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The Marine Observer

A quarterly journal of Maritime Meteorology

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October, 1956

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THE MARINE OBSERVER

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prepared by the Marine Division of the
Meteorological Office

Vol. XXVI

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M.O. 608 AIR MINISTRY

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A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

VOL. XXVI **No. 174** **OCTOBER, 1956**

TABLE OF PRINCIPAL CONTENTS

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Editorial

One of the more difficult tasks of the professional meteorologist, engaged on general forecast duties, is to convey to a vast and varied number of clients a relatively brief word picture of the existing and future weather conditions over a wide geographical area. The weather bulletins he issues are normally broadcast by radio and are published in the newspapers, and his audiences vary from those whose livelihood depends on the weather, such as seamen and farmers, to rail and road transport users, industrialists of all types, sportsmen and the general public. The area that the British forecaster at the Central Forecasting Office in Dunstable has to deal with covers the whole of the United Kingdom, with all its topographical and geographical variations, and a number of extensive sea areas, stretching from Cape Finisterre to the Denmark Strait and out in the Atlantic nearly to Cape Farewell. To help him form his word picture he has before him a series of weather maps, showing conditions both at the surface and in the upper atmosphere and covering much of the northern hemisphere, and in the area in which he is primarily interested the picture may be complicated by the presence of various depressions, fronts, etc., at any time of the year. Even in summer-time, in otherwise settled conditions, the situation may be made difficult owing to thunderstorm risks. So that his audience can also have a reasonably clear mental picture of what is happening, it is first necessary to divide the area into a number of arbitrary divisions. Thus, in the forecast issued by the Meteorological Office for broadcast by radio, we have areas named South-east Region, Midland Region, etc. (which may be further sub-divided by counties, as necessary), Irish Sea, Hebrides, etc. (depending on whether it is a land area or a sea area). But these areas themselves are extensive and each land area at least has its own meteorological problems due to local peculiarities. Even if the forecaster had a Shakespearian command of English, an intimate knowledge of local topography and no restriction as to the length of message, he would still find it virtually impossible to give an exact forecast for every section of every area. All he can do is to convey in very general terms a brief picture of the weather at present, followed by an almost equally brief account (based upon his scientific knowledge and experience as a forecaster) as to the general developments that he expects will take place during the next 12 hours or so.

Having decided this, with the aid of a " prebaratic " or forecast chart, his next problem is how to convey his conclusions to his clients. The particular needs of aviation are dealt with at the airfields in the form of a verbal briefing to the pilots and the issue of written forecasts, including weather maps in plan and section, and by coded radio bulletins issued to the aircraft in flight. Similarly, the particular needs of shipping are catered for by means of coastal and Atlantic bulletins issued by radio both by the B.B.C. and G.P.O. radio stations, and those of the various interested parties ashore are met by bulletins issued by the B.B.C. or through the Press.

The forecaster can, and does, use a different technique for each purpose. Thus, for the mariner the wind force is given in Beaufort numbers and the direction in compass points because that is what the mariner is used to. In the case of visibility, the terms " good ", " moderate ", " poor ", etc., are used, each descriptive term covering a range of visibility. Thus, " dense fog " means visibility less than 50 yards, " fog " 50–100 yards, " slight fog " 200–1,000 yards, " mist or haze " 1,100–2,200 yards, " poor visibility " 1¼–2½ miles, " moderate visibility " 2½–6¼ miles and " good visibility " 6¼–25 miles. Frequently the forecaster will use the term " fog patches " to indicate that, during her passage through the area, a ship will probably encounter a certain amount of fog which may be extensive but is not expected to be general. In other words, it is a way of stating that fog may be expected in that area, the extent of which is a bit uncertain.

For the general public a somewhat different phraseology is used. In this case wind is not so important and the wind force and direction are indicated in general terms such as " moderate northerly ", and the emphasis is rather on the character of the weather itself, such terms as " occasional rain ", " thundery rain ", " thundery showers " being used. The terms " backing " and " veering " of the wind are fairly frequently used both in the forecasts for landsmen as well as for seamen.

Much information on this subject is contained in a useful little illustrated booklet entitled *Your Weather Service*, which is obtainable from Her Majesty's Stationery Office or from any bookseller at the modest price of 1s. 6d. This booklet is due for a revision to include recent changes in the contents and schedule of forecasts, but even in its present form it is well worth reading. A shorter pamphlet concerning sea area forecasts (entitled *Weather Forecasts and Warnings for Coastwise Shipping*) is obtainable on request from Port Meteorological Officers or by writing to the Director of the Meteorological Office.

The forecast service which is provided by the British Meteorological Office is also provided in a similar manner by most other Meteorological Services of the world. Thus, the visitor to Paris or Buenos Aires will read the *prevision du jour* or the *pronostico del tiempo* respectively in the newspapers, hear it broadcast by radio or see it on the television, or (as in the United Kingdom) he can probably quite easily obtain a special forecast by phone. The arrangements for co-ordinating such activities in all parts of the world are carried out by the World Meteorological Organisation in accordance with advice given by its various Technical Commissions. The preparation of the forecast itself is essentially an international business because, in order to prepare an adequate weather map, the meteorologist in every country needs numerous and regular messages from other countries and from ships of all nationalities at sea, and the contents of the bulletins broadly follow an agreed international pattern.

The Commission for Maritime Meteorology of the W.M.O. is holding its second session in Hamburg in October this year. During that conference various matters concerning meteorology as applied to the shipping industry will be discussed. The agenda includes the preparation of an international pamphlet on the meteorological care of cargo; international arrangements for the distribution to ships of blank synoptic maps of various oceanic areas; the possibility of introducing a forecast code for use by countries which are not able to issue forecasts in English; ways and means of improving the network of observations from ships in various parts of the ocean with the eventual object of improving the quality of forecasts; possible measures for persuading certain countries which do not at present co-operate to recruit some selected ships; the treatment of marine observations for the International Geophysical Year programme; and international co-ordination for the preparation of marine climatological atlases.

Most maritime countries are represented on this Commission and although most of the members are meteorologists there are a number of seamen on the Commission, so that the mariner's practical viewpoint is always kept well in mind. Although this will only be the second conference of this Commission under the W.M.O. (it held an earlier conference in London in 1951), the Commission for Maritime Meteorology has been in existence for many years under the former International Meteorological Organisation, having been instituted at Paris in 1907; it held its first conference in London in 1909. The International Meteorological Organisation itself was formed in 1872.

The problem of the meteorological care of cargo is perhaps one of the most striking examples of the application of meteorology to the needs of the shipping industry. Thanks to observations made by voluntary observers at sea during many years, there is available a considerable amount of climatological information in all oceans, and a study can therefore be made by meteorologists as to the variations in air temperature, dew point and sea temperature which a ship may expect to encounter during a certain voyage, at various times of the year. Bearing in mind the various types of cargo which the ship is likely to carry, and the varying conditions which may be encountered during the voyage, both in the open air and inside the hold, meteorological advice can be given to ship-owners and ships' officers as to simple and practical steps which can be taken to minimise moisture damage to cargo in ships' holds. More exact rainfall data than is obtainable at sea is available at certain loading and discharging ports and is also of value. Many ship-owners and ships' officers undoubtedly know a lot about this subject of "meteorological care of cargo" already, but it is a complicated question and one concerning which more knowledge is needed.

In order to make the best use of the advice which they are given about this subject, it is essential that ships' officers themselves properly appreciate the problem and know something about the meteorological factors concerned. Considerable interest in this question is being shown in certain maritime countries—notably Western Germany—where a conference entirely devoted to the subject was held in Hamburg in June this year under the auspices of the West German Meteorological Office. At this conference various experts gave lectures explaining the complexity of the problems involved and gave practical advice as to possible ways of dealing with some of them. It is hoped that a summary of some of these lectures can be published in a future number of *The Marine Observer*. Various papers on this subject have already been written in the United Kingdom, some of which have been extensively quoted in *The Marine Observer*. The Commission for Maritime Meteorology of the W.M.O. has a Working Group which is studying this question, and it is hoped that a comprehensive guide giving summarised advice as to how best to minimise risk of damage to cargo in ships' holds due to moisture, without the necessity of the ship-owner going to the expense of providing any elaborate equipment, will be made available as a result of this conference. Shipping is essentially an international industry and it is the shipmaster's duty to the shippers, consignees and to his owners to carry his cargo in as good condition as possible. Cargo which is damaged due to faulty ventilation is an example of avoidable waste on an international scale and inevitably has an effect upon the prices that the consumer has to pay. Anything which can be done to assist in preventing such waste is to the good of all concerned.

MARINE SUPERINTENDENT

SPECIAL LONG-SERVICE AWARDS

Each year since 1948 the Director of the Meteorological Office has made a special award to a maximum of four voluntary marine observers whose long and meritorious work at sea, on behalf of the Meteorological Office, is considered as deserving special recognition. The basic qualification for this award is a minimum of 15 years during which meteorological records have been received from the observer. To ensure that the award is made fairly, considerable care is taken in the Marine Division of the Meteorological Office to check the records both as regards actual years of observing and the quality of the individual logbooks. A mathematical formula giving credit for the number of years in which records have been received and the classes into which the records have been assessed, effectually places the observers with the basic qualifications in an order of merit.

This year the Director is pleased to make these awards to the following captains:

CAPTAIN L. W. FULCHER (New Zealand Shipping Company), whose first meteorological logbook was received here in 1929. In 16 years he has sent us 31 records, 27 of which have been classed excellent.

CAPTAIN D. M. MACLEAN, D.S.C., R.D., R.N.R. (retired) (Cunard Line). A voluntary observer since 1925. In 17 years he has sent us 89 records of which 48 have been classed excellent.

CAPTAIN F. LOUGHEED (New Zealand Shipping Company). A voluntary observer since 1924, who in 15 years has sent in 24 records, 19 of them having been classed excellent.

CAPTAIN P. H. POTTER, O.B.E. (Bibby Line), whose first meteorological record was received here in 1921. Since then he has, in 15 years, sent us 42 records of which 28 have been classed excellent.

The award will as in past years be in the form of a suitably inscribed barograph. We congratulate these captains on this recognition of their voluntary work over many years. They will be personally notified of the award and of the arrangements which will be made for its presentation.

THE MARINE OBSERVERS' LOG

October, November, December

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

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

Responsibility for each observation rests with the contributor.

LINE OF DEMARCATION

Coral Sea

M.V. *Port Dunedin*. Captain E. W. Dingle, M.B.E. Balboa to Brisbane. Observers, the Master and Mr. A. A. Gough, 3rd Officer.

16th October, 1955, 0000 G.M.T. The vessel steamed parallel to and at a cable's distance southward of a narrow but very distinct line of demarcation in the water. A little weed was also observed but attempts to secure a specimen failed. After 4½ miles the line followed an erratic course in the same general direction for another ¾ mile before taking a sudden sweep to the southward. The sweep recurved after another 1½ miles had been steamed, and then the line became very scattered and broken until it faded completely.

Position of ship: 15° 25′S., 151° 32′W.

PHOSPHORESCENCE

South African waters

M.V. *Dominion Monarch*. Captain B. Forbes Moffatt. Fremantle to Cape Town. Observer, Mr. M. Thornton, 3rd Officer.

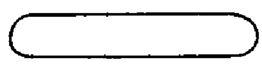
9th November, 1955, 1815 G.M.T. Fifteen minutes after having crossed the 100-fm line four long streaks of phosphorescence were seen lying 060°–240°, of a bright bluish colour. They were seen some distance off. The vessel passed through two of the streaks but did not appear to break them up. All were seen simultaneously, were in sight for about 5 min and then disappeared. There was no movement to be seen and no fading. No further phosphorescence was observed. Sea temp. 70°F.

Position of ship: 34° 40′S., 24° 40′E.

Gulf of Guinea

S.S. *Clan Forbes*. Captain I. C. Scott. Cape Town to Dakar. Observer, Mr. C. L. Lea-Swain, 3rd Officer.

14th October, 1955, 2200 G.M.T. The vessel passed through an extensive phosphorescent mass, some of which was just beneath the surface and some floating.



The mass consisted of separate pieces, all oval-shaped and measuring approximately 9 in. by 3 in. broad. As far as could be observed all the pieces appeared to be of the same size and shape. They did not seem to move through the water; all objects and edges were clearly defined.

Position of ship: 2° 00′S., 7° 56′W.

Gulf of Aden

M.V. *Cambridge*. Captain P. P. O. Harrison. Sydney to Aden. Observers, the Master, Mr. R. Burton, Chief Officer, Mr. W. Field, Radio Officer, and others.

12th October, 1955, 1930 S.M.T. The sea showed no phosphorescence at all, not even in the bow wave, except where light from the ship reached it, and the least amount of light started phosphorescence. Shining an Aldis light on the sea produced a fascinating sight. The whole sea surface was dotted with red-yellow pinpoint lights and there was another type of phosphorescent object beneath the surface. The latter were innumerable, the largest about a foot long; they gave some impression of animation and may have been fish, but it was difficult to say for certain. It was only necessary to touch the sea with the light for it to burst into a blue-green fire. Running the light out to sea produced a bright glowing beam for lengths up to 500 ft (about the ship's length). By switching the light on and off a dozen times a dozen bright blue traces were left. By 2000 the brighter "blobs" of phosphorescence had gone, but when the light was shone on the water a glow remained, as also did the pinpoints of red light.

Position of ship at 1930: 12° 15′N., 48° 15′E.

13th October, 1955. At 2115 S.M.T. the sea suddenly took on a brilliant electric blue colour. The bow waves and white caps showed the colour more clearly. There was no reaction on this occasion to the Aldis light. The phosphorescence lasted for 5 to 6 miles on a course of 272°, $15\frac{1}{2}$ kt.

Position of ship at 2115: 12° 29′N., 44° 11′E.

Note. The observation of 12th October is extremely interesting, as we have had very few previous accounts of the effect of light in stimulating phosphorescence and none in which the result appeared to be so spectacular. The Aldis light was used in an observation made in the Indian Ocean by M.V. *Port Lincoln*, published on page 28 of the January 1955 number of this journal, wherein it was stated that "wherever the light was shone a trail of phosphorescence followed (even at 150 yd range) and remained quite bright for about 30 sec". On this occasion the ship's lights also produced phosphorescence when they fell on the water, but there was phosphorescence in the sea independent of that produced by light stimulation.

It seems likely that reaction to light is not common, otherwise in the hundreds of observations of phosphorescence we have received the effect of the ships' lights on the sea would have been much more frequently noted and remarked upon. It would be valuable if we could have further observations of the effect of light in producing or brightening phosphorescence.

South Pacific Ocean

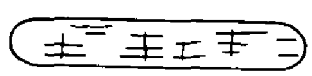
S.S. *City of Edinburgh*. Captain W. Nimmo. Lyttleton to Balboa. Observer, Mr. F. W. More, 2nd Officer.

11th October, 1955, 1100 G.M.T. Very large and brilliant pieces of phosphorescence, averaging (at sight) about 18 in. in length, surrounded the vessel in converging bands running from W'S. to E'N. The ship appeared in the centre of the phenomenon, and up to eight bands were distinguished on either side. Phosphorescence beyond could be seen but it was impossible to see any pattern. The phenomenon was visible for 10 min. and towards the end of this period large globular balls were seen and appeared to be at some depth below the surface, but the shape and colour were not clear cut. Air temp. 54°F, wet bulb 53°, sea 55°. Cloudless.

Position of ship: 38° 01'S., 146° 06'W.

M.V. *Port Pirie*. Captain D. C. H. Bradley. Bluff to Panama Canal. Observer, Mr. P. P. Crumpton, 3rd Officer.

27th October, 1955, 1330–1430 G.M.T. There were a great many pieces of very bright phosphorescence which resembled a lenticular cellular plant. From the ship's bridge (height 45 ft) the pieces were thought to be 12–18 in. long and 4–6 in. wide on the average. Definite patterns were noted as shown in the sketch.



These were green in colour. The phosphorescent objects were visible for about 200 yd from the ship and seemed to be floating just underneath the surface and glowed very brightly in the broken seas. Wind SW., force 7–8; overcast, light rain, no moon. Very rough sea and heavy SW'ly swell.

Position of ship: 45° 35'S., 176° 40'W.

A similar phenomenon was observed at approximately the same time the following night. By then the weather had moderated considerably, but the phosphorescence was equally bright.

Position of ship on 28th October: 44° 15'S., 168° 20'W.

North Pacific Ocean

S.S. *Loch Gowan*. Captain E. N. Giller, M.B.E. Balboa to Los Angeles. Observer, Mr. J. Marks, 4th Officer.

2nd December, 1955, 0000 G.M.T. A large amount of phosphorescence was observed in the form of small balls which appeared when the water broke. The balls were coloured an intense green, and were 2–4 in. in diameter.

Position of ship: 14° 54'N., 97° 30'W.

WEATHER CONDITIONS

Little Bitter Lake, Suez Canal

M.V. *Dilwara*. Captain M. G. Williams. Southampton to Aden. Observer, Mr. R. J. Elston, 3rd Officer.

