	Silver Line, Ltd. ..	19.8.49
<i>Silverguava</i> ..	GMVK	W. G. Cole ..		A. B. King ..	Silver Line, Ltd. ..	11.10.49

<i>Silverleaf</i>	..	GSFR	E. Palmer ..	J. M. Evans, W. Cole, H. Rose, M. Bingham	J. Thomas ..	Silver Line, Ltd. ..	4.4.49
<i>Silverwalnut</i>	..	GSFT	E. L. Tilmouth ..	W. J. Ross, J. B. de Wet, F. A. Ferguson ..	J. Hands ..	Silver Line, Ltd. ..	28.3.49
<i>Sneaton</i>	..	GDBS	W. Armstrong ..	W. Locker, N. Newton, E. Wilson	A. D. Carter ..	Headlam & Son ..	1.6.49
<i>Socotra</i>	..	MASC	C. F. Halliday ..	D. L. Smith, J. L. Dunkley, R. B. Nowell, P. W. F. Holmes	H. J. Camp ..	P. & O. Steam Nav. Co., Ltd.	20.7.49
<i>Somerset</i>	..	GJMN	P. S. Calcutt ..	C. Maason, W. Martin, R. Kinloch	P. Broome ..	Federal Steam Nav. Co., Ltd.	20.7.49
<i>Southern Collins</i>	..	MASE	D. Hunter ..	D. Falconer, D. Moar, G. Reid	G. Ballantine ..	Chr. Salvesen & Co. ..	31.3.49
<i>Southern Garden</i>	..	MASF	W. J. Swanson ..	W. Scott, R. Marshall, E. G. Sutton	W. J. Tullock ..	Chr. Salvesen & Co. ..	2.6.49
<i>Sovac</i>	..	GDV	H. Anthony ..	J. Miller, R. Jarrett, L. Ash	E. Hobson ..	Vacuum Oil Co. ..	25.8.49
<i>Speaker</i>	..	GGT	C. C. Heaton ..	R. J. Abbott ..	I. Glover ..	T. & J. Harrison ..	10.11.48
<i>Specialist</i>	..	GCYF	L. E. Harriman ..	J. Beam, A. F. Perry ..	A. Guy ..	Springwell Shipping Co. ..	18.1.49
<i>Springfield</i>	..	GKQ	T. R. Mackie ..	J. Reid ..	T. W. Bearman ..	Stanhope S.S. Co., Ltd. ..	10.11.47
<i>Stancourt</i>	..	GKCP	F. H. Wainford ..	J. A. Jones ..	O. R. Wilcox ..	Stanhope S.S. Co., Ltd. ..	5.5.49
<i>Stanhall</i>	..	GCOZ	H. V. Wightman ..	P. J. Macpherson, L. A. Bowen-West	F. K. Pope ..	Stanhope S.S. Co., Ltd. ..	27.7.49
<i>Stanthorpe</i>	..	GCZC	R. G. Roberts ..	E. L. Davies, I. Macquarrie, B. D. Murray	P. P. Williams ..	Union-Castle Mail S.S. Co., Ltd.	28.9.49
<i>Stirling Castle</i>	..	GYPX	C. C. Page ..	D. Campbell, M. Gray, R. Kinton, E. Hall	N. J. Braddon ..	Turnbull, Martin & Co., Ltd.	20.6.49
<i>Stirlingshire</i>	..	GCQD	J. McCrone ..	A. S. Palethorpe-May, G. A. Winter, R. T. Esculme	F. E. Ash ..	P. & O. Steam Nav. Co. ..	10.11.48
<i>Strathaird</i>	..	GRSX	H. S. Allen, R.D., Cmde., R.N.R.	M. H. D'aeth, P. Gudgeon, J. Owen	H. S. Horn ..	P. & O. Steam Nav. Co. ..	19.1.48
<i>Stratheden</i>	..	GDGT	S. W. S. Dickson ..	H. Toon, D. G. Daniel, D. C. Guthrie ..	A. M. Preston ..	Chr. Salvesen & Co. ..	13.5.49
<i>Struan</i>	..	MASI	M. Polson ..	J. Rafflen, A. M. Brown ..	J. Turnham ..	Federal Steam Nav. Co., Ltd.	20.4.49
<i>Stuffolk</i>	..	GQOS	F. Pover ..	J. Laidlow, N. A. Dennis, D. Nicholson	J. McMahon ..	Junecrest Shipping Co., Ltd.	6.2.48
<i>Suncrest</i>	..	GNWW	T. G. Barwell ..	T. L. Ison, J. E. Collins, P. Tate	I. R. Lloyd ..	B. J. Sutherland & Co., Ltd.	31.3.48