2nd October, 1955. Passing through the Little Bitter Lake, going south, the wind changed from W., force 2, to SE., force 3, at 1130 G.M.T. and became very hot. The SE. wind blew at the same strength for three hours during which time the air was very dry. Although it was coming off the desert there was no sand present. At 1130 the dry bulb was 102°F and the wet bulb 68°. Barometer 1007·8 mb.

Note. This observation is of considerable interest. At Suez, light offshore winds almost always blow in the early afternoon, with an average relative humidity of just under 40%. The above temperature readings in Little Bitter Lake give a relative humidity of only 12%. At Suez a temperature above 95° is unusual in October and 100° is seldom exceeded after August.

FOG PATCHES AND SQUALL

North Atlantic Ocean

S.S. *Beaverlodge*. Captain L. H. Johnson. Antwerp to St. John, N.B. Observer, Mr. J. Hooley, 3rd Officer.

7th December, 1955. The ship was proceeding through fog patches. Wind SE., force 3. Air temp. 51°F, bar (corrected) 993·9 mb. Suddenly at 0420 G.M.T. there was a terrific roar of wind and the ship heeled over as a fierce squall passed over which cleared the fog. The squall lasted about 8 min with very heavy rain. Afterwards the air temperature was found to be 43°. No appreciable change in barometer reading occurred. The wind eventually settled at SW., force 5. At 0600 the temperature had fallen to 40°.

Position of ship: 47° 32′N., 43° 34′W.

Note. This is an interesting and unusual occurrence. Evidently a front passed over the ship. At 1200 on 6th December there was a depression centred over the Newfoundland region, with a secondary depression in about 40°N., 37°W. At 1200 on 7th December the main depression was centred northward of Newfoundland. There were then two secondary depressions, one far to the eastward of Newfoundland and the other far to the south-eastward, with a complex system of fronts extending as far eastwards as about 26°W.

KATABATIC WIND

Icelandic waters

S.S. *Cairnavon*. Captain G. Percy. Reykjavik to Grangemouth. Observer, Mr. K. A. Murray, 2nd Officer.

23rd December, 1955. At 1100 G.M.T. as the vessel was leaving Reykjavik harbour there was a strong NE'ly gale blowing off Esja Mountain, 2,575 ft, distance 5·6 miles. This wind was assumed to be katabatic, since once clear of the land the wind backed to N. and moderated considerably.

WATERSPOUT

North Atlantic Ocean

S.S. *Bassano*. Captain C. H. Tutty. Middlesbrough to New York. Observer, Mr. A. M. Robson, 2nd Officer.

18th October, 1955, 1845–1855 G.M.T. After exceptional heavy rainfall which reduced visibility to about 1 cable for approx. 10 min a waterspout was seen to form at the rear of the fast-receding Fs clouds. The wind was previously 170°, force 7, and increasing. It veered to 260° and remained in that direction for the full period of the observation, i.e. from the waterspout bearing 220° to abeam, distant 1 cable. The wind then backed slowly to 200°, force 6. Air temp. 71°F, sea 71°. Course 250°(T), speed 12 kt.

Position of ship: 42° 20′N., 57° 40′W.

Mediterranean Sea

S.S. *Esso Canterbury*. Captain J. W. Smith. Banias to Fawley. Observer, Mr. W. D. Walters, 3rd Officer.

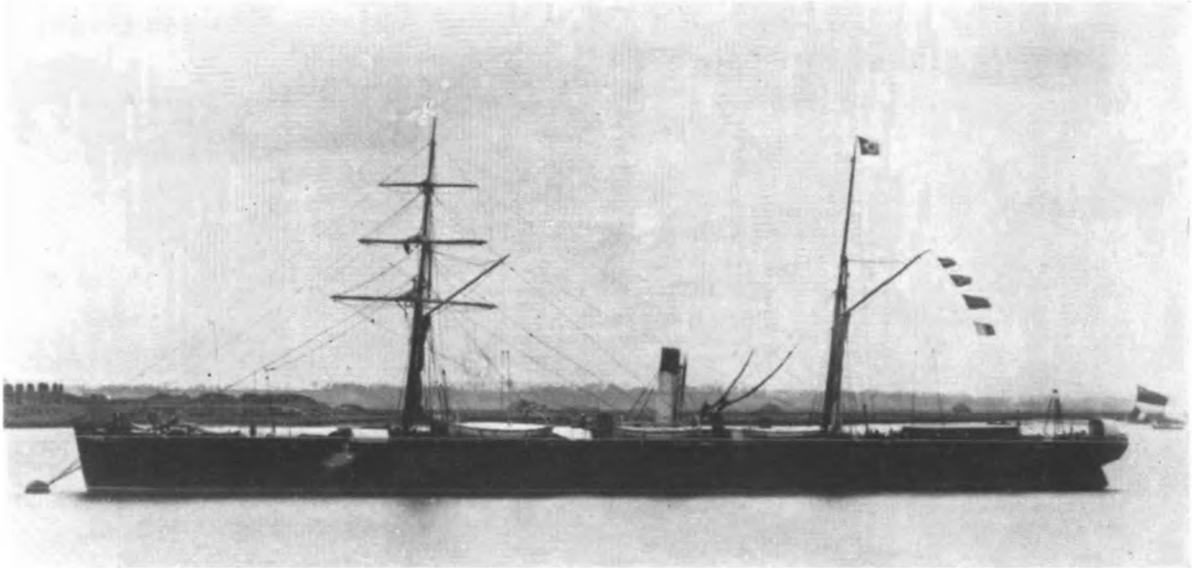
26th October, 1955, 0930 G.M.T. A waterspout was seen from the ship about 4 miles to N. It travelled in a SE'ly direction at about 15 kt, and lasted for 20 min.

(*Opposite page* 200)

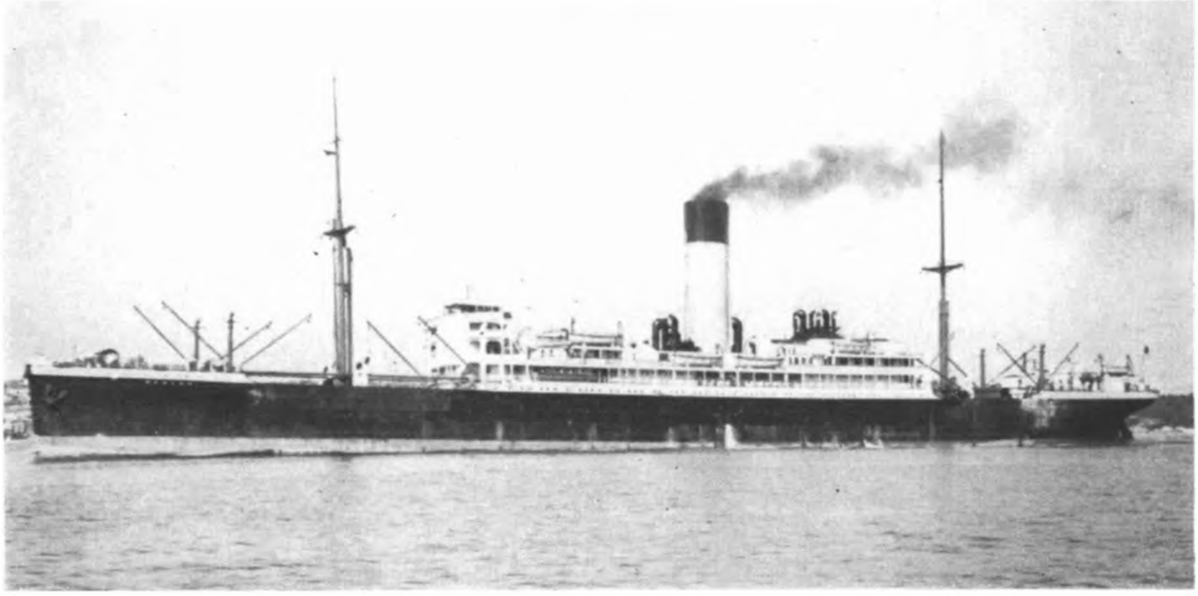
Photograph of a waterspout taken aboard S.S. *Bassano* on 18th October, 1955, in 42° 20′N., 57° 40′W. (see opposite).

The presentation of an Excellent Award by the Australian Bureau of Meteorology to M.V. *Duntroon*. The photograph shows Mr. L. J. Dwyer, the Director, with Captain L. N. Fry and Mr. D. G. Eadie, Radio Officer. In the background is the citation and the award, a print of Melbourne in 1861, as it will be permanently displayed in the ship's lounge.

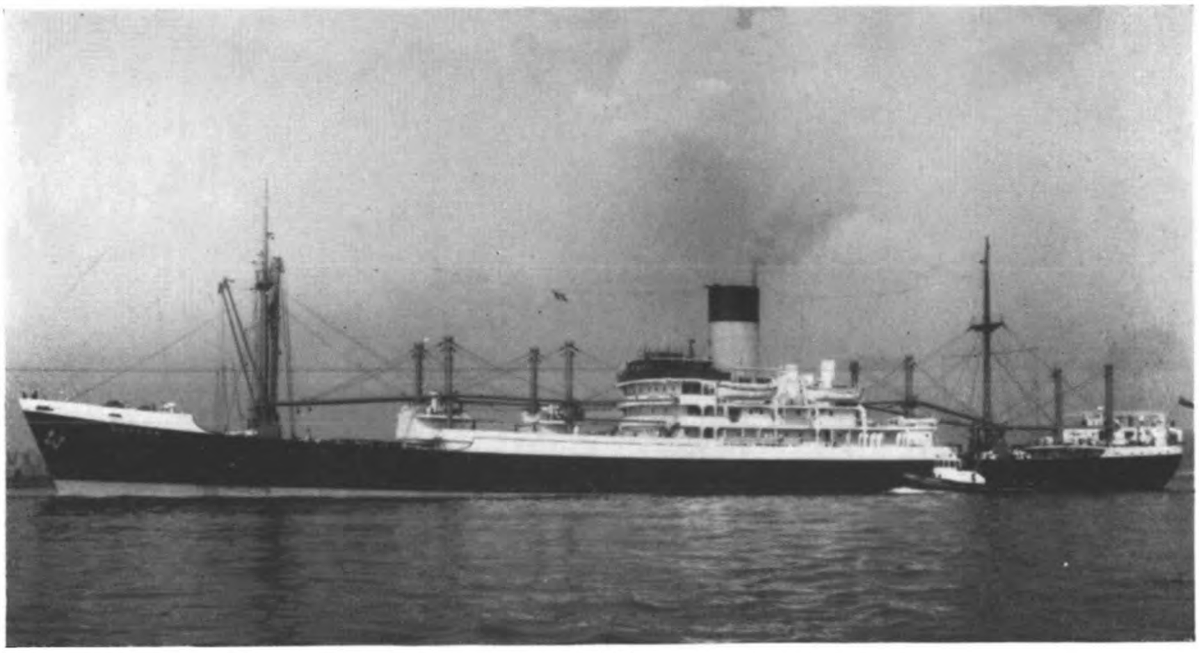
(*Opposite page* 201)



1868



1913



1952

S.S. *Nestor* (Alfred Holt and Co.).

When first seen it was quite wide at the top, tapering slightly to a definite break at the bottom, as shown in the first sketch. Later it became very narrow and

curved, and the break at the bottom was not so clear. Wind NW., force 4, increased to force 6 at 0945, decreased to force 4 again at 1015. Sky overcast.

Position of ship: 35° 58′N., 18° 00′E.

Bass Strait

S.S. *Captain Cook.* Captain A. Bankier. Wellington to Fremantle. Observers, Mr. I. MacInnes, 2nd Officer, and Mr. W. S. Doodson, 4th Officer.

3rd December, 1955, 1875 G.M.T. Two waterspouts observed on the edge of a very dark Cb cloud were followed by a heavy shower of rain and hail with lightning but no thunder. The waterspouts extended to about 1,000 ft in height and were about 1,000 ft apart when first sighted. They converged on each other and eventually formed one large waterspout.

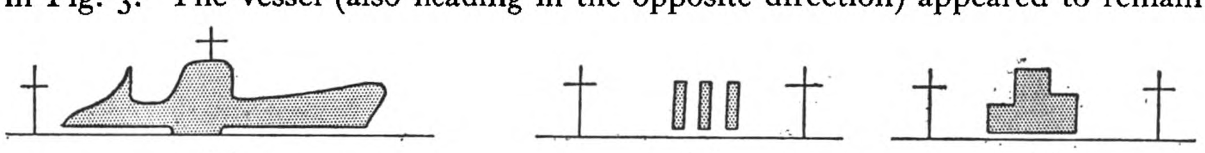
Position of ship: 39° 12′S., 147° 30′E.

ABNORMAL REFRACTION

Gulf of Aden

M.V. *City of Johannesburg.* Captain W. J. Merchant. Colombo to Aden. Observer, Mr. P. Collin, 4th Officer.

1st November, 1955, 1400 G.M.T. A vessel bearing 300°(T) was observed as shown in Fig. 1. Five minutes later she had taken on a normal shape and subsequently proved to be heading in the opposite direction to ourselves. Another vessel was observed bearing 350° and appeared as in Fig. 2. At 1410 the superstructure was seen to change colour from black to buff and the shape appeared as in Fig. 3. The vessel (also heading in the opposite direction) appeared to remain



(1) (2) (3)

in this shape until no longer visible. Sky cloudless, excellent visibility. Air temp. 81°F, wet bulb 70°, sea 84°.

Position of ship: 12° 14½′N., 49° 03′E.

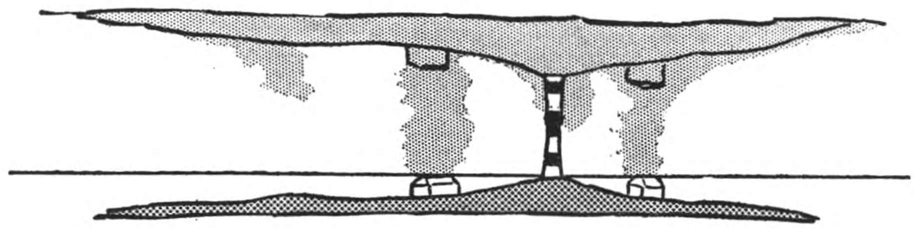
S.S. *Maihar.* Captain J. Clarke. Djibouti to Madras. Observer, Mr. J. Hanbidge, 3rd Officer.

10th November, 1955, 0620 G.M.T. The sketches show the changes in a vessel's appearance at 9 miles distance during a period of 8 min. Cloud 1/8 fair weather Cu. Sun's altitude 49°. Dry bulb 79°F, wet bulb 72·5°.

Position of ship: 12° 12′N., 50° 24′E.

Approach to Cape Town

M.V. *Imperial Star*. Captain G. C. Goudie. Tenerife to Cape Town. Observers, the Master and Mr. G. J. Miles, 2nd Officer.



25th October, 1955, 1700 G.M.T. At a distance of 12 miles to S. of Dassen Island the island and light appeared to be inverted above the actual island, an effect which was not noticeable to the N. of the island.

Great Australian Bight

S.S. *Ixion*. Captain R. Blakey. Albany to Adelaide. Observer, Mr. A. T. Moody, 3rd Officer.

7th December, 1955, 0730 G.M.T. The nearest land, Stuart Point, bearing 020° at 43 miles, appeared poised about 10′ above the true horizon. Land could also be seen to NNW., Flinders Island at 70 miles. Many double images could be seen, one inverted over another, and the illusion kept changing in appearance. The refraction continued throughout the afternoon and early evening. Air temp. 68°F, wet bulb 63°, sea 60°. Cloud 7/8 Sc.

Position of ship: 35° 27′S., 135° 04′E.

LUNAR RAINBOW

Ionian Sea

M.V. *British Consul*. Captain J. H. Nelson. Venice to Piraeus. Observer, Mr. A. H. Skellern, 2nd Officer.

26th November, 1955, 2300 G.M.T. As a heavy thunderstorm began to clear a bright lunar rainbow was observed, bearing SE. At the time the moon was bearing W. at altitude approximately 20°. All colours of the spectrum were clearly defined. The phenomenon was repeated at 2400 in similar conditions.

Position of ship: 38° 52′N., 19° 50′E.

Mediterranean Sea

S.S. *Empire Fowey*. Captain W. T. C. Lethbridge. Southampton to Port Said. Observer, Mr. D. H. R. White, Supernumerary 2nd Officer.

28th November, 1955, 0145 G.M.T. A lunar rainbow was observed in process of formation ahead, commencing with the northern lower arc and gradually spreading until at about 0205 a complete arc was visible. At about 0225 a secondary bow appeared which gradually became almost complete. The moon was bearing W., altitude 10°, the altitude of the vertex of the bow was 28°. The intensity of the primary bow was moderate with colours faintly visible; the secondary bow was faint with colours hardly apparent. Cloud 4/8 Cu and Cb to eastward.

Position of ship: 34° 12′N., 22° 00′E.

LUNAR CORONA

Indian Ocean

M.V. *Lustrous*. Captain Stuart Weatherston. Newcastle, N.S.W., to Abadan. Observer, Mr. G. E. Baker, Chief Officer.

23rd October, 1955, 1218 G.M.T. The first quarter moon, at altitude 75° 30′, was surrounded by a circular area of approximate diameter $1\frac{1}{2}°$, bright yellow in colour. Outside this was a deep purple ring of width equal to half the moon's diameter. Cloud, Cu of considerable development with funnel clouds, also Ac and Cc. Afterwards the sky became overcast and a heavy rain squall began at 1315.

Position of ship: 7° 00′S., 89° 30′E.

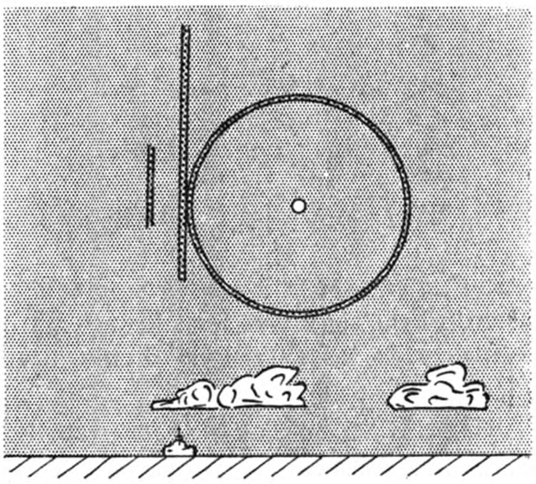
Note. This is an interesting observation of an abnormal corona. The inner part of a corona, known as the aureole, normally consists of a yellowish or bluish-white area surrounded by a brownish-red ring. This may be all that is seen, but when more fully developed there is an external series of rings showing the spectrum colours, the violet ring being inside, nearest the sun or moon, and the red outside. On rare occasions this colour sequence is repeated outwards two, three or even four times. On the present occasion it appears that while the rings of the other spectrum colours were absent, the inner violet ring was unusually pronounced and combined with the reddish ring of the aureole to give the impression of a deep purple colour.

LUNAR HALO

South Pacific Ocean

M.V. *Gloucester.* Captain D. A. G. Dickens, R.N.R. Balboa to Auckland. Observer, Mr. L. E. Howell, 3rd Officer.

22nd October, 1955, 2045 S.M.T. A lunar halo was observed, which appeared white, of radius $21\frac{1}{2}°$. The altitude of the moon was 49° 30′. Two parallel lines, about 5° apart, one of which was a tangent to the halo, stretched over the observer's



zenith. The longer line (similar thickness to the halo) was approximately 50° long, while the shorter line was approximately 15° long. These lines were only seen for about 5 min although the halo lasted about an hour. Cloud 6/8, mainly Cs.

Position of ship: 30° 23′S., 139° 49′W.

Note. No explanation can be given of the two parallel luminous lines as they do not constitute any known halo phenomenon. It is also difficult to explain them on the supposition that they were lines of cloud illuminated by the moon, on account of their extreme straightness and regular width.

South China Sea

S.S. *Yo Chow.* Captain V. R. Woolfe. Bangkok to Hong Kong. Observer, the Master.

26th November, 1955, 1200 G.M.T. A perfect lunar halo was observed with radius of inner edge $23\frac{1}{2}°$–24°, moon's altitude 75°. Width of halo estimated to be not more than 1°, sharply defined on inner edge and fairly clear on outer edge. Colour white. Sky inside halo appeared very much darker than that outside it. Cloud cover 8/8 As, with some passing Cb.

At 1230 the halo became less distinct in the NW. quadrant but remained in the

SE. Cloud, uniform As over the whole sky. At 1300 halo became less bright and remained so until it was obscured by low Cu at 1530.

Position of ship at 1200: 12° 48′N., 109° 39′E.

Note. This observation was forwarded to us by the Director, Royal Observatory, Hong Kong, who sends us the following remarks:

"The synoptic situation existing at the time indicates that the layer of altostratus cloud causing the halo was associated with a very active trough to the south of the ship, which stretched across the South China Sea into the Pacific and in which was formed the tropical storm which did considerable damage in the Philippines on 28th and 29th November, and became typhoon Patsy on 1st December after it had recurved into the Pacific."

This observation is interesting as the halo of 23½° radius is very rarely observed. If it occurs it is usually masked by the ordinary 22° halo on which it is partly superimposed, resulting in the appearance of a 22° halo having a greater breadth than normal. A previous observation of the 23½° halo, without the 22° halo being present, will be found on page 152 of the July, 1955, number of this journal. The cloud present was presumably Cs, since halos are not produced with As.

North Atlantic Ocean

M.V. *Cambridge*. Captain P. P. O. Harrison. Liverpool to Curaçao. Observer, Mr. R. Pook, 3rd Officer.

26th December, 1955. A white lunar halo was seen, of radius 11½° to the inner edge of the halo. Moon's altitude 66° 17′. Cloud, a thin Ci veil, also 4/8 Ac, which cleared quickly. At 2325 S.M.T. before the cloud cleared a corona was visible in addition to the halo; this showed orange-green on its inner edge and rusty on the outer.

Position of ship: 39° 57′N., 21° 20′W.

Note. The halo of about 11° radius has only been observed on a few occasions. A previous observation, by S.S. *Brasil Star*, will be found on page 15 of the January 1954 number of this journal. In that observation the radius was also measured as 11½°.

M.V. *Linga*. Captain W. Anderson. Jacksonville to Curaçao. Observer, Mr. W. Kelly, 2nd Officer.

6th October, 1955, 0500 G.M.T. A lunar halo was observed, radius 20½°, altitude of moon 58°. The halo when first seen was a yellowish white, but later the colours of the spectrum were visible. It lasted till 0630 and was then obscured by Ac.

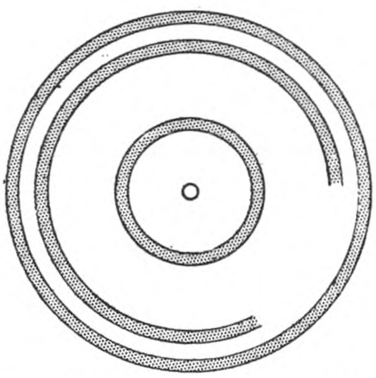
Position of ship: 19° 37′N., 68° 10′W.

SOLAR HALO

New Zealand waters

M.V. *Brisbane Star*. Captain S. Foulkes. Auckland to Panama. Observer, Mr. M. K. S. Mann, 3rd Officer.

4th December, 1955, 0000 G.M.T. A well-defined solar halo was observed with



the colours of the spectrum ranging from red to blue, and inside radius 21° 42′, outside radius approximately 22° 17′. There was also a corona with little colour and radius approximately 9° 40′. At 0030 the phenomenon increased in intensity and a second halo appeared with an approximate radius of 20°. For a short time the colours of the spectrum were also visible in this halo, but soon faded. Shortly afterwards Ac obscured the phenomenon. High cloud appeared to consist of Cc, thin and patchy.

Position of ship: 36° 37′S., 176° 44′W.

South Pacific Ocean

M.V. *Brisbane Star*. Captain S. Foulkes. Auckland to Panama. Observer, Mr. T. J. E. Dyer, 4th Officer.

8th December, 1955, 2010 G.M.T. A solar halo was observed with initial radius about 20°, faint yellow in colour. By 2030 the radius of the halo increased to about 24° and became quite vivid in intensity. The colours of the spectrum were easily defined. The halo was visible till 2045, when it was obscured by Cc. Cloud 8/8, thin Cs and 5/8 Ac.

Position of ship: 29° 55′S., 140° 28′W.

Note. The radius of a halo depends on the shape of the ice crystals forming the Cs cloud producing the halo, also on the orientation of the crystals, that is, the way they are floating in the air with respect to the horizontal. While the better known halos, e.g. the 22° halo (actual radius 21° 50′) have constant radii, some of the rarer halos appear from the observations available to have radii which differ to some extent on different occasions. Thus under the designation of the halos of 17°, halos with radii of from 16¾°–18° are grouped, thus including the observation of M.V. *Port Dunedin* (see below). Similarly observations of radii of from 18½°–20° are grouped under the designation of the halo of 19°. The observations of M.V. *Brisbane Star* above include halos with radii of about 20°. The observation of M.V. *Linga* of a 20½° halo is interesting as the radius exceeds the range given above. It is not, however, unique, as a halo of 20° 43′ has been recorded.

It may be found as our knowledge increases that there are, really, a considerably larger number of different halos of constant radii than are at present recognised, each produced by a definite form and orientation of ice crystal. The subject presents difficulties. Halos are, at best, somewhat indistinct phenomena and in certain states of sky may be very indistinct, so that an observation of a radius, however carefully made, may not be very accurate. Furthermore the more usual halos such as those of 22° and 46° can be readily explained by geometrical optics as being produced by well-known forms of ice crystals, but there are probably other forms of crystal as yet unknown to us, of more or less rare occurrence, which would produce halos of what are known as abnormal radii.

Two halos of about 24°, one of 23° 24′ and the other of 24° 34′, are known to be possible and are occasionally observed. The observation of M.V. *Port Brisbane* on 8th December is of one of these (see also the observation of S.S. *Yo Chow* above). The observation of M.V *Port Brisbane* of 4th December is of singular interest, the halos of 20° and 22° being visible simultaneously, each with its range of spectrum colours distinct from the other, without partial superimposition or blurring. This is probably a unique observation.

Indian Ocean

M.V. *Port Dunedin*. Captain E. W. Dingle, M.B.E. Melbourne to Aden. Observers, the Master and Mr. G. H. Boswell, 3rd Officer.

29th December, 1955, 0545 G.M.T. A complete solar halo was observed with radius 18° to the inner circumference and 19° 21′ to the outer. The upper half of the halo had a yellow tint and the lower half a reddish tint. Complete layer of Cs.

Position of ship: 13° 40′S., 75° 36′E.

Note. See the note to observations of M.V. *Linga* and M.V. *Brisbane Star* above.

SKY COLORATION

Gulf of Aden

S.S. *Canton*. Captain J. L. W. Last, O.B.E. Southampton to Hong Kong. Observer, Mr. K. S. Maclean, 4th Officer.

24th–25th November, 1955. At 1800 G.M.T. the sky was of a very light colour, pale greenish at the horizon. There was also a green corona round the moon. At

0600 on 25th sky was strangely pale. The sun had a large area of white light surrounding it. Wind E'N. force 3.

Position of ship at 1800: 14° 24′N., 52° 36′E.

Note. The observer suggests that these phenomena were due to a dust-laden atmosphere. This was probably the case and it seems likely that fine dust was present at a considerable height, since the observer reports that the visibility was excellent at the time, 25 miles or more.

GREEN FLASH

Eastern North Atlantic Ocean

R.R.S. *Discovery II.* Captain H. O. L'Estrange, D.S.C. Gibraltar to Plymouth. Observers, the Master, Mr. R. M. Frederick, 2nd Officer, and Mr. I. R. Norrington, 3rd Officer.

13th November, 1955. The sun set with a green flash just visible to the unaided eye. Venus set shortly after with vivid green flash, following a series of changing colours for a few minutes before setting. Next day at approximately 0130 Jupiter and Canopus rose in the horizon blood-red.

Position of ship: 30° 00′N., 16° 00′W.

Arabian Sea

M.V. *British Resource.* Captain S. Bruce. Bandar Mashur to Suez. Observer, Mr. J. S. Fitzwalter, 2nd Officer.

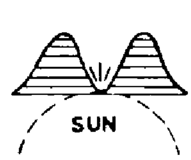
26th November, 1955. The setting of Venus was observed: the magnitude of the planet, —3·3, decreased to about —1·0 as altitude decreased to approximately 0° 30′. Nearer to the horizon, at say 0° 10′, the planet regained former brilliance but had a reddish hue. As Venus approached the horizon its magnitude varied between —2·0 and 0·0, the reddish hue being maintained. On actually setting, a green flash was observed of about $\frac{1}{5}$ sec duration and magnitude —1·0. Visibility was such that Jabal Khanier at 65 miles could be seen shortly before the phenomenon occurred.

Position of ship: 21° 18′N., 59° 30′E.

Red Sea

S.S. *Empire Clyde.* Captain A. C. Johnston. Port Said to Aden. Observers, Mr. G. Ramage, Chief Officer, and Mr. R. B. Douglas, 2nd Officer.

(1)



(2)

11th December, 1955, 1448 G.M.T. The sun set between two mountains on the Sudanese coast. When the sun had reached a position as in sketch 1, where the upper limb was level with the mountain peaks, a green flash was observed on either side. When the sun's upper limb had just disappeared as in sketch 2, another green flash was observed. The first two flashes were rather weak, the third was a brilliant green. Visibility excellent.

Position of ship: 24° 23′N., 36° 06′E.

Note. It is possible to see two or more successive green flashes from different parts of the sun when it sets behind distant irregular mountains, cliffs or islands, but suitable occasions do not occur very frequently. In the present observation the first two flashes were weaker than the third since the sun was then at a higher altitude.

Gulf of Aden

S.S. *Clan Alpine*. Captain T. O. Marr. Aden to Bombay. Observer, Mr. A. C. Myhill, 3rd Officer.

1st October, 1955, 1500 G.M.T. Shortly after sunset a green-blue band of light was visible clearly defined on a background of light Ci. The band was apparently radiating from the place of the sun's setting (bearing 263°). The base of the band was about 2° wide and gradually broadened out towards the zenith. The total duration of the phenomenon was about 15 min.

Position of ship: 13° 00′N., 48° 16′E.

North Pacific Ocean

M.V. *Cingalese Prince*. Captain R. C. Proctor, O.B.E. San Francisco to Manila. Observer, Mr. J. F. Newton, 2nd Officer.

2nd October, 1955, 0840 G.M.T. The sun was observed through binoculars as it was setting and the following phenomena noted. When approximately half the sun was below the horizon it began to shoot off from the edges at the horizon light green rays. At the same time an intermittent light green mist of varying intensity appeared to drift fairly rapidly across the sun's surface in a S.–N. direction. A vivid green flash was observed as the sun finally disappeared.

Position of ship: 20° 45′N., 152° 00′E.

S.S. *Loch Gowan*. Captain E. N. Giller, M.B.E. Balboa to Los Angeles. Observer, Mr. J. Marks, 4th Officer.

2nd December, 1955. Whilst observing the sunset a green flash was seen which lasted for about 1½ sec. It extended over an arc of some 5° and had an altitude of about 7°.

Position of ship: 14° 54′N., 97° 30′W.

Note. The observations of S.S. *Clan Alpine*, M.V. *Cingalese Prince* and S.S. *Loch Gowan* afford further interesting varieties of green sky coloration associated with sunset. See also the observation of M.V. *City of Johannesburg* and the note attached thereto on page 15 of the January 1956 number of this journal.

AURORA

North Atlantic Ocean

S.S. *Cairnavon*. Captain G. Percy. Port Alfred to Leith. Observers, Mr. J. O. M. Davidson, 3rd Officer, and Mr. D. W. Cook, Radio Officer.

22nd October, 1955. At 2200 G.M.T. a white glow was observed over a large area of the northern sky. This increased in brilliance until after a period of about 10 min it appeared to reach full brilliancy in the form of an arc and assume a slight greenish colour. The arc stretched from 300° to 030°. Rays reaching to a maximum of 20° altitude were observed coming mainly from the middle of the arc. At about midnight the rays disappeared and the arc faded to a glow resembling the first appearance of dawn in the tropics. During the display all the horizon was covered by cloud which reached an altitude of about 5°. Local radio stations which should have been at maximum signal strength were almost inaudible.

Position of ship: 58° 35′N., 17° 52′W.

S.S. *Begonia*. Captain R. Reekie. Swansea to Montreal. Observer, Mr. J. M. Oliver, 2nd Officer.

16th November, 1955, between 0230 and 0430. About 2/8 of the northern sky was illuminated by aurora. There was no arc visible but several rays were in evidence. These rays changed position quite frequently. The phenomenon was quite bright and lasted for about two hours.

Position of ship: 51° 26′N., 31° 18′W.

S.S. *Cairnavon*. Captain G. Percy. Grangemouth to Montreal. Observers, Mr. J. O. M. Davidson, 3rd Officer, and Mr. D. W. Cook, Radio Officer.

18th November, 1955. At 1800 G.M.T. aurora was first observed through breaks in the clouds as a ray traversing the sky from 300° to 060° through the zenith. Little change occurred until about 2000 when an arc formed from 260° to 040°, altitude 3° in the west rising to 10° at the north-eastern end. The arc was about 5° wide, and rays with curtains were observed to rise from it at times. At 2155 the arc disintegrated and faded except for a dim length between 260° and 290°. At 2200 the aurora regained brilliancy and took the form of a double arc from 260° to 330° with a 5° space between them at 260° and a 10° space at 330°. This double arc rapidly broke up across a section of the sky from 270° to 060°, with the vertex at 350°. Rapid changes in form occurred and most types were observed, including auroral corona which formed at 2240 and again at 2254. At 2310 the aurora began to fade and cloud which was developing from the S. obscured the sky and no further observations were possible. A complete radio blackout occurred on H.F. but conditions were above normal on M.F.