<i>Sutherland</i>	..	MIWR	J. McCure ..	C. Dick, D. Hogben, J. Walker ..	D. Ford ..	Sir R. Ropner & Co., Ltd.	24.2.49
<i>Sutherland</i>	..	GBYG	R. W. Nicolson ..	R. Thwaites, A. L. Clemenit, H. Juels-Dorf	I. McConnell ..	Blue Star Line, Ltd. ..	12.7.49
<i>Sutherland</i>	..	GPFS	J. E. Roddam ..	K. Jackson, A. C. Bolton, W. M. Fallon	N. Brewer ..	Pacific Steam Nav. Co. ..	6.8.48
<i>Swinaby</i>	..	MKSM	T. F. McDonald, O.B.E.	A. Kennedy, J. C. Davies, G. C. Jones, J. C. MacIntosh	D. MacRae ..	Shaw, Savill & Albion Co., Ltd.	7.6.49
<i>Sydney Star</i>	..	GCOT	H. Eardley ..	D. I. Jones, R. T. Riley, W. R. Holmes	F. Broomfield ..	Elder Dempster Lines, Ltd.	14.5.47
<i>Talca</i>	..	GFWX	W. Thompson ..	S. P. Oliver, J. B. Cousins, A. H. Baber	G. Gilling ..	Elder Dempster Lines, Ltd.	6.1.49
<i>Tamale</i>	..	GCBF	W. Munt ..	P. I. Finan, D. Thompson, A. Lamper	J. Williamson ..	Ellerman's Wilson Line, Ltd.	11.2.49
<i>Tarkwa</i>	..	MASU	G. D. Sampson ..	R. Munro, G. Moore, A. Bird ..	J. Campbell-Wilson ..	Elders & Fyffes, Ltd.	6.12.48
<i>Tasso</i>	..	GLMR	H. Scarborough ..	D. J. C. Martin, R. Cudbertson, R. Whittleton	L. W. Bell ..	Royal Mail Lines, Ltd.	16.12.48
<i>Telemachus</i>	..	GBLB	G. Brown, M.B.E.	A. G. Reed, P. D. F. Cruickshank, E. Brown	G. Nicholls ..	United Whalers, Ltd.	20.5.49
<i>Tetela</i>	..	GMPN	R. W. Lundy O.B.E., R.D., Cdr., R.N.R.	D. Guinness, R. J. Kistler, G. F. I. Jameson	W. F. Sykes ..	New Zealand Shipping Co., Ltd.	10.11.48
<i>Teviot</i>	..	MASX	H. E. Sang ..	J. P. Ross, R. L. Newcombe, P. B. Goldie	G. Penkeith ..	G. Heyn & Sons, Ltd. ..	17.3.48
<i>Thamesfield</i>	..	GDGK	R. Cunningham ..	S. H. Bennett, A. Ledger, E. J. Agar	L. B. Priestley ..	Counties Ship Management Co., Ltd.	21.3.49
<i>Thule</i>	..	GGBL	S. Andersen ..	E. W. Clubb, D. L. Farkin, S. W. Lambrick	W. F. Kavanagh ..	Hain S.S. Co., Ltd.	9.9.49
<i>Tinto</i>	..	GBYT	S. H. Bennett, M.B.E.	D. Gault, A. J. Farrel, W. Greig	D. W. Cross ..	Hain S.S. Co., Ltd.	17.10.49
<i>Tongariro</i>	..	GLFZ	E. E. Chadwick ..	J. Milne, P. Westcote, R. B. Dawson	J. T. W. Nixon ..	T. & J. Harrison ..	10.11.48
<i>Torr Head</i>	..	GZPW	M. Kennedy ..	P. E. Maiden, D. M. Curror, F. D. Ingram	Chr. Salvesen & Co. ..	Anglo-Saxon Petroleum Co., Ltd.	..
<i>Tower Grange</i>	..	MQJL	G. Robson ..	R. B. Oliver, W. E. Lyons, D. R. Jenkins	..	..	..
<i>Tresillian</i>	..	GCKP	C. R. Mill, O.B.E.	W. Lawton, J. S. Jones, J. Adams	..	..	..
<i>Trevaylor</i>	..	GCKG	A. G. Williams, O.B.E.	D. W. Falconer ..	..	..	..
<i>Tribesman</i>	..	GBNZ	A. Smart ..	..	..	..	..
<i>Tribulus</i>	..	GFJS	F. Leask ..	..	..	..	..
<i>Tronda</i>	..	MMLX	J. W. Leask ..	..	..	..	..