Position of ship: 59° 00'N., 24° 00'W.

Barents Sea

S.S. *Menastone*. Captain S. F. Sheasby. Igarka to Brest. Observer, Mr. A. R. Todd, 2nd Officer.

13th October, 1955, at 2330 G.M.T. A bright display of aurora was visible in a single shallow arc beginning at an altitude of 5° bearing 280°, rising to an altitude of 21° and gradually disappearing at 7° bearing 040°. At 2343 the arc was fading and reaching horizon, several faint bands in pairs appearing along the arc. At 2345 the centre of the arc was fading leaving a faint curtain effect. At 2350 the whole had disappeared and only a faint suspicion of light remained along the original arc.

Position of ship: 70° 38'N., 42° 38'E.

Denmark Strait

S.S. *Begonia*. Captain J. Shaw. Port Churchill to Reykjavik. Observer, Mr. J. B. Barker, 2nd Officer.

15th October, 1955, 0300 G.M.T. Moderate auroral activity in the form of diffuse patches, green in colour, were observed to move irregularly across the sky from the southern horizon through the zenith towards the north horizon. There was an occasional particularly bright whorl of light, clearly defined and green in colour, above the western horizon.

Position of ship: 60° 10'N., 40° 00'W.

Hudson Strait

S.S. *Begonia*. Captain J. Shaw. Port Churchill to Reykjavik. Observer, Mr. J. B. Barker, 2nd Officer.

11th October, 1955, 0420 G.M.T. Aurora was visible in the form of arcs; the highest was at altitude 61°, and the azimuths of its ends 085° and 265°. This arc was exceptionally bright for about 15 min and there were fainter arcs between it and the southern horizon. The fainter arcs were pale green in colour; the ends of all the arcs were 12° to 15° above the horizon. Auroral activity lasted until dawn, with arcs, draperies, irregular rays and diffuse patches lying across the sky. An outstanding arc at 0635 was at altitude 26° 10' and reached the horizon at each end, bearings 052° and 250°, and was a clearly defined pale green. At 0710 rays from the end of this arc reached to the zenith, and the inside of the triangle was filled with rays darting towards the zenith.

Position of ship: 60° 36'N., 60° 42'W.

North Pacific Ocean

S.S. *B.C. Standard Service.* Observer, Mr. C. H. Lelievre.

10th October, 1955, 0835 G.M.T. Observed aurora extending from about 10° W. of Ursa Major to about 10° to the E. of the constellation, it being below the pole. The summit or vertex of the arc was situated about 10° E. of and 5° above the star Benetnasch. When first observed the display lacked pulsating bands and seemed of an almost uniform glow brightening slightly towards the base, which was obscured by mountains for about 5° above the horizon.

At 0905 one wide pulsation extending to rim of arc slightly to the E. of Phecda. At 0915 two narrow pulsations extending to rim of arc, slightly to the W. of Benetnasch. At 0941 display lost in spreading cloud and in glow of rising moon. Radio reception was poor for 12 hours previous which would indicate a magnetic storm of some intensity.

Position of ship: 49° 06·5′N., 123° 50·5′W.

Note. This observation was forwarded to us by the Controller, Canadian Meteorological Division.

New Zealand waters

M.V. *Hauraki.* Captain R. Hollingdale. At Timaru. Observer, Mr. J. Stringfellow, 3rd Officer.

20th November, 1955, 0245 S.M.T. Brilliant rays of light over an arc of 10° lay ahead of ship in appearance as of sunrise or sunset. The rays became orange-red for a period of 3 min. A few minutes later similar rays occurred on the left-hand side of the arc. The rays were first noticed at 0215 and faded at 0300.

Position of ship: 44° 23′S., 171° 42′E.

Bass Strait

S.S. *Orcades.* Captain N. W. Smith. Sydney to Melbourne. Observer, Mr. N. I. Collett, 3rd Officer.

19th November, 1955, 1400–1600 G.M.T. From Gabo Island to Cape Everard the brilliant spectacle of the " Southern Lights " was observed, consisting mainly of hanging curtains of whitish light continually pulsating and rippling, and occasionally changing to a rose-pink colour for a few seconds at a time. The aurora gradually faded towards the end of the period.

METEOR

North Atlantic Ocean

S.S. *Andes.* Captain H. H. Treweeks. Las Palmas to Salvador. Observers, M. J. S. Wisden, 2nd Officer, and Mr. J. D. Williams, 4th Officer.

7th October, 1955, 2355 G.M.T. A bright green meteor was observed moving slowly from bearing 290°, altitude approximately 8°, to 280°, altitude approximately 4°, where it exploded into at least four pieces. Each piece was visible to the unaided eye for 2–3 sec before disappearing. The meteor was visible for a total period of 8 sec.

Position of ship: 18° 13′N., 20° 43′W.

S.S. *Tetela.* Captain W. F. Young. Birkenhead to Jamaica. Observer, Mr. N. W. Thomas, 3rd Officer.

7th October, 1955, 0208 G.M.T. A brilliant meteor was observed which appeared quite suddenly at bearing approximately 215°(T), altitude 18°, and moved horizontally at a fairly slow speed in a SE'ly direction. It was yellowish in colour and had a trail extending for about 2°. When at bearing about 195°(T) its altitude decreased slightly and appeared to become divided into pieces of equal size, separated by

about 1°, one following the other in the same line. The altitude of these pieces began to decrease more rapidly as they went beyond a patch of lenticular Ac at about 10°, bearing approximately 170°. The meteor could be seen momentarily through the cloud, but soon disappeared and was not observed below the lower limit of the cloud at 5° altitude. The observed duration of flight was 6 or 7 sec. It was about twice the brilliance of Venus.
Position of ship: 23° 20′N., 66° 54′W.

Bay of Biscay

M.V. *Esso Cambridge*. Captain R. Drummond. Persian Gulf to Fawley. Observer, Mr. R. Chapman, 2nd Officer.

4th November, 1955, 0240 G.M.T. A meteor was observed bearing S. It had a blue head and a vivid red trail of extraordinary brilliance.
Position of ship: off Cape Finisterre.

Strait of Gibraltar

S.S. *Philomel*. Captain H. Selmer. Palermo to London. Observer, Mr. G. Rowe May, Chief Officer.

15th November, 1955, 1919 G.M.T. A meteor was sighted bearing 341°, elevation 35°. It first appeared close to Kochab and fell apparently slowly to about elevation 10° towards Dubhe, when it disappeared. Its shape at first was almost spherical, greenish-white in colour, and of a magnitude estimated to be four to six times that of Venus. As it descended it assumed a pear shape and a deeper green, and left a trail of white sparks which persisted for about 1 sec. The whole phenomenon lasted for 2 to 2½ sec. Sky almost cloudless: visibility extremely good.
Position of ship: 36° 14½′N., 6° 31′W.

Arabian Sea

M.V. *Dilwara*. Captain M. G. Williams. Aden to Colombo. Observer, Mr. R. J. Elston, 3rd Officer.

10th October, 1955, 2000 G.M.T. A large meteor appeared at altitude 60°, bearing 105°, and disappeared 3 sec later close to Aldebaran, altitude 45°, bearing 075°. The meteor was brilliant white in colour and as bright as the full moon, being difficult to look at with eyes accustomed to the dark. The trail, some 5° long and orange in colour, seemed to consist mainly of several large pieces and did not persist after the meteor disappeared.
Position of ship: 9° 45′N., 62° 54′E.

M.V. *British Piper*. Captain M. Hutchinson. Abadan to Djibouti. Observer, Mr. G. Lambert, 2nd Officer.

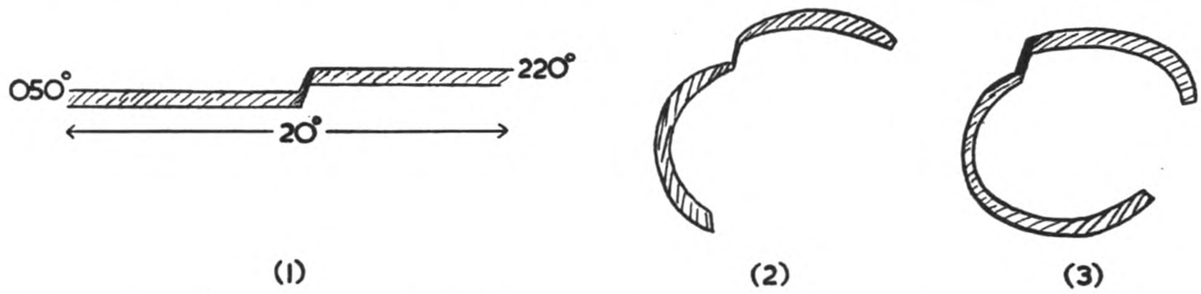
16th December, 1955, 0350 G.M.T. A large meteor, brighter than Sirius and surrounded by an electric-blue glow, was observed for about 3 sec travelling between Orion's belt and Sirius. The meteor disappeared behind Cu cloud, but the reflected glow was visible on the fringe of the cloud.
Position of ship: 21° 32′N., 59° 38′E.

METEOR TRAIL

East Pacific Ocean

S.S. *City of Edinburgh*. Captain W. Nimmo. Lyttleton to Balboa. Observer, Mr. F. W. More, 2nd Officer.

19th October, 1955, 0807 G.M.T. A brilliant white flash lasting less than a second lighted up ship and sea from horizon to horizon. Unfortunately the cause was not seen, but immediately afterwards a long trail was visible, therefore deduced cause to be a large meteor. Remains of the trail were visible for 10 min more. It took up peculiar shapes as shown in the sketches. When first seen it was as in the first



sketch and then over a period of 5 min it gradually changed, the two ends coming round to form a nearly complete circle. The third sketch shows the trail just before dispersing. A feature of all the varying stages was the abrupt break as shown, where nearly a 90° angle in trail was formed. Sky cloudless.

Position of ship: 17° 13′S., 107° 22′W.

Note. This is an interesting observation of a kind we do not receive very often, since the great majority of meteors have trails which either do not persist at all or last only a few seconds. Some have no trails at all. Observations of this kind enable us to estimate wind direction in the high atmosphere, providing that three or four identifiable stars are included in each drawing of the trail; the position of the trail should be estimated and drawn as exactly as possible with reference to these stars. The exact time of each observation should also be noted. If such observations of the same meteor trail are available from two ships, the distance between which is, say, 15 to 200 miles, it becomes possible to work out the speed and direction of the wind at the height of the trail. Though less accurate, some information could also be got from the observation of a single ship.

The trail seen on the present occasion is the form of a ribbon and it is curious that, in spite of obvious changes in the trail as a whole, the short central section is presented edgewise to the observer throughout.

HURRICANE IONE

North Atlantic Ocean

On page 140 of the July 1956 number of this journal we published an observation by M.V. *Gloucester* of this hurricane, stating that it had also been sent to the Chief of the United States Weather Bureau. Dr. Reichelderfer's reply was received too late for publication with the observation. He wrote as follows:

" The U.S. Weather Bureau received from M.V. *Gloucester* several radio weather messages while the vessel was underway in the storm area. We are very grateful for the excellent co-operation of the captain and his officers in furnishing frequent reports on this occasion. These data were of much value to our forecasters in preparing and issuing warnings while hurricane Ione was in progress. We are pleased to have the copy of the vessel's synoptic observations as a valuable addition to our climatological data concerning this tropical storm. The extremely lucid account of the experiences aboard this vessel should make an interesting contribution to *The Marine Observer*."

NESTOR

We publish opposite page 201 photographs of three ships belonging to Messrs. Alfred Holt & Co., each of which has borne the name *Nestor* and each of which has been a voluntary observing ship.

The first *Nestor* (1868) was a voluntary observing ship for several years when she was under the command of Captain T. W. Freeman, on the run Liverpool to Shanghai via Suez. One of her early logbooks shows her to have made the passage to Suez in 17 days, to Penang in 40 days, Hong Kong in 52 days and Shanghai in 59 days. A feature of her logbooks is the number and variety of additional remarks in them. Quoting a day at random:

> June 23, 1878. Fine clear sunrise. Light brassy sky. Butterflies and moths make their appearance.
> At 7.25 a.m. Cape Bon abeam, distant 15 miles.
> 11 a.m. Sea very smooth. A school of grampus.
> At noon Pantellaria abeam 16 miles.
> 2 p.m. Passed two turtle. Several sail in sight. The coast of Sicily visible, 35–40 miles.
> At sunset sky partially overspread in the western quarter with a greasy cirrostratus.
> Midnight. Stars out bright.

All temperatures were read to the decimal point and sea-water temperature taken not only by the bucket method but also from the intake, noted as 20 feet below the surface. Observations in those days were taken six times a day at the end of the watch, and it is interesting to note that this ship maintained her homeward observations until she was past the South Foreland.

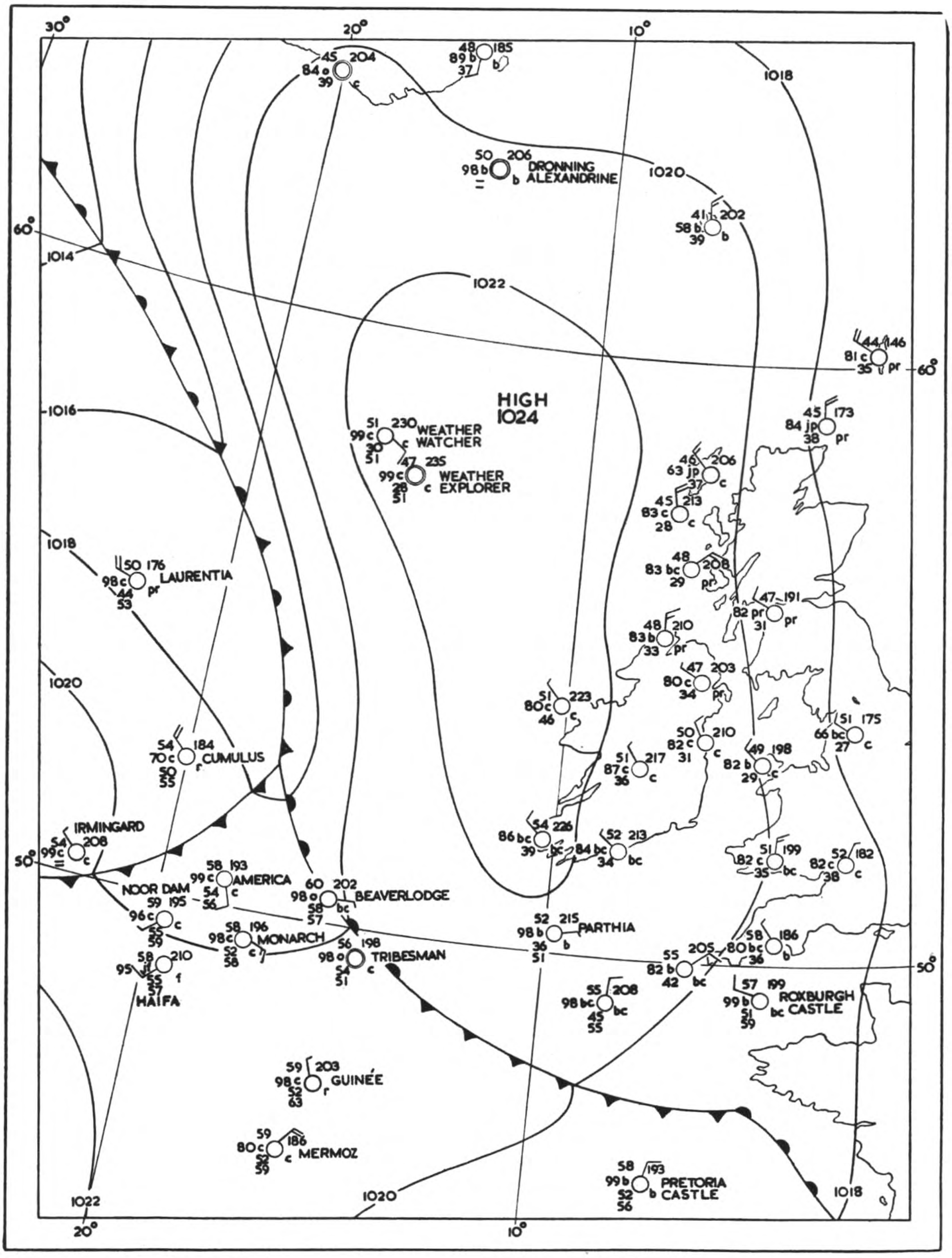
Under Captain R. D. Owen, O.B.E., the second *Nestor* (1913) started keeping meteorological records after the First World War. They were made on a form which provided for observations at 8 a.m. and 8 p.m. only. These forms left little room for remarks, but we read that on 14th August, 1924, a partial eclipse of the moon was observed in 10° 45′N., 18° 21′W., on the passage from Australia to London via the Cape of Good Hope.

The present *Nestor* (1952) has been observing for us under the command of Captain J. M. Anderson since she sailed on her first voyage and gained Excellent Awards in 1954, 1955 and 1956.