NAME OF VESSEL	CALL SIGN	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/MANAGERS	LAST RETURN RECEIVED
<i>Tweed</i> ..	GBRP	D. R. Miller	G. C. W. Meldrum, J. Chester, D. S. Guinness.	A. McInnes ..	Royal Mail Lines, Ltd. ..	17.10.49
<i>Twickenham</i> ..	GNDC	W. D. Shields, O.B.E.	M. Blair, D. A. Forrester, J. C. Howell ..	J. H. Parkes ..	Watts, Watts & Co., Ltd. ..	23.2.49
<i>Umtali</i> ..	GYWB	F. E. J. O'Hea ..	J. A. Bensley, F. Evans, D. G. Jupp, D. McNeill ..	S. Hewitt ..	Bullard, King & Co., Ltd. ..	25.5.48
<i>Umtata</i> ..	GDOF	I. W. Miles ..	B. J. McAree, H. K. Underwood, L. Farrer ..	A. H. Coxhead ..	Bullard, King & Co., Ltd. ..	12.2.49
<i>Umtzinto</i> ..	GIFQ	F. Harris ..	H. D. Nock, K. Canten, C. R. Dench ..	J. S. Sprunt ..	Bullard, King & Co., Ltd. ..	11.3.49
<i>Valacia</i> ..	MATR	J. G. Bradley, R.D., R.N.R.	N. Jones, J. D. Smythe, L. Portet ..	P. A. Hayes ..	Cunard White Star, Ltd. ..	13.12.47
<i>Vardulia</i> ..	GCFW	J. F. Drake, O.B.E., R.D., R.N.R.	J. M. Hughes, I. A. Stewart, A. Bull ..	F. Berry ..	Cunard White Star, Ltd. ..	14.10.48
<i>Vasconia</i> ..	MQJY	G. S. Evans ..	A. L. Davies, R. H. Arnott, A. R. W. Graham ..	W. J. Peat ..	Cunard White Star, Ltd. ..	31.3.49
<i>Vestra</i> ..	MNNB	D. S. Archibald	J. D. Mackenzie, I. Macalpine ..	D. S. Archibald	J. T. Salvesen & Co. ..	..
<i>Victrix</i> ..	GZLL	E. Garnett ..	C. F. Lawrence ..	F. Howell ..	Henriksen & Co. ..	..
<i>Vienna</i> ..	GTBR	A. P. Sutton ..	J. Shotton, R. Fergus, E. Atkinson ..	G. Williams ..	British Transport Commission (E.R.) ..	..
<i>Volo</i> ..	GPCJ	A. Morrill ..	T. Briggs, T. A. Firth, T. Johnson ..	A. C. Elliott	Ellerman's Wilson Line, Ltd. ..	22.4.48
<i>Waimana</i> ..	MATW	L. J. Hopkins ..	A. S. D. Masters, J. W. Webster, K. C. Davis, M. Lock, R. H. Dennison ..	J. Murphy ..	Shaw, Savill & Albion Co., Ltd. ..	10.5.49
<i>Waipawa</i> ..	GWXQ	F. A. Smith ..	I. Carroll, G. Watkins, —, Hignett ..	H. Jardine ..	Shaw, Savill & Albion Co., Ltd. ..	26.4.49
<i>Wairangi</i> ..	MATX	W. G. West ..	I. L. Harrison, G. Fairgrieve, F. Sangster ..	J. Downie ..	Shaw, Savill & Albion Co., Ltd. ..	5.8.49
<i>Waiwera</i> ..	GBJB	B. Forbes-Moffatt ..	F. Charnley, J. Gunning, A. C. H. Childs ..	G. Shaw ..	Shaw, Savill & Albion Co., Ltd. ..	13.8.49
<i>Warwick Castle</i> ..	GRRJ	J. Trayner ..	H. D. Lawton, M. M. Melson, J. Armstrong ..	W. Allen ..	Union-Castle Mail S.S. Co., Ltd. ..	23.6.49
<i>Yóna</i> ..	GLPN	M. M. Ramsay ..	J. Morgan, D. Wilson, J. Kinniborough ..	A. McLennon	P. Henderson & Co. ..	21.7.49
<i>Zealandic</i> ..	MAGJ	P. F. Owens ..	P. J. Brenmall, G. R. Sherlock, D. A. Atkinson ..	..	Rio Cape Lines, Ltd. ..	7.6.49
<i>Zent</i> ..	GRDW	F. T. Barber ..	..	..	Elders & Fyffes, Ltd. ..	28.1.48
<i>Conway, H.M.S.</i> ..	—	E. Hewitt, R.D., Capt., R.N.R.	The Senior Cadets ..	—	—	5.8.49
<i>Pangbourne Nautical College</i> ..	—	H. C. Skinner, O.B.E., Cdr., R.N.	The Senior Cadets ..	—	—	3.4.48
<i>Worcester, H.M.S.</i> ..	—	G. C. Steele, V.C., Cdr., R.N. (Retd.) ..	The Senior Cadets ..	—	—	25.7.49