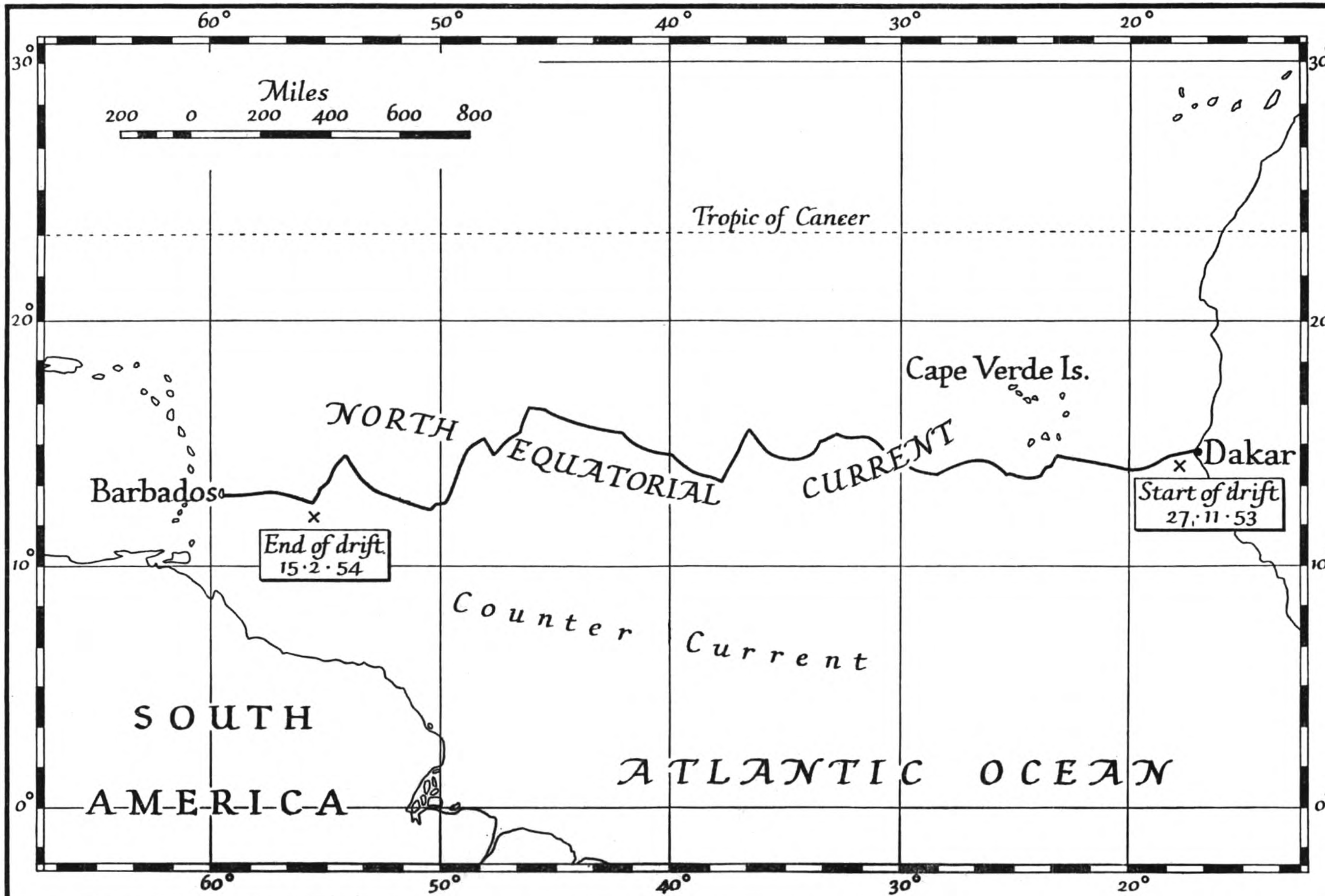
It is hoped to continue the series of three observing ships of the same name in the October number of *The Marine Observer* each year.

LOW RELATIVE HUMIDITY OVER THE ATLANTIC

A recent meteorological report from the British ocean weather ship *Weather Explorer* during her period of duty at ocean station I (position 59°N., 19°W.) during April–May, 1956, included the statement, " Towards the end of the voyage the air was unusually dry with humidities below 60 per cent ". An extract from the ship's meteorological logbook shows that during her homeward passage, when in position 57° 42′N., 15° 6′W., at 1200 G.M.T. on 18th May, a dry bulb temperature of 47°F accompanied by a dew point of 28° was observed, the relative humidity being 47 per cent. Such a low humidity is unusual for this part of the ocean and was doubtless accounted for by the existence of a ridge of high pressure over the area (see chart) giving little vertical mixing due to stable conditions and very light winds (a calm was reported by the *Weather Explorer* at 1200 G.M.T.). The humidity at this time was much the same as that at Tiree where the air temperature was 48°F and the dew point 29°, and at Benbecula where the temperature was 45°F and the dew point 28°.



Synoptic chart for 1200 G.M.T. on 18th May, 1956.



[By courtesy of the Institute of Navigation

Track chart of the yacht *Petula*.

The *Petula's* Meteorological Logbook

By C. N. Dickson and F. Evans, B.Sc.

(Mr. Dickson is now a scientific assistant in the Meteorological Office; Mr. Evans is a zoologist at the Dove Marine Laboratory and was formerly 2nd Officer in S.S. *Umtali*. They both took part in this voyage, Mr. Evans being the leader of the expedition and Mr. Dickson the meteorologist/radio operator.)

The voyage of the yacht *Petula* from Dakar to Barbados during the winter of 1953–54 produced a considerable volume of meteorological and hydrographic data, much of which is still under review. The purpose of the present account is to give an outline of only those observations recorded in the yacht's selected ship meteorological logbook. A general account of the voyage has already been given[1]; briefly, it was undertaken to study aspects of biology, meteorology and hydrography close to the sea surface in the Atlantic North Equatorial Current. The yacht, a 12-ton yawl, sailed from Dakar on 26th November, 1953, with a 16-foot raft in tow, and drifting under staysail alone reached Barbados on 16th February, 1954 (see photograph opposite page 216). There was a crew of three aboard.

Before we sailed we foresaw that from this small, slowly-drifting yacht and from the raft we might make meteorological and hydrographic observations of some significance. With this aim in view we approached the Marine Division of the Meteorological Office for advice and assistance in organising our meteorological programme. Standard selected ship instruments were lent to us by the Meteorological Office and items were specially made for us. On passage we made observations regularly in the ship's synoptic code from 29th November to 14th February at midnight, 0600, 1200 and 1800 G.M.T.

Wind

Perhaps the most interesting features of our meteorological logbook are the wind columns. Wind speeds were estimated owing to a power failure on the anemometers. During the early part of the voyage we experienced normal trade winds, but on the western side of the Atlantic we often felt that the wind was unusually strong, and on occasion we encountered squalls in excess of 45 knots. To discover whether the wind was in fact abnormal we have turned to two valuable papers by Professor P. R. Crowe.[2] Following his methods we analysed our wind records for December, January and the first half of February and also for longitudes 30°–40°W. and 40°–50°W. It should be noted that the bounding latitudes of our track were 12½°N. and 15½°N.

Table 1. Wind Speed and Direction

Date 1953–54	Longitude W.	No. of observations	Mean direction	% Trades	Mean wind speed	
					All winds	Trades
1.12–31.12	20°–33°	124	047°	82	11·6	13·6
1.1–31.1	33°–49°	124	070°	94	16·7	17·7
1.2–14.2	49°–55°	55	073°	100	17·2	17·2
23.12–15.1	30°–40°	93	—	83	12·0	13·7
15.1–2.2	40°–50°	73	—	97	18·2	18·6

Trade winds were taken for our purpose to be those winds which blew within 45° of the arithmetical mean wind direction at a speed greater than 6 knots. These directions are generally similar to those obtained from large numbers of observations and shown on climatological charts of the area. Correspondingly there is good general agreement between our records and the very much more numerous records analysed by Crowe. Winds on the east side of the Atlantic were roughly NE. and on the west side roughly ENE. The trades were very constant, perhaps unusually so. There were no calms and wind forces of 1 and 2 became progressively less frequent as the heart of the trade wind system was approached.

Such disagreement as there is lies in the wind speeds. Crowe quotes no figures for 20°–30°W., roughly our December longitude, but interpolation in his graphs gives a figure of about 12·5 knots with which our December trade speed of 13·6 knots agrees reasonably well. In January, however, our trade wind speed had risen to 17·7 knots—which appears high—and in February it remained at almost the same level. In order to make a direct comparison we analysed our records for 30°–40°W., the region which Crowe indicates as the heart of the system at this time of year. Surprisingly, we found the wind speed here to be only 13·7 knots with many light airs recorded. Between these meridians Crowe gives speeds for January–February of 16 knots in 12½°N. and 14·5 knots in 15½°N.

It was not until we examined our wind records for 40°–50°W. that we found the highest figures. Here the speed was not only 3 knots higher than Crowe's January–February maximum, but was more than 2 knots higher than the highest speed quoted by him for any North Atlantic latitude in any season. Thus it appears that the heart of the North Atlantic trade wind system in the winter of 1953–54 not only lay further to the west than usual but was considerably more vigorous. It would be interesting to know what wind speeds were recorded in the same region during March and April of 1954, the months when the North Atlantic trade winds are most highly developed.

Pressure

The barograph was found to be a valuable instrument for presaging wind changes; its trace wandered away from a smooth semi-diurnal rhythm as the wind increased.

Cloud Cover

For most of the voyage the sky was cloudy. Low clouds included typical tropical cumulus and stratocumulus (C_L1, 2, 4, 5 and 8), some cumulonimbus without anvil (C_L3), but almost no stratus or anvilled cumulonimbus. Middle clouds were commonly recorded, almost always as altocumulus (C_M4, 5 and 6); but the most characteristic cloud of all was the thin veil of cirrostratus (C_H7), noted on 140 occasions. This tenuous cloud gave the sky a faded blue appearance by day and dimmed the stars by night, only rarely thickening to show detail and yet persisting for days on end.

Rainfall

Rain was recorded five times in December, 21 times in January and 25 times in February.

Currents

Turning now to current observations we find a total of 74 daily records. Set and drift was estimated each day from the observed and D.R. positions. As we towed no log the ship's speed through the water was measured with a "Dutch" log, a method well known to give accurate results at low speeds. The yacht's speed through the water was only about 1 knot. We used a 27-foot run (1 knot = 16 seconds) and timed the chip with a stop-watch, with very consistent results. The yacht made a lot of leeway and this was estimated by the angle that the warp of the plankton net made with the vessel's fore and aft line.

For Table 2 the figures were treated in the same way as those of the wind, by taking the arithmetic mean of direction and disregarding those sets which lie more than 45° either side of the mean.

The yacht *Petula* drifting in light airs.

Taking the sea temperature from the yacht.

The Stevenson screen aboard the *Petula*.

(*Opposite page* 217)

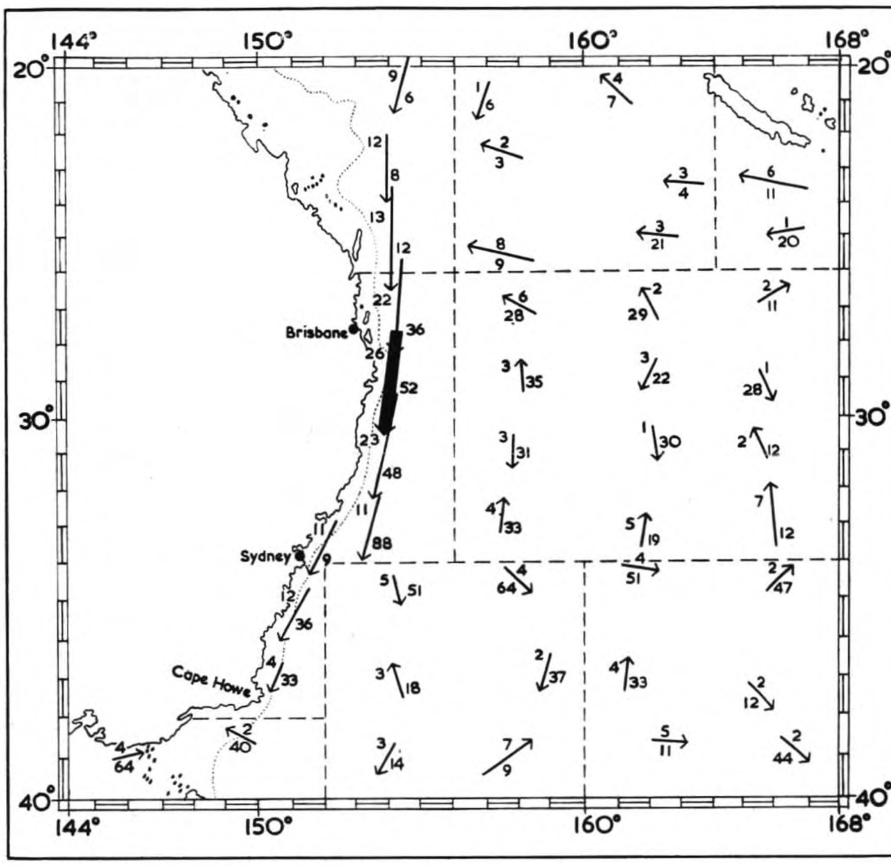


Fig. 1. Vector mean currents, December–February.

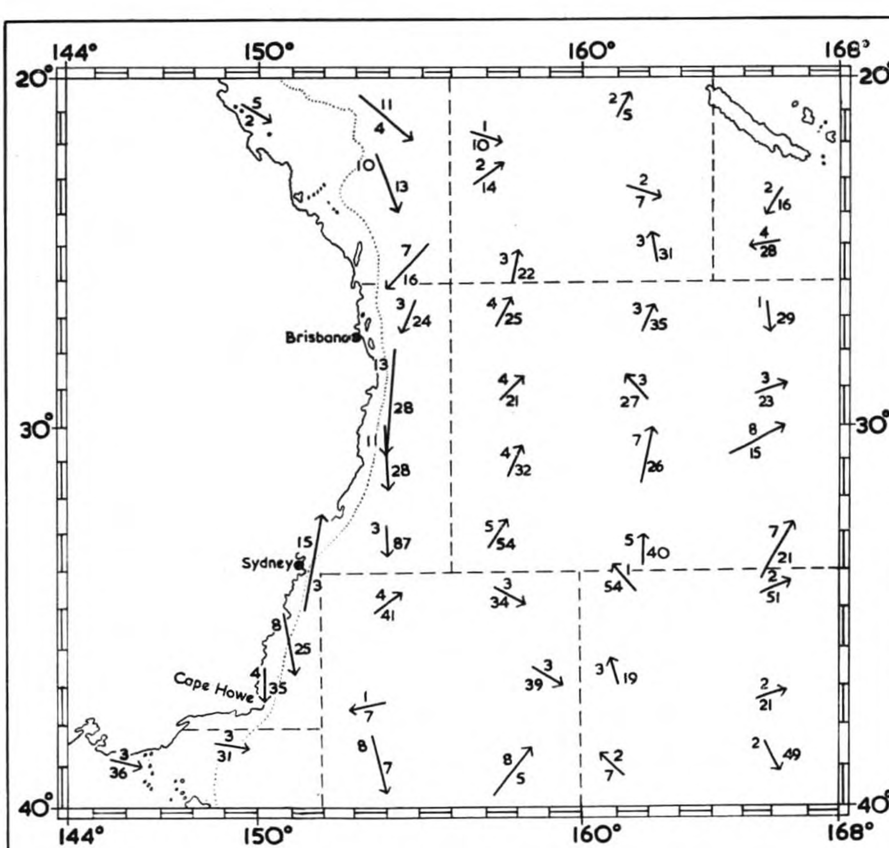


Fig. 2. Vector mean currents, June–August.

Table 2. Current Directions

Date	No. of observations	Mean direction	No. within 45° of mean direction
December	31	258°	24
January	31	263°	27
February	12	289°	12

From Tables 1 and 2 it follows that currents flowed on the average 31° to the right of the wind in December, 13° in January and 36° in February.

For a comparison of current drifts we quote figures abstracted from M.O.466.[3]

Table 3. Drift in miles per day of currents in the predominant quadrant

Longitude w.	*Petula*		M.O.466 November–February. Mean drift
	No. of obs.	Mean drift	
18°–30°	19	16	12
30°–46°	26	13	13
46°–58°	21	15	16

For comparison with the investigation of the relation between current and wind contained in R. F. M. Hay's paper[4] in this journal, the vector means of current and wind were computed for each of 13 periods of three successive days, using currents observed with winds of Beaufort force 2 to 5. The mean angle between wind and current for the 13 cases was found to be 24°, which is in very good agreement with the value found by Mr. Hay for station J. The standard deviation was 15°, which is a measure of the deviation of the individual three-day values from the mean of them all. This value is less than those derived by Mr. Hay for stations I and J; this would be expected owing to the *Petula's* observations having been made in the trade wind region where wind direction is much less variable. The vector mean speed of current in the 13 cases is 0·463 knot and the vector mean wind 11·8 knots. The " wind factor ", the ratio between the speed of the surface current and that of the wind, works out at 0·0193.