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	OBSERVING OFFICER	RADIO OFFICER	OWNERS
Selected Ships:				
Kaitoke	H. S. Collier	G. R. Inkster	N. Barwell	Union S.S. Co.
Karetu	T. S. MacNicol	A. B. Macdonald	R. L. Nobbs	Union S.S. Co.
Karitane	C. W. Dovey	H. G. Harwood	A. E. Whalley	Union S.S. Co.
Kauri	W. H. C. Millward	R. E. P. Williams	L. V. Scott	Union S.S. Co.
Komata	W. J. Hill	J. C. Young	R. H. Willis	Union S.S. Co.
Kopua	F. T. Chapman	I. G. Sykes	W. L. Lambie	Union S.S. Co.
Korowai	I. Billingham	L. Joyce		Union S.S. Co.
Koromiko	A. F. Inman	J. W. Hannan	W. Hankins	Union S.S. Co.
Kurou	A. T. Adam	E. H. Busby	L. M. Harvey	Union S.S. Co.
Lautoka	A. Meldrum	F. Wright	L. Macallum	W. R. Carpenter & Co.
Matua	A. R. Russell	S. G. Taylor	E. H. Ward	Union S.S. Co.
Maua Pomare	L. C. Boulton	J. Hare	E. H. Ward	Union S.S. Co.
Monowai	G. B. Morgan, D.S.O., D.S.C.	D. A. Baigent	J. G. Rea	Union S.S. Co.
Piri	M. W. Monaghan	J. Drummond		Nobel (Australasia) Proprietary Ltd.
Port Waikato	C. Keith	J. Flett		Holm & Co.
Suna	R. Hamilton	E. G. Johnson	W. Marshall	W. R. Carpenter & Co.
Waipori	W. A. Gray	S. R. Davis	H. A. Shields	Union S.S. Co.
Wairata	F. W. Gibson	K. A. Manners	A. A. Lindsay	Union S.S. Co.
Wairimu	C. Burgess	J. G. Wailes	C. Ward	Union S.S. Co.
Waitaki	E. F. Rainbow	S. R. Sleeman	L. C. Calvert	Union S.S. Co.
Watemata	D. M. Keith	J. A. Barbour	J. A. Barbour	Union S.S. Co.
Supplementary Ships:				
James Cook	A. Deed	J. H. Kean	A. J. Jeans	H. C. Sliegh
Kaimiro	D. C. N. Champion	H. A. Hodgkinson		Union S.S. Co.
Kapako	L. Sinclair	R. K. Brown	E. A. Miller	Union S.S. Co.
Karepo	W. Kehoe	E. M. Bienenman		Union S.S. Co.
Kartigi	G. H. Edwards	P. H. Palin	R. N. Dennis	Union S.S. Co.
Kiwitea	R. Tulloch	J. R. Brace	N. F. Layther	Union S.S. Co.
Manuka	E. I. Johnson			Chatham Fishing Co.
Onana	H. H. Pike	H. J. Southworth	P. R. Walker	Union S.S. Co.
Viti	F. A. Barrett	L. Lindsay		Tasman S.S. Co.

FLEET LIST (Hong Kong)

VOLUNTARY OBSERVING SHIPS

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

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	SHIPPING COMPANY OR OPERATORS
<i>Anhui</i> ..	F. H. Histad	A. J. Keddie, H. M. Stanfield, P. H. Ward	Leung Man Sing	China Navigation Co., Ltd.
<i>Bris</i> ..	S. Eydjord	S. Midthassel, A. Reitan, A. Rossetlund	A. Reitan	China Siam Line
<i>Caroline Moller</i> ..	J. Adam	I. Mathieson, T. J. Smith, F. McKay	..	Mollers' (Hong Kong), Ltd.
<i>Chak Sang</i> ..	G. W. F. Edwards	B. D. Johnson, L. D. Markland, Yuan Tso Ying	..	Indo-China Steam Navigation Co.
<i>Choy Sang</i> ..	A. G. Robjant	I. E. Williams, E. Jones, A. Nelson	Im Ki	Indo-China Steam Navigation Co.
<i>Eastern Saga</i> ..	S. Schofield	W. E. Reeve, G. P. Parish, C. M. Wilson, F. L. Rowden	Chow Tong Wa	Indo-China Steam Navigation Co.
<i>E Sang</i> ..	I. Shiel	L. C. Cox, J. R. Findlay, A. O. Jakobsen	G. MacDonald	Indo-China Steam Navigation Co.
<i>Fengtien</i> ..	F. Gibbs	C. N. Stewart, C. L. Phillips, W. T. Masters	Ma Ping Leung	Indo-China Steam Navigation Co.
<i>Foochow</i> ..	E. G. Thomas	S. Fergusson, G. S. Ireland, J. S. Anderson	Leung Tjeuk Shing	China Navigation Co., Ltd.
<i>Fukien</i> ..	M. H. Wallace	C. M. Tso	Lam Bun Leung	China Navigation Co., Ltd.
<i>Fukien</i> ..	G. T. M. Ramsay	J. W. E. Warrior, L. Walker, A. Roddis	Y. S. King	Chinese Maritime Customs
<i>Greystoke Castle</i> ..	S. W. Millwright	F. Kelly, E. Docherty, R. N. Frappell, S. A. Archibald	Chin Fook On	China Navigation Co., Ltd.
<i>Hai Jung</i> ..	M. M. Stewart	P. F. Yee, P. S. Wang, M. S. Wang, H. S. Hsu	..	Mollers' (Hong Kong), Ltd.
<i>Hai Lee</i> ..	I. Hansen	R. Olsen, H. J. Mikkelsen, H. Andersen	K. S. Wang	Chinese Maritime Customs
<i>Hai Yang</i> ..	W. G. Erwin	J. R. Simpson, H. L. Jett	T. Y. Chan	China Siam Line
<i>Hang Sang</i> ..	L. W. Harrison	F. H. Smith, L. Oussanikoff	..	Douglas S.S. Co.
<i>Han ang</i> ..	O. Fox	L. King, S. H. Liu, J. R. Keddie	Young Shan	Indo-China Steam Navigation Co.
<i>Heinrich Jessen</i> ..	R. A. D. Neilsen	J. P. Johansen, C. S. Jensen, N. E. Christensen	Leung Cheuk Shing	China Navigation Co., Ltd.
<i>Hermelin</i> ..	S. B. Eliassen	Th. Pedersen, H. Berge, K. Andersen	P. Johnke	China Navigation Co., Ltd.
<i>Hin Sang</i> ..	C. R. Harris	R. C. Traill, W. Graham, D. Dekker	Th. Pedersen	China Siam Line
<i>Hiram</i> ..	Stange Olsen	T. Torkildsen, J. Jacobsen	E. V. Thoresen	Indo-China Steam Navigation Co.
<i>Hong Siang</i> ..	R. E. Agar	R. Goss, J. Barrett, H. B. Vance	K. T. Chan	China Siam Line
<i>Hunan</i> ..	J. McKinley	B. L. Miller, P. Flory, J. C. Cristal	E. A. West	Ho Hong S.S. Co.
<i>Hungking</i> ..	P. L. W. Leguit	H. K. Fung, H. M. Chu, Y. C. Hu	Choi Pong Cheung	China Navigation Co., Ltd.
<i>Hupei</i> ..	W. E. Awock	R. G. W. Gorman, E. W. Woodcock, A. P. Sokoloff	S. C. Wang	Chinese Maritime Customs
<i>Jungking</i> ..	C. C. Norman	P. Whitecross, E. C. C. M. Trestail, L. Ku	Tsang Kau	China Navigation Co., Ltd.
<i>Kwaiyang</i> ..	J. Taylor	D. W. R. Gash, M. D. B. Sweeny, G. Young	S. F. Yu	Chinese Maritime Customs
<i>Kut Sang</i> ..	D. G. Burleigh	F. H. Main, B. D. Hoatson, J. Jones	Leung Gan	China Navigation Co., Ltd.
<i>Lok Sang</i> ..	R. I. Groundwater	R. B. Todd, J. Mck. Marshall, G. E. N. Tinley	W. H. Carmichael	Indo-China Steam Navigation Co.
<i>Mau Sang</i> ..	R. G. Gillespie	J. H. Thomas, D. R. McFadden, P. Bock	E. J. Chew	Indo-China Steam Navigation Co.
<i>Muncaster Castle</i> ..	A. G. Gorham	W. A. Findlay, L. L. Watson, P. Potts	A. G. Lum	Indo-China Steam Navigation Co.
<i>Nanchang</i> ..	I. W. Evans	S. J. Yeandle, A. Harper, P. Baxter	..	Mollers' (Hong Kong), Ltd.
<i>Newchwang</i> ..	M. Defty	E. T. Griffiths, C. Stark, T. M. J. Davies	Chau Wing	China Navigation Co., Ltd.
			Liu Yuck Kong	China Navigation Co., Ltd.