Temperature

Air temperatures were closely grouped around the 80°F mark and are in no way remarkable.

Sea temperatures throughout the voyage remained remarkably constant, ranging between 76·5°F and 80·6°F. They agree well with those figured in the November and February sea-surface temperature charts compiled by Schott.[4] Temperatures for the six-hourly weather reports were taken by scooping the water straight into the sea thermometer trough (see photograph opposite page 216). Using this method we found that the temperature on opposite sides of the ship varied on an average by ±0·2°F and sometimes by as much as ±0·6°F. The greatest differences occurred during the day and were probably largely due to differential heating by the ship on the sunny and shady sides. The presence of night differences seems to indicate that shielding of the lee side also played its part in raising sea temperatures.

We always assumed that the lower of the two temperatures was the truer. Fortunately we had a means of checking both air and sea temperatures taken aboard the ship very accurately. On every favourable day we took air and sea temperatures from the raft at levels of 0·10 m, 0·25 m, 0·50 m, 1·00 m and 2·00 m above and below the surface in a survey of energy exchange at the air/sea interface. The air temperatures were taken with an Assmann psychrometer and the sea temperatures with a set of standard earth thermometers mounted on a stalk, each earth thermometer being wax lagged around the bulb to prevent contamination while the stalk was moved through layers of varying temperature. Careful checks showed that both sea and air temperatures were unaffected by the presence of the raft. These temperature records were used to determine the accuracy of shipboard temperatures taken at about the same time.

On 25 occasions we took sea temperatures from the raft within an hour of taking them from the ship. Comparing the raft temperatures at the 0·10 m level with the ship temperatures we find that the latter were on average 0·2°F higher. This difference, due to a number of factors, indicates that even a small, slow, engineless ship distorts the sea temperature in its vicinity. The distortion in a large steamship must certainly be greater.

Conclusion

The *Petula's* selected ship meteorological logbook, although containing only a part of the meteorological observations made during the voyage, is in itself an unusually detailed record of the weather conditions across the width of the Atlantic Ocean in a narrow band of latitude.

ACKNOWLEDGEMENTS. We are indebted to the members of the Marine Division of the Meteorological Office and in particular to Mr. E. W. Barlow and Mr. R. F. M. Hay for the numerous improvements which they suggested in this account; and to Dr. H. O. Bull of the Dove Marine Laboratory who read and commented on the original typescript.

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[2] CROWE, P. R. The Trade Wind Circulation of the World. *Trans. and Pap. No.* 15, *Inst. Brit. Geogr.* (1951). The Seasonal Variation in the Strength of the Trades. *Trans. and Pap. No.* 16, *Inst. Brit. Geogr.* (1951).
[3] M.O.466. *Quarterly Surface Current Charts of the Atlantic Ocean.* Meteorological Office, London.
[4] HAY, R. F. M. A verification of Ekman's Theory relating wind and ocean current direction using ocean weather ship data. *The Marine Observer*, **24**, 226 (1954).
[5] SCHOTT, G. *Geographie des Atlantischer Ozeans.* Boysen, Hamburg (1942).

Weather Messages from Ships via Portishead Radio

By W. SWANSON
(Inspector of Wireless Telegraphy, Radio and Accommodation Department, General Post Office)

In order to understand the part that Portishead Radio plays in handling OBS messages expeditiously, it is necessary to explain briefly the general arrangements made at the station for the reception of radio traffic from ships.

Radio officers aboard all ships will be aware that watch is kept in the calling bands of 4, 6, 8, 12, 16 and 22 Mc/s, in accordance with the schedules published in the current Notices to Ship Wireless Stations. Especially during single-operator periods the number of ships calling in any one band is so large that a system known as search-point working is operated according to the following schedule:

16 Mc/s Band	0800–1800 G.M.T.
12 Mc/s Band	0800–2000 G.M.T.
8 Mc/s Band	0800–0100 G.M.T.
6 Mc/s Band	0800–0100 G.M.T.
4 Mc/s Band	As traffic demands.

Search-points operate as follows. Each search-point operator is allocated a number of working points which, within limits, is determined by the number of ships waiting to be worked in a particular frequency band. The search-point operator and up to five working-point operators share the answering frequency transmitter. Therefore, it is not always possible for the search-point to answer immediately the ship that he has logged; and ships are asked to bear this in mind and not to repeat calls too frequently. They should give the search-point an opportunity to get control of the answering transmitter.

The search-point operator maintains a special log sheet upon which he records the following details of each call received.

Time of call	Call sign of ship	Directional Aerial	Working freq. of ship	QRY	Working Pt. No.	Time to Working Pt.	Remarks

He continually searches the calling band using an omni-directional aerial. Upon intercepting a call, he ceases the search and waits to identify the calling ship. During the interval, he switches to horizontal rhombic aerials and records the optimum directional aerial.

Provided that the calling station has indicated its working frequency, the appropriate QRY is signalled, and when this has been acknowledged by the ship the search is continued. It will now be obvious that unnecessarily long calls and failure to signal the working frequency at the end of the call considerably slow down the speed of search-point working, and add to congestion and interference in the calling bands, particularly during the busy periods.

An experienced search-point operator can handle up to 40 calls in one hour provided that he receives the co-operation of the ships as mentioned in the preceding paragraph.

When a working-point operator becomes free, he informs the search-point operator via an intercommunication system. The latter passes details of the next ship on the waiting list—call sign, optimum directional aerial and working frequency. The working-point operator then requests the ship to QSV on the working frequency and contact is established. It greatly assists the working-point operator if the ship's call sign is interspersed with the series of V's rather than the Portishead call sign.

The foregoing indicates the procedure used for ordinary radio traffic from ships. It is the practice to give the utmost priority to all OBS messages and therefore the search-point operator does not signal a QRY (turn) to ships offering OBS messages but signals them to AS (wait), and passes them out to the first free working point. The receiving operator attaches a priority label to each OBS message; it is taken by hand from the message conveyor belt to the checking point, where it is again given priority over all other traffic and taken by hand to the Dunstable teleprinter for immediate despatch.

Unfortunately, some delay between ship and shore occurs at 0800, when all ships in Zones A and B commence watch, and also at 1200 G.M.T. when all ships in Zones A, B and C commence watch, and as many as 20 ships may be calling in a band at any one time; it is impossible for them all to be answered at once. The search-point operators at these times endeavour to pick out the ships with OBS messages to give them priority. It is therefore very important that the prefix is always used for this traffic. Also, if a call is not answered within a reasonable time, a check should be made to ensure that the optimum frequency for communication with Portishead is being used. Investigation into complaints reveals that on some occasions ships call in the wrong frequency band. For example, a ship complained recently about failure to contact Portishead with an OBS after calling for 30 minutes on 4 Mc/s. The ship changed to 16 Mc/s and was answered after the first call.

At midnight, ships in positions up to 40°W. should use generally 4 Mc/s for clearing their OBS messages, as at this time Portishead opens a search point to clear all weather messages as quickly as possible.

The number of messages handled in 1955 was:

Ordinary radio messages	606,500.	Average 1,662 per day.
OBS messages	31,119.	Average 85 per day.

The majority of the staff at Portishead Radio have served at sea and fully appreciate the value and importance of ships' weather reports, both to the Forecasting Department of the Meteorological Office at Dunstable and to other ships at sea. We would like to assure our colleagues aboard the voluntary observing ships that it is our aim at all times to assist them to clear their traffic as quickly as possible and that we gladly acknowledge the very good co-operation which has existed over many years.

Dew Point and Cargo Ventilation

By J. C. Matheson

(Mr. J. C. Matheson, Master Mariner, is Port Meteorological Officer at London)

The British Merchant Navy has grown, by following the path of the explorer and trader in search of cargoes, from a number of very small craft of ancient times to the great fleet of heterogeneous vessels of the present day that is found plying in all the oceans of the world, carrying all kinds of goods from buttons and bows to timber and tea. This vast fleet plays an important part in the economic life of the country from the earnings derived from the carriage of cargoes, but, unfortunately, some cargoes do not have a good out-turn, which results in financial loss. It is the duty of the seaman to ensure that the cargo under his care is carried with as little damage as possible, for in these difficult times any loss or damage sustained is detrimental to the economy of the country.

Serious sweat damage is often sustained by cargoes from the condensation of moisture in ships' holds; to combat this ships' officers, in some modern ships, often have one of a number of mechanical systems at their disposal to circulate air through the holds and cargo for ventilation. The air used for both mechanical and natural ventilation, except in cases where the air is drawn from the holds, passed through " de-humidifyers " and re-circulated through the holds, comes from the surrounding atmosphere, but often this air may not be suitable for ventilation owing to it having a large moisture content and, if used, would tend to increase the moisture content of the hold. When at sea, I was engaged mostly on the Indian trade, where I found that cargoes sometimes suffered considerable moisture damage, caused by sweating in the holds, if advantageous ventilation was not carefully carried out. To overcome this I used the information gained from the Stevenson screen and the hold temperatures as a guide for ventilation and found that I was able to keep sweating down to a minimum. I am glad to pass on my experience to those interested, and hope that the following notes (which are not intended to be very comprehensive or to cover all conditions) will be a help to them in obtaining a good out-turn of cargo with little or no moisture damage.

A quantity of water vapour is always present in the atmosphere. This quantity varies in different parts of the world according to climatic or local weather conditions, and the maximum amount of water vapour the air can contain before it becomes saturated depends entirely on the air temperature, as warm air can contain a greater proportion of water vapour than cold air. For example, air at 40°F can contain 6·6 grams of water vapour per cubic metre and air at 65°F can contain 15·7 grams per cubic metre—a rise of 9·1 grams in 25°—while air at 90°F can contain 34·2 grams per cubic metre—a rise of 18·5 grams in 25°. When the air contains the maximum possible amount of water vapour in relation to its temperature the air is said to be saturated.

Saturation point is soon reached if warm air containing a relatively large amount of water vapour is cooled. The temperature at which saturation is reached is called the dew point and should further cooling take place the water vapour is condensed out in the form of visible drops of water as in cloud or fog; also should air be in contact with a surface of lower temperature than its dew point, condensation will occur on that surface. For example, dew forms on the ground that has lost heat through radiation at night and sweat forms on the internal surfaces of a compartment that have cooled through external reasons, provided that the amount of water vapour contained therein remains constant.

Cargoes, before export, tend to acquire the same temperature and humidity as the air present during manufacture, packing or while lying awaiting shipment. In hot damp climates the amount of water vapour absorbed by a hygroscopic cargo will be relatively large, and when loaded the cargo will give the holds a relatively large moisture content, or may tend to increase the dampness of the holds that already have a large moisture content. Should the vessel's voyage take her to a colder climate, and if the moisture content of the holds remains constant through lack of ventilation, a great deal of condensation will take place on the surfaces of the holds that cool below the dew point of the air in the holds, and sweat damage will result on any cargo in contact with these surfaces and the cargo having top stowage will be wetted with drops of water falling from the deckheads should condensation appear on these surfaces.

In order to have negligible moisture damage the ideal conditions would be to load a dry cargo in a dry climate and have a passage to the port of discharge through climates of low dew point with little fall or preferably a rise in temperature. These conditions, however, are seldom met and careful ventilation is usually needed to keep the moisture content of the holds as low as possible. On the other hand, providing the cargo does not need ventilation in itself and the holds are insulated from external temperature changes, should the cargo be loaded in a dry climate and the vessel on her voyage has to pass through a damp atmosphere, it may well be advisable to keep the damp air out of the holds. In actual practice the conditions which cause sweating are complicated by the facts that most holds are not insulated, that the vessel on her voyage passes through areas of varying air temperature, dew point and sea temperature, and that the cargo is often of varying hygroscopic quality; then there are the physical difficulties of not only controlling the ventilation to all parts and pockets of the holds, but also of knowing the exact conditions of temperature and humidity in all parts of the holds at any given time. In order to control the ventilation effectively a knowledge is required not only of the temperature and dew point of the outside air and the temperature of the holds, but also the history of how these have varied during the voyage. The hold temperatures should be taken at least once per day. Even with all this information no hard and fast rule can be given about hold ventilation. It is really a question of judgment, experience, seamanship and some knowledge of scientific principles involved.

Selected ships of the Voluntary Observing Fleet are issued, as part of their equipment of meteorological instruments, with a Stevenson screen containing dry and wet bulb thermometers. The object of the instrument is to record the temperature and humidity of a representative sample of air in the vicinity unaffected by the influence of the ship. For its proper operation there should be an air speed of 10 knots or more through the screen so it is " slatted " in the front, back, sides and bottom to allow the passage of air over the thermometer bulbs. To obtain correct readings the screen must be hung to windward, as near to the ship's side as practicable, free from any artificial heating that may take place on board and from any air pockets that may have become trapped in the superstructure. The dry bulb thermometer needs to be free from any dirt or salt particles, as they may harbour moisture, and this moisture can cause the thermometer to act as a wet bulb. The wet bulb thermometer must also be clean and the attached muslin and wick free from dirt and salt as these will interfere with the evaporation of water from the bulb. The water used must be pure, preferably distilled, for should it contain any foreign matter an incorrect reading will result.

The taking of hold temperatures in some ships may require some ingenuity, especially with a full cargo. If ventilation trunks are left at the corners of the hatch square a thermometer can be lowered down there to obtain a reading or the bilge sounding pipe can be used.* In modern ships an access trunk to the holds is usually fitted, which can be used to take temperatures. If a thermometer is lowered down the ventilator to obtain a reading the cowl must be turned back to wind for a few minutes in order to obtain the correct temperature. The best answer, probably, is to have a distant reading thermometer permanently mounted in the hold so that a reading can be obtained on deck when required.

The dew point of the air on deck can be found from the dry and wet bulb readings and the dew point table in the *Marine Observer's Handbook*, pages 112 and 113; the dew point thus found coupled with the hold temperatures can be a good guide for ventilation. If the dew point on deck is well below the hold temperature it would probably be advantageous, weather and sea conditions permitting, to have all the ventilators turned on to the wind and have the top hatches open to allow the maximum amount of air to circulate through the cargo, or have the fans full on if mechanical ventilation is fitted. This will dry out the holds and reduce the risk of sweating should a lower temperature be experienced later. On the other hand, if the dew point on deck is higher than the hold temperature, it would be advisable to have no ventilation, thereby keeping the damp air out and avoiding an increase of the moisture content of the holds.

Frequent comparisons should be made with the dew point of the air and the hold temperatures during the voyage, preferably at least once a day, and used as a guide for ventilation, and, in general, if the dew point is lower than the hold temperatures, ventilate, and if higher, cease ventilation.

The following examples tend to show how difficult it is to generalise about this question of when and when not to ventilate and to emphasise how the ship's officer needs to approach this question with intelligence and some scientific knowledge of the principles involved. Not all ships have the means of finding the dew point of the holds, but the hold temperature can usually be obtained. In the examples the hold wet bulb readings are given to show the hold dew points, relative humidities and moisture contents for illustration purposes, but it will be seen that when the air dew point is lower than the hold temperature it is usually safe to ventilate, although caution must be exercised in certain cases.

	Atmosphere	Hold
(*a*) Dry bulb (°F)	36	46
Wet bulb (°F)	34	42
Dew point (°F)	30	36
Relative humidity (%)	80	69
Moisture content (gm/m³)	4.5	5.6

Ventilate. Dew point on deck is well below hold temperature.

Note. The cool air on being introduced into the hold has the same temperature as the dew point of the hold, but both the temperature and the dew point of the hold as well as the moisture content will be reduced.

	Atmosphere	Hold
(*b*) Dry bulb (°F)	75	50
Wet bulb (°F)	71	48
Dew point (°F)	69	46
Relative humidity (%)	82	86
Moisture content (gm/m³)	17.7	8.1

Do not ventilate. Air dew point is above hold temperature.

* This is practicable in some ships fitted with perforated bilge sounding pipes.

	Atmosphere	Hold
(*c*) Dry bulb (°F)	36	46
Wet bulb (°F)	36	42
Dew point (°F)	36	36
Relative humidity (%)	100	89
Moisture content (gm/m³)	5.6	5.6

Ventilation can take place with caution on the assumption that the vessel is proceeding into colder weather so that it is necessary to take steps to lower the hold temperature.

Note. This is a borderline case as this saturated air has the same dew point and moisture content as the hold, but on mixing it will cease to be saturated. The moisture content will remain the same, but the hold temperature will be lowered. The hold temperature must be watched carefully lest it fall to about 38° (i.e. a little above the outside dew point) when sweating may occur.