NAME OF SHIP	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	SHIPPING COMPANY OR OPERATORS
<i>Ninghai</i>	E. J. Bower, St. E. M. F. Haelett, P. Bulatoff ..	Lo Kin Chek ..	China Navigation Co., Ltd.
<i>Pakhoi</i>	W. J. Bunney, S. Davidson, D. R. Mackenzie ..	Tang Chung Fai ..	China Navigation Co., Ltd.
<i>Poyang Sangola</i>	A. V. Harrison, W. Layfield, C. B. Skinner ..	Li San Kau ..	China Navigation Co., Ltd.
..	..	G. A. Brignall, J. R. Melgrove, C. P. C. Gordon ..	..	British India S.N. Co.
<i>Shansi</i>	E. Bruce, J. F. O'dowd, J. Hunter ..	I. E. Martieau ..	China Navigation Co., Ltd.
<i>Shengking</i>	N. McMillan, V. Walker, D. I. Robertson ..	E. J. Rozario ..	China Navigation Co., Ltd.
<i>Shirdala</i>	D. S. Hutton, T. L. Jones, C. G. Hirst ..	Tsang Piu Leung ..	British India S.N. Co.
<i>Sinkiang</i>	A. Watson, G. A. Rankin, R. M. Cooper ..	K. J. Bourke ..	China Navigation Co., Ltd.
<i>Sirdhana</i>	D. M. Reid, G. Usher, E. R. Daniels ..	Young Chow Yee ..	China Navigation Co., Ltd.
<i>Soochow</i>	D. Manthorpe, G. J. Gunderson, S. R. L. Tonkins ..	R. O. Smith ..	British India S.N. Co.
<i>Stanvac 312</i>	D. R. Williams ..	F. Gallatly ..	Australian Oriental Line
<i>Szechuen</i>	W. E. Hargrave, R. Tasker, P. T. Adams ..	Yu Pak Pui ..	Standard-Vacuum Oil Co.
<i>Tak Sang</i>	T. J. Ashcroft, K. P. Wilkinson, A. E. Ladbrooke ..	Yu In San ..	China Navigation Co., Ltd.
<i>Tai Chung Shan</i>	A. E. Lovegreen, K. Leung, K. K. Li ..	G. N. Williams ..	Indo-China Steam Navigation Co.
<i>Tai Ping</i>	J. W. Hurst, S. C. Chan ..	P. K. Ma ..	Shun Cheong S.N. Co.
<i>Tai Po Shan</i>	E. Johansen, I. H. Feng, K. K. Chu ..	S. L. Pong ..	United Corporation of China, Ltd.
<i>Teh Hsing</i>	F. Hindle, R. A. P. Spears, V. A. Boutskei ..	T. M. Cheng ..	Shun Cheong S.N. Co.
<i>Tsiran</i>	W. J. Bartlett, D. Knight, P. D. Coles ..	Wai Pun Un ..	Chinese Maritime Customs
<i>Wing Sang</i>	T. C. W. Marr, S. A. Sheridan, C. A. Bates ..	F. G. Hayes ..	China Navigation Co., Ltd.
<i>Wo Sang</i>	K. McLeod, T. R. Young, W. J. Coburn ..	A. W. J. Levack ..	Indo-China Steam Navigation Co.
<i>Yochow</i>	D. Rees, D. T. Le, M. Lu ..	Cheung Shing Cheung ..	China Navigation Co., Ltd.
<i>Yunking</i>	S. Duff, D. J. Mander, G. D. Rennie ..	S. F. Lai ..	Chinese Maritime Customs
<i>Yunnan</i>	Lee Hor Chung ..	China Navigation Co., Ltd.