	Atmosphere	Hold
(*d*) Dry bulb (°F)	40	50
Wet bulb (°F)	39	42
Dew point (°F)	38	29
Relative humidity (%)	91	45
Moisture content (gm/m³)	6.0	4.2

Note. If it were possible in this case to know aboard the ship the moisture content of the hold and compare it with the moisture content of the atmosphere, it would be apparent to the ship's officer that the best procedure would be to cease ventilation. If that information were not available, then on the assumption that the vessel is proceeding into colder water and being guided by the general rule that ventilation is normally practicable when the outside dew point is below the hold temperature, then the cargo would probably not come to any great harm if ventilation takes place, provided the hold temperature remains a few degrees above the hold dew point. By such a procedure the hold temperature will be lowered, and although the moisture content of the hold will probably be increased, saturation point should not be reached.

This example emphasises how both the hold temperature and the atmospheric dew point must be carefully watched and compared at all stages during the voyage.

Apart from tackling this question of whether or not to ventilate with the meteorological data available, the ship's officer has often many physical difficulties to face. Is all the cargo in one hold of the same hygroscopic quality ? Is the cargo loosely or tightly stowed, and are there any pockets inaccessible to ventilation ? Heating or cooling of parts of the hold and cargo near hot engine and boiler room bulkheads or cold bulkheads of refrigerated spaces giving different temperatures in different parts of the hold can add to this complex problem, for, should cargo of high hygroscopic quality be stowed near a hot bulkhead, evaporation will take place, thereby increasing the moisture content of the hold, and with a sudden drop of outside temperature it would not take long for the deck and ships' sides above the water-line to cool and, unless these surfaces were insulated, sweating would soon take place in the relatively warm hold if no ventilation were carried out. Similarly, a sudden change from warm to cold sea water would cause sweating below the water-line. In a hold of high moisture content sweating will take place on the cold bulkhead adjoining or on the deck over an adjoining refrigerated space.

The above comments are given as a general guide to hold ventilation to keep the moisture content down, and do not necessarily apply to the ventilation of special cargoes such as cotton, jute and rice, for which particular care is required, or to the surface ventilation of coal, etc., of which much has been written elsewhere. Intelligence, experience and judgement are required to tackle this complex problem, but if ventilation is carried out when the dew point on deck is below the hold temperature the cargo should not come to much harm.

Currents of the Western South Pacific Ocean

By E. W. Barlow, B.Sc.
(Marine Division, Meteorological Office)

Of the four parts into which the Pacific Ocean has been divided for current computation and charting in the Marine Division, the atlas of the Western North Pacific was published in 1949 and that of the Eastern North Pacific will be the next to appear. For the charts of the Western South Pacific the roses and the vector means are computed and drawn, and work is proceeding on the last remaining portion, the Eastern South Pacific.

Towards the end of 1954 it was decided, in consultation with the Admiralty, that the western and eastern portions of the South Pacific should not be published as separate atlases as in the case of the North Pacific but as a combined one, to replace the existing atlas M.O.435, *South Pacific Ocean Currents*. This older atlas needs revision in order to bring it up to date in the light of a considerable number of further observations on ocean currents in this area which have been received in this Office from British voluntary observing ships since 1938. In addition to charts of current roses and vector means the new atlas will include charts of predominant current similar to those given in the atlases of the Atlantic Ocean and Western North Pacific. The advantage of the combined atlas is that the whole of the route Panama to Australia or New Zealand will be contained on one chart, as also will be the route Australia or New Zealand to Cape Horn. Another consideration was the difficulty experienced in determining the predominant flow of current in the extensive region of the central latitudes of the South Pacific Ocean, from about 20° to 40°s., where the currents are very variable. It is possible that there are no very definite trends of predominant current in this region, but this can only be determined satisfactorily when the currents for all the oceans are computed and can be considered as a whole.

As the new atlas of the South Pacific will not be available for a considerable time, the present article has been written to give our readers some information about the currents of the Western South Pacific as they will eventually be shown in the new charts. It is illustrated by 10 chart sections, reproduced on a smaller scale than that which will be used for the atlas. Details of the current strengths, indicated by the various sections of the arrows in each current rose, and the scale of frequency, are given in Fig. 5. The upper figure in the centre of the rose shows the total number of observations from which the rose is constructed. The lower figure gives the percentage of currents observed with rates of less than a quarter of a knot; these are not included in the rose.

The charts of the Western South Pacific extend into the Indian Ocean as far westward as 98°w., and thus include the whole of the sea area around Australia and also the East Indies. The eastern limit is 160°w.

In this area the East Indies and also the north coast of New Guinea come under monsoonal influence, with consequent reversal of the currents. South of Australia and New Zealand the Southern Ocean Current pursues its easterly trend round the globe. The two strongest and most constant currents are the South Equatorial Current of the Pacific and the East Australian Coast Current; the latter forms the western side of the circulation of the South Pacific and flows southward along the Australian coast from Fraser Island (Great Sandy Island) to Cape Howe.

Four areas have been selected for special comment and the illustrations refer to these. Seasonal variation of current occurs in three of them and the quarters December to February (southern summer) and June to August (southern winter) have been chosen to show the fullest extent of the seasonal variation.

Figs. 1 and 2 show the vector mean current in the region of the East Australian Coast Current and the neighbouring part of the ocean. The figure above or to the left of an arrow is the vector mean speed in miles per day and the figure below or to the right of an arrow gives the number of observations on which it is based.

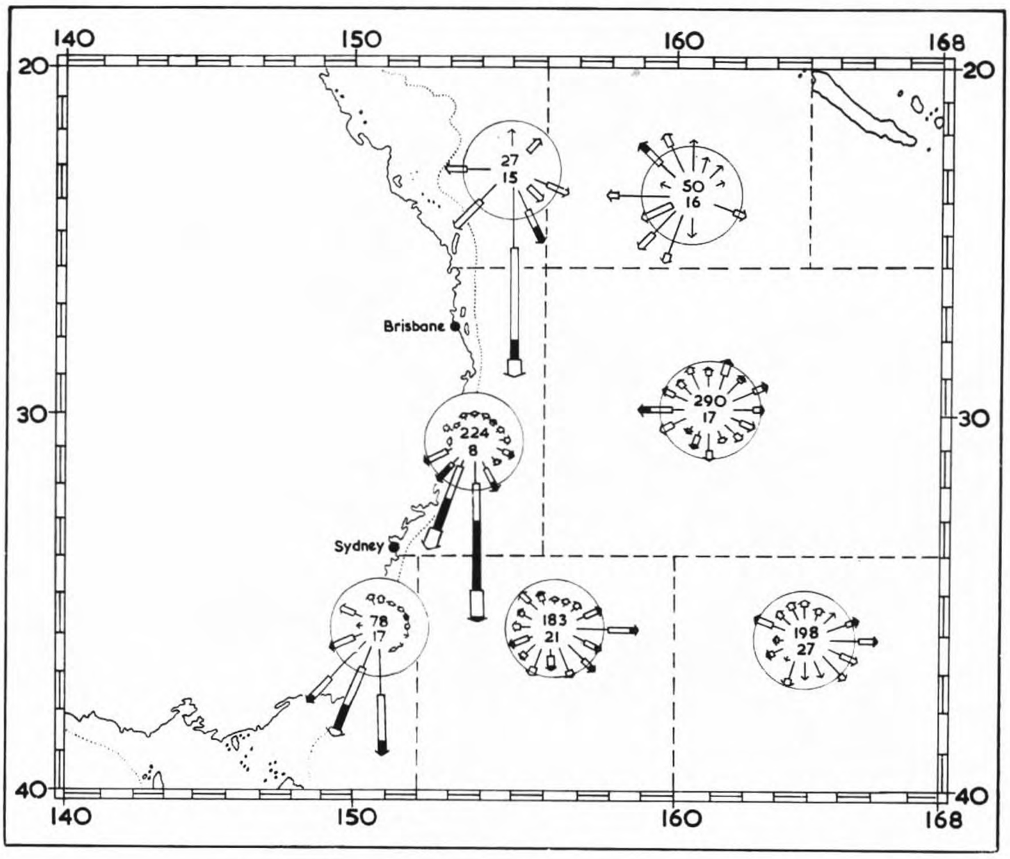

Fig. 3. Current roses, December–February.

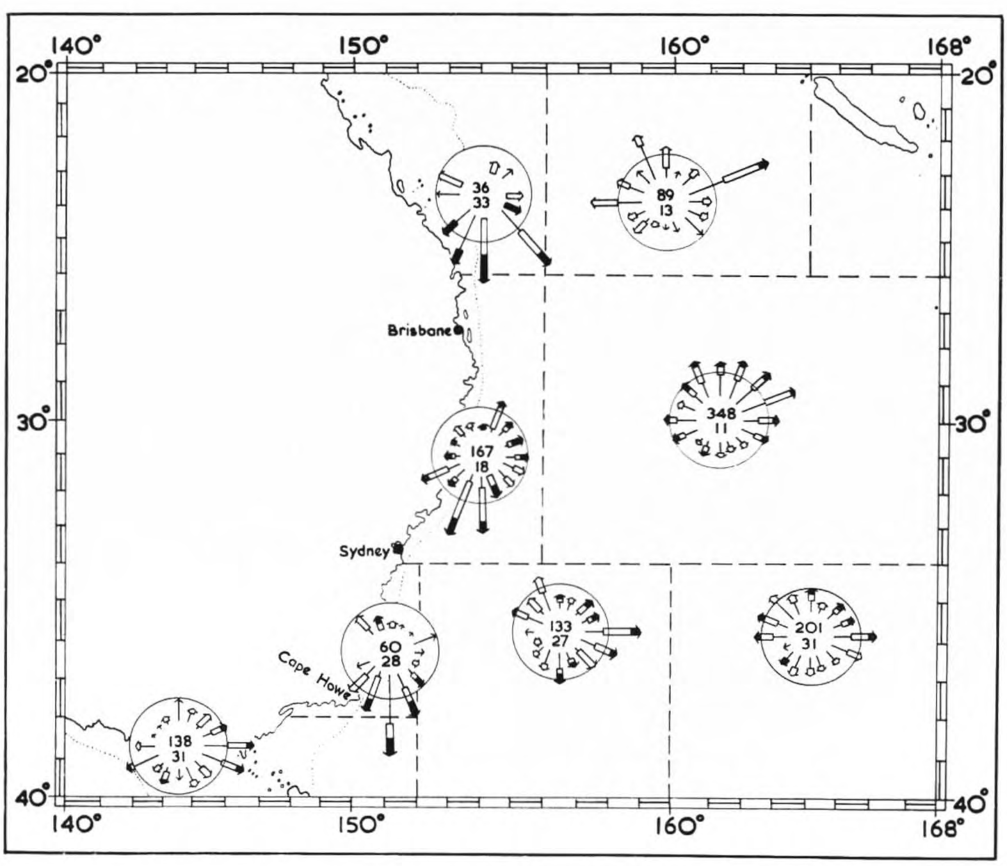

Fig. 4. Current roses, June–August.

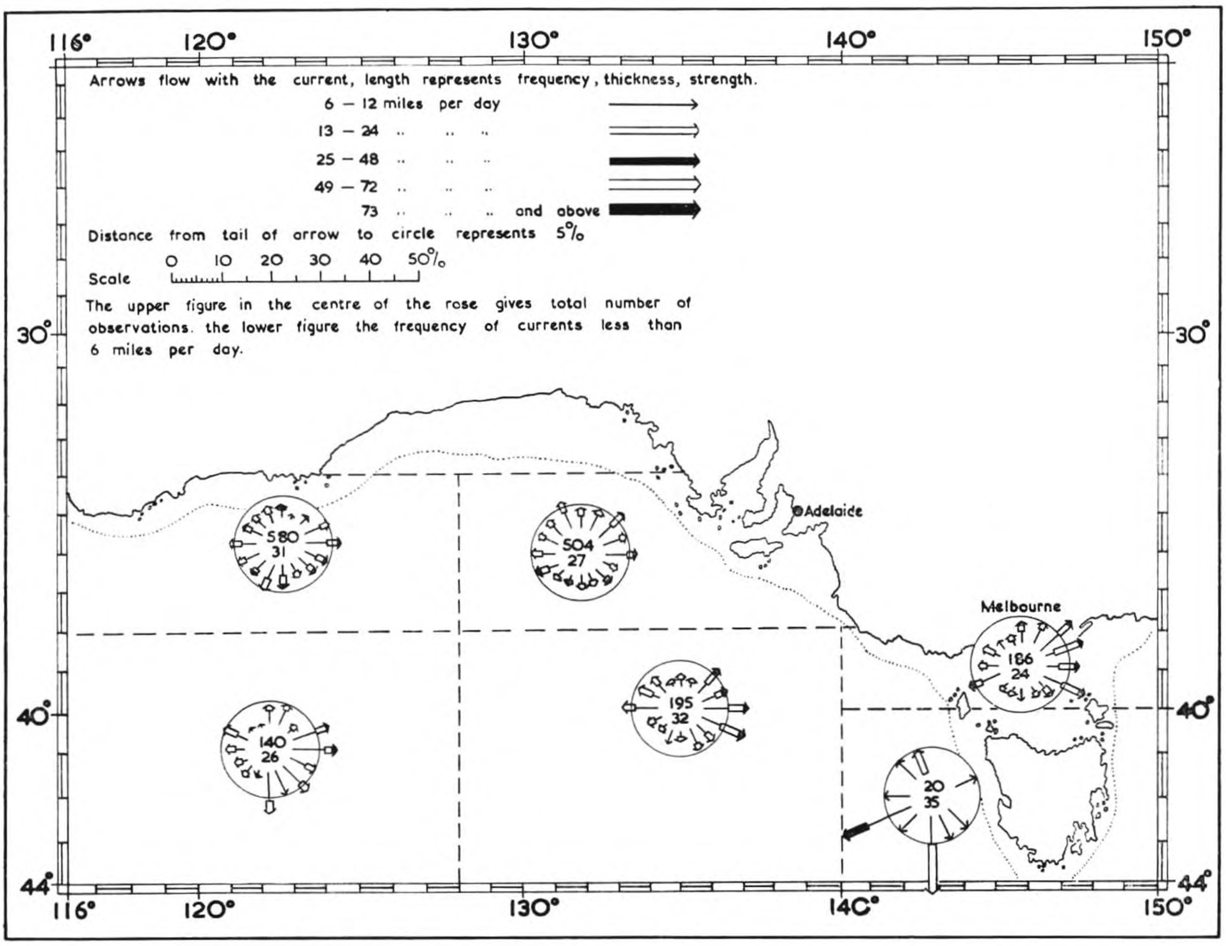

Fig. 5. Current roses, December–February.

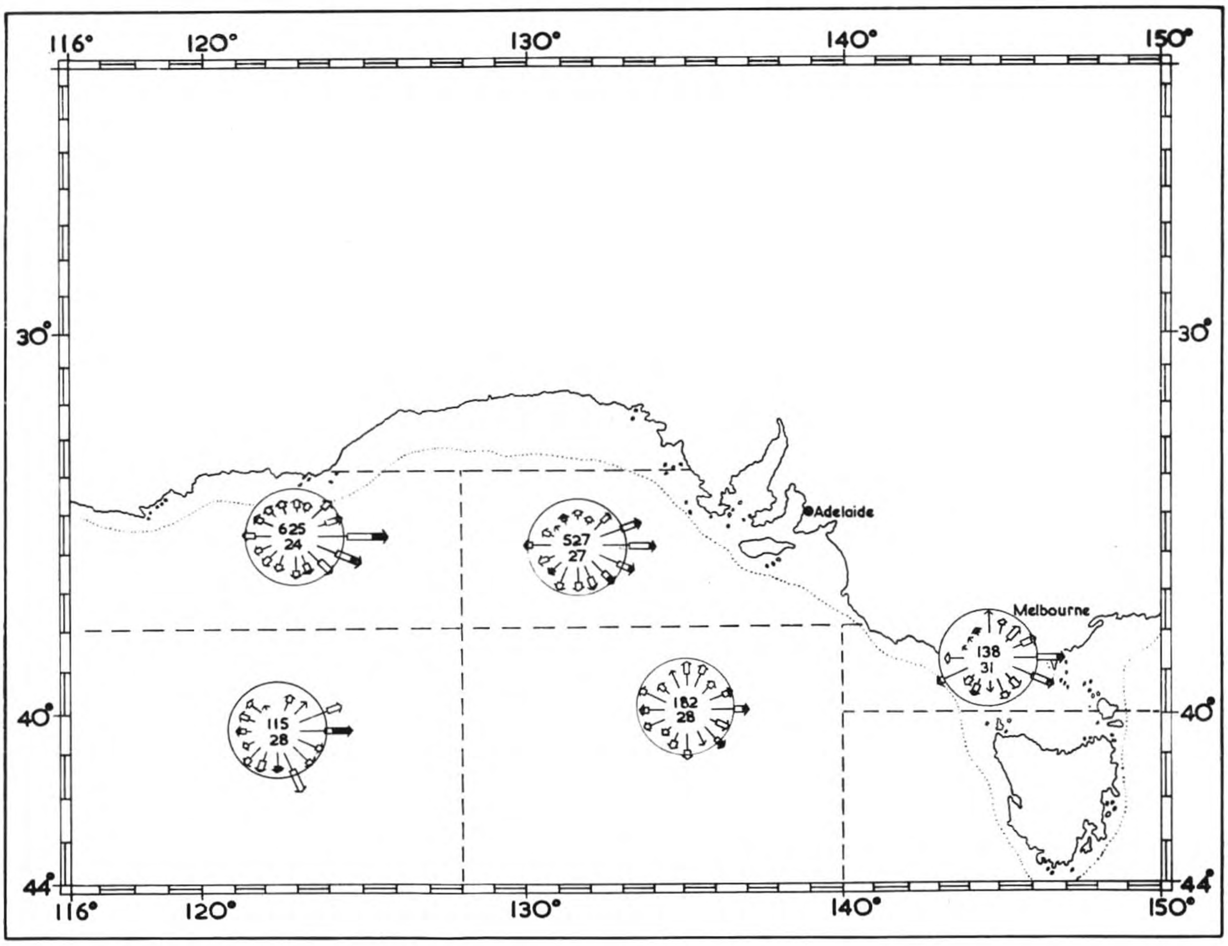

Fig. 6. Current roses, June–August.

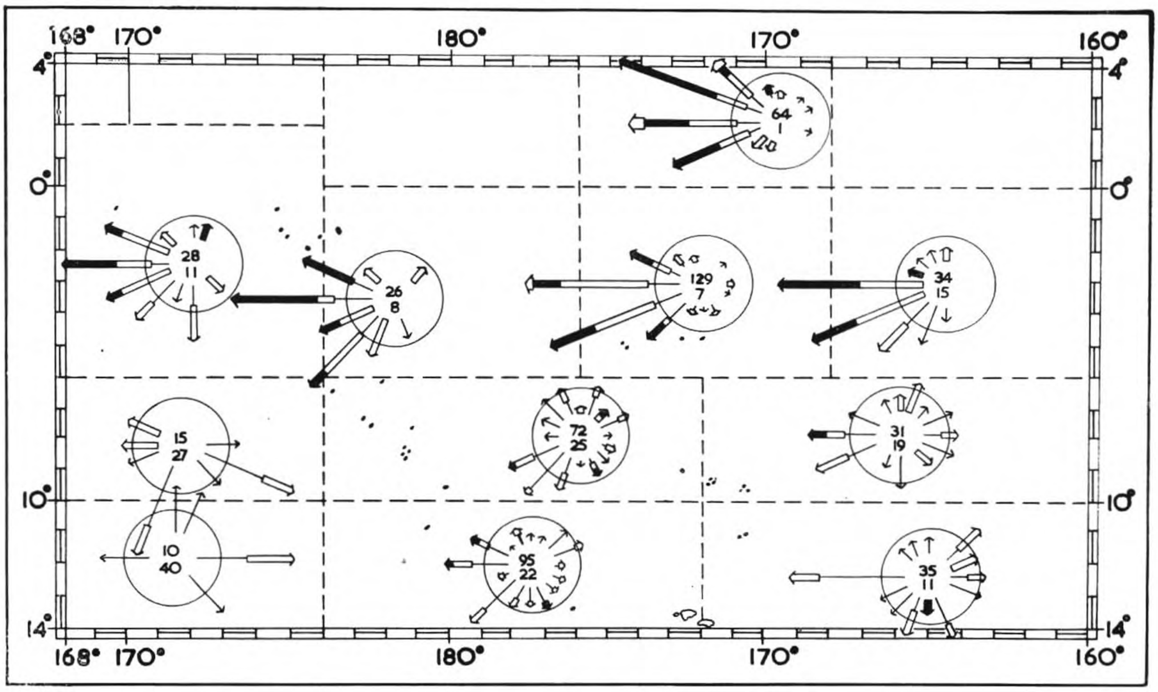

Fig. 7 Current roses, December–February.

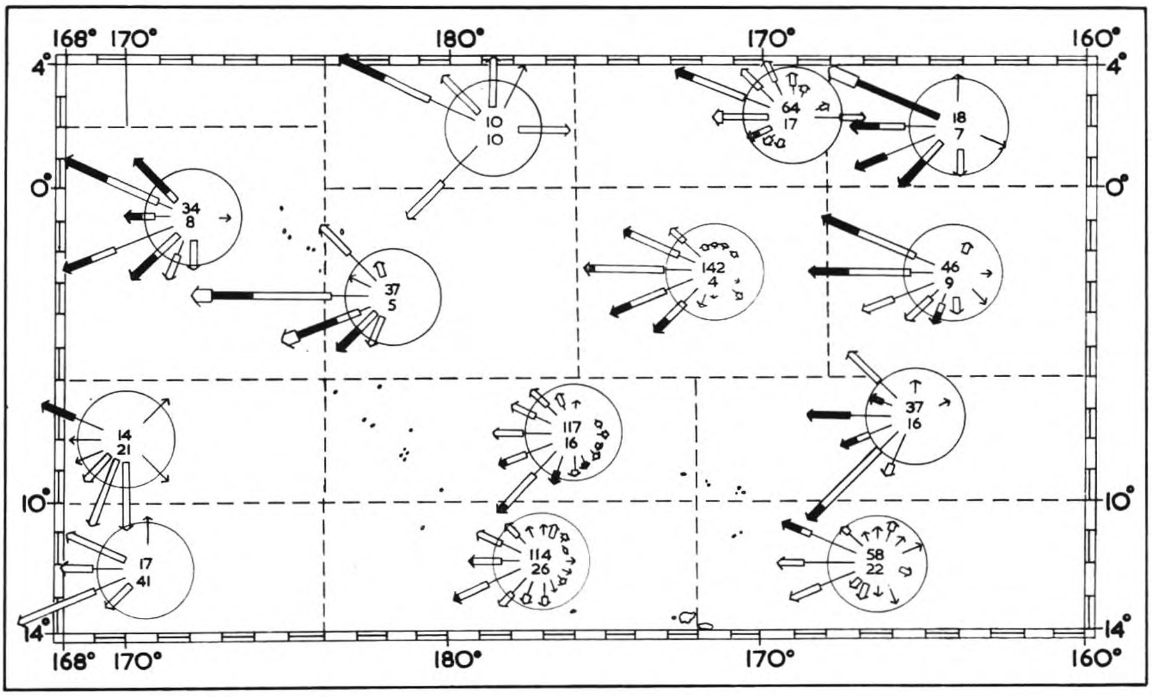

Fig. 8. Current roses, June–August.

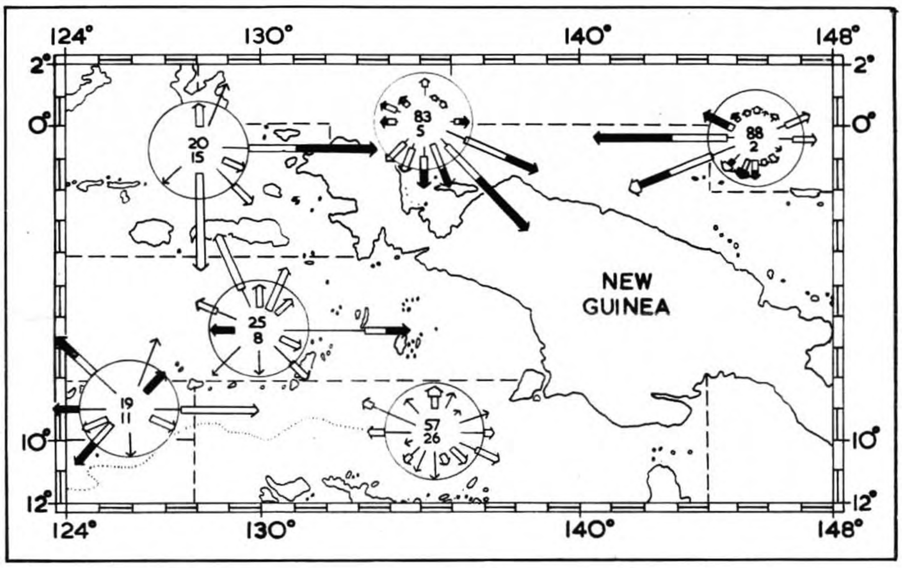

Fig. 9. Current roses, December–February.

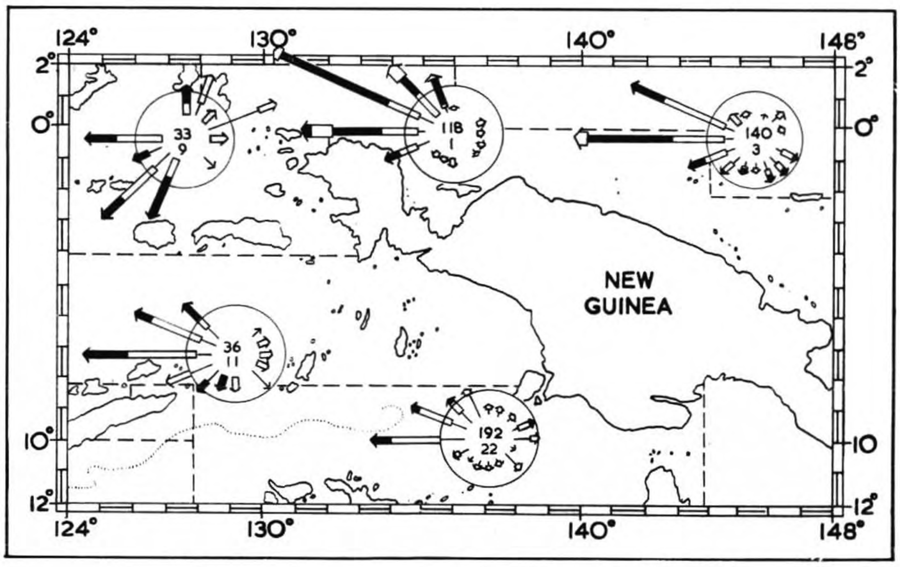

Fig. 10. Current roses, June–August.

The meaning of the vector mean speed and direction is quite simple. As every seaman knows, the currents in any region are more or less variable, even in regions of relatively constant current, so that water flows out of any limited area at various speeds and in various directions. Over any period, say three months, there is a resultant flow in a certain direction and at a certain daily speed which would be exactly equivalent in total effect to all the varying individual flows throughout that time. This flow is the vector mean or mean resultant flow, and when this is computed for all parts of an ocean the general circulation of the ocean is revealed.

The resultant flow of the East Australian Coast Current is shown to be stronger and more closely parallel to the trend of the coastline in summer (Fig. 1) than in winter (Fig. 2). The rose charts (Figs. 3 and 4) indicate that some currents of between 2 and 3 knots occur in summer, and occasionally exceed 3 knots, while in winter no current has been observed to exceed 2 knots. The rose charts clearly show a characteristic feature of this current; throughout the year there are a considerable number of currents in directions other than southerly, this being especially the case in winter. The reduced southerly water transport of this current in winter, as shown by the vector mean charts, is therefore due to a combination of two factors; the southerly currents are less frequent and less strong in winter while at the same time the northerly currents are stronger and more frequent.

North of 26°S. a definite flow to westward is shown in summer (Fig. 1), which is also seen to some extent in the charts, not here included, for the spring and autumn; it disappears in winter (Fig. 2). In the open ocean, between 26° and 34°S., the currents are variable but there are more northerly currents than southerly ones throughout the year. Southward of 34°S. the currents are more variable.

The rose charts of the Southern Ocean Current southward of Australia (Figs. 5 and 6) show the characteristic variability of this current. Throughout the year the resultant easterly drift of this current shows only as a more or less marked predominance of sets with easterly components, every other direction being represented. There is, however, an unusually strong predominance of easterly sets in the vicinity of the Great Bight, northward of 38°S., in winter (Fig. 6), the contrast with the summer roses for this region being quite marked; the roses for the spring and autumn quarters are essentially similar to the summer ones.

Figs. 7 and 8 show the flow of the South Equatorial Current and the South Sub-Tropical Current between 168°E. and 160°W. These charts extend to 4°N. and the strongest and most constant part of the westerly current between 4°N. and 6°S. is known as the South Equatorial Current, while the weaker and less constant, but still predominantly westward, flow which is found between 6°S. and about 20°S. is distinguished as the South Sub-Tropical Current. Rates of up to between 2 and 3 knots may be experienced in different parts of this section of the South Equatorial Current throughout the year. A much smaller proportion of currents exceeding the rate of 1 knot occurs in the South Sub-Tropical Current and no observed current exceeds 2 knots. No appreciable seasonal variation in this region is shown.

In the charts for the New Guinea region the South Equatorial Current is shown setting westward between the north coast of New Guinea and 2°N. in June to August (Fig. 10) with rates sometimes exceeding 2 knots and occasionally exceeding 3 knots. When the south-east trade wind is replaced by the north-west monsoon, in December to February, the current along the north coast of New Guinea is reversed, to a south-easterly direction, with a considerable proportion of currents also in southerly directions.

Westward of New Guinea, in the Molucca, Ceram and Banda Seas, the predominant direction of the north-west monsoon and the south-east trade wind varies appreciably in different parts of the area. They are known locally as the northerly and southerly monsoons. The effect of the southerly monsoon is well shown in Fig. 10, the predominant currents being from west to north-west, south of 4°S., and between west and south further north. Fewer observations are available during the northerly monsoon (Fig. 9) but the effect of this monsoon appears to be less marked, with a resulting greater variability of current.

National Institute of Oceanography

The annual report for 1954–55 of the National Institute of Oceanography recently published (Cambridge University Press, price 5s.) gives a full account of the organisation, work and proposed programme of the Institute.

The description of the work in marine physics includes the following:

Waves

Attempts are being made to study the physics of wave generation by making simultaneous recordings of the wave profile and variations in air pressure very close to the surface. The plan is to use a buoy 5 feet 6 inches diameter and 1 foot 6 inches deep floating with a few inches freeboard. The buoy has been made symmetrical, and it will be kept orientated in the same direction relative to the wind and waves by a small sea anchor. It contains a microbarograph, which communicates with the air through small holes in a flat mushroom 3 inches above the general level of the surface, two gyroscopes to record the slope of the waves in the direction of the wind and at right angles to it, and a vertical accelerometer with double integrating circuit to record the wave heights. Complete with instruments, recording camera and batteries, it weighs 0·5 ton and has a natural period of 1·5 seconds when afloat. The sensitivity of the microbarograph is adjustable, and variations as small as the weight of a few centimetres of air can be measured. The buoy has been taken to sea and complete records obtained in winds up to 35 knots.

Wave measurements which have been made on the King George VI Reservoir at Staines show expected increases of wave height and wave length with wind speed and fetch, and show that the same wind speed measured at 30 feet produces longer and higher waves when the air is colder than the water. Information has been obtained about the wave spectrum and it is estimated that the net rate of gain of energy to the wave system on the reservoir is about 1 per cent of the downward transfer of energy past the height of 30 feet. It has been found that the waves which contain most of the energy travel approximately 10 per cent faster than would be expected if they were simple sinusoidal waves; the difference is attributed to greater steepness, effect of the mean flow and the convergence of trains of waves from adjacent bearings.

A theoretical investigation is in progress of the statistical properties of a random moving surface. The probability distributions have been obtained for the height and mean density of maxima and minima, for the velocities of reflected points of light and for the motion and orientations of the contours. These properties can be used to determine the distribution of energy in the open sea, and to find the spread of directions and wavelengths. If the necessary observations can be made, the method will have an important application to the study of wave generation and propagation. Some information is already available from aerial photographs of the sea surface. It is planned to use airborne radar altimeters to obtain the complete energy spectrum.

A study has been made of the statistical distribution of wave heights, and the good agreement found between theory and measurements at sea shows that the waves behave as if they originate in a large number of disturbances which are unrelated except in so far as each contributes more or less the same range of wavelengths. The arguments hold strictly for low waves only, but they seem to represent a wide range of sea conditions very satisfactorily, and allow good use to be made of any advances in our knowledge of the physics of wave generation and propagation.

The statistical fluctuations of mean wave height in long recordings have been studied and the degree of certainty has been calculated with which mean wave height and length can be measured from wave records of different lengths. Equipment has been installed in R.R.S. *Discovery II* to record mean square wave height to test the conclusion based on the Fourier spectrum.

The shipborne wave recorder fitted in R.R.S. *Discovery II* has been used in connection with the problems of finding directions of wave travel. The sea surface is usually traversed by trains of waves travelling in several directions, and a stationary wave recorder gives only the sum of the waves. Continuous recordings made as the ship steamed at 7 knots round a regular 12-sided figure allowed the Doppler shifts in the frequency of identifiable wavebands to be used to estimate their mean directions. The mean values and amplitudes of the sine curves which resulted from plotting the apparent frequency against the ship's course as it steamed round the 12 sides give independent estimates of the frequency and phase velocity of the waves. The method has been tried several times, and on each occasion the measured phase velocity was within 5 per cent of the theoretical value for the long-crested gravity wave of the same period. Further work is in progress, and records of the ship's roll, pitch and heave are being studied in relation to the waves.

Wind Drift

Research on the flow of water through the Strait of Dover in relation to wind and differences in sea level show current surges with peaks which lag up to six hours behind the corresponding maxima in wind stress or surface gradient. The results give rather higher values for the wind-stress coefficient than others based on wind profiles, and