FLEET LIST (India)

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

NAME OF VESSEL	OWNERS
Selected Ships :	
<i>Alavi</i>	Asiatic Steam Nav. Co., Ltd.
<i>Bahadur</i>	Asiatic Steam Nav. Co. Ltd.
<i>Chanda</i>	British India Steam Nav. Co., Ltd.
<i>Dara</i>	British India Steam Nav. Co., Ltd.
<i>Dumra</i>	British India Steam Nav. Co., Ltd.
<i>Dwarka</i>	British India Steam Nav. Co., Ltd.
<i>Englishtan</i>	Scindia Steam Nav. Co., Ltd.
<i>Havildar</i>	Asiatic Steam Nav. Co., Ltd.
<i>Islami</i>	Asiatic Steam Nav. Co., Ltd.
<i>Jaladuta</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalaganaga</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalagyoti</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalamani</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalamohan</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalarashmi</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalaveera</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalavihar</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalayamuna</i>	Scindia Steam Nav. Co., Ltd.
<i>Jehangir</i>	Asiatic Steam Nav. Co., Ltd.
<i>Kampala</i>	British India Steam Nav. Co., Ltd.
<i>Karanjia</i>	British India Steam Nav. Co., Ltd.
<i>Karapara</i>	British India Steam Nav. Co., Ltd.
<i>Khandalla</i>	British India Steam Nav. Co., Ltd.
<i>Khosrou</i>	Asiatic Steam Nav. Co., Ltd.
<i>Maharaja</i>	Asiatic Steam Nav. Co., Ltd.
<i>Masimpur</i>	Burma Oil Co.
<i>Nadir</i>	Asiatic Steam Nav. Co., Ltd.
<i>Nahadevi</i>	Asiatic Steam Nav. Co., Ltd.
<i>Nurjehan</i>	Asiatic Steam Nav. Co., Ltd.
<i>Pundit</i>	Asiatic Steam Nav. Co., Ltd.
<i>Rajput</i>	Asiatic Steam Nav. Co., Ltd.
<i>Rajula</i>	British India Steam Nav. Co., Ltd.
<i>Shahjehan</i>	Asiatic Steam Nav. Co., Ltd.
<i>Shirala</i>	British India Steam Nav. Co., Ltd.
<i>Singu</i>	Burma Oil Co.
<i>Sirsa</i>	British India Steam Nav. Co., Ltd.
<i>Subedar</i>	Asiatic Steam Nav. Co., Ltd.
<i>Tairea</i>	British India Steam Nav. Co., Ltd.
<i>Vasna</i>	British India Steam Nav. Co., Ltd.
<i>Yenang Young</i>	Burma Oil Co.
Supplementary Ships :	
<i>Akbar</i>	Asiatic Steam Nav. Co., Ltd.
<i>Badarpur</i>	Burma Oil Co.
<i>Bamora</i>	British India Steam Nav. Co., Ltd.
<i>Barla</i>	British India Steam Nav. Co., Ltd.
<i>Barpeta</i>	British India Steam Nav. Co., Ltd.
<i>Begum</i>	Asiatic Steam Nav. Co., Ltd.
<i>Binfield</i>	British India Steam Nav. Co., Ltd.
<i>Itaura</i>	British India Steam Nav. Co., Ltd.
<i>Jaladurga</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalagopal</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalakrishna</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalaratna</i>	Scindia Steam Nav. Co., Ltd.
<i>Jalavijaya</i>	Scindia Steam Nav. Co., Ltd.
<i>Malika</i>	Asiatic Steam Nav. Co., Ltd.
<i>Nurani</i>	Asiatic Steam Nav. Co., Ltd.
<i>Pasha</i>	Asiatic Steam Nav. Co., Ltd.
<i>Risalder</i>	Asiatic Steam Nav. Co., Ltd.
<i>Rizwani</i>	Asiatic Steam Nav. Co., Ltd.

FLEET LIST (Canada)

VOLUNTARY OBSERVING SHIPS

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

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

LIGHT VESSELS

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

NAME OF VESSEL	MASTERS
<i>East Goodwin</i>	A. Giblin
<i>Humber</i>	F. I. Butcher, L. A. Brett
<i>Newar</i>	B. Hadden, R. J. Middleton
<i>Royal Sovereign</i>	W. J. Sheaf
<i>Shipwash</i>	G. W. Broom, C. G. Isaac

MARID SHIPS

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

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

NOTICES TO MARINE OBSERVERS

Postal Arrangements

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

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

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

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

Ice Observation

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

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

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

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

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

RETURN OF LOGBOOKS

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

Meteorological Services for Shipping

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

Fleet List Call Signs

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

GREAT BRITAIN—LOCAL WEATHER FORECASTS

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

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

PORT	ADDRESS OF NEAREST FORECAST CENTRE	TELEPHONE No.
Aberdeen	The Meteorological Officer, Dyce Airport, Aberdeenshire	Dyce 331. 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, 111.
Dundee	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
Falmouth	The Senior Meteorological Officer, H.Q. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Glasgow	The Meteorological Officer, Renfrew Airport, Renfrewshire	Renfrew 2352. Ex. 21/3.
Hartlepool	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731/5. Ex. 230/1.
Hull	The Senior Meteorological Officer, H.Q. No. 1 Group, Royal Air Force, Bawtry, Doncaster, Yorkshire	Bawtry 363/7. Ex. 105
Inverness	The Senior Meteorological Officer, Royal Air Force, Raigmore, Inverness	Inverness 1853/8. Ex. 62/65.
Kirkwall	The Meteorological Officer, Hatston Airport, Orkneys	Kirkwall 421. Ex. 2.
Leith	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
London	The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2	Holborn 3434. Ex. 629.
Liverpool	The Senior Meteorological Officer, Speke Airport, Liverpool, 19	Garston 1240. Ex. 21/2.
Milford Haven	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Newcastle	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731. Ex. 230/1.
Plymouth	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Southampton	The Senior Meteorological Officer, Southampton Airport	Eastleigh 87228. Ex. 8/10.
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 J. C. Matheson, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone : Cardiff 4474.)

Southampton

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

AGENTS

Clyde

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

Forth

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

Humber

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

Tyne

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

OFFICERS OF THE METEOROLOGICAL SERVICES OF THE BRITISH COMMONWEALTH

CANADA

Headquarters

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

Halifax

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

Saint John

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

Vancouver

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

NEW ZEALAND

Wellington

The Director, Meteorological Office, Kelburn, Wellington, New Zealand. (Telephone : 44418.)

Marine Meteorological Officer, Post Office Box 72. (Telephone 44-418 ; Ext. 930.)

Auckland

Port Meteorological Officer, Meteorological Office, Mechanics Bay, Auckland. (Telephone : 49551.)

Lyttleton

Officer-in-Charge, Meteorological Office, Wigram Aerodrome. (Telephone : 32-585.)

Dunedin

Officer-in-Charge, Meteorological Office, Taieri Aerodrome, Dunedin. (Telephone : 21-666.)

SOUTH AFRICA

Cape Town

A. B. Crawford, Meteorological Office, Post Office, Maitland, Cape Town.

E. WILMAN & SONS, LTD.

Spinners and Manufacturers of

SPONGE CLOTHS, SCOURERS, DORSETS,
etc., of all types and descriptions

DECK AND HOUSE FLANNEL
in various widths, weights and qualities

SILK NOIL CLOTH FOR EXPLOSIVE
CHARGE BAGS

SILK NOIL YARNS FOR CHENILLES

Station Mills, Hadfield, Manchester

Telephone: Glossop 160

Telegrams: Noils, Hadfield

CADET SCHOOL SHIP



H.M.S. "CONWAY"

*Training
Afloat*

For the Royal Navy and the
Mercantile Marine

Age of admission: Between 13½ and
16½ years. Fees £200 p. a. (including
cost of uniform). Reductions for
Members of M.M.S.A. & N.E.O.U.

WRITE FOR PROSPECTUS: giving full details of training from 16, Nautilus
House, Rumford Place, Liverpool, 3

ABRIDGED LIST OF PUBLICATIONS OF THE METEOROLOGICAL OFFICE

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

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

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

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

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

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

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

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

(Amendments issued as necessary and priced separately.)

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

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

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

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

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

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

Meteorological Magazine. 8vo. Published monthly. Each 1s. Postage 1d.
(Annual subscription, 13s. post free.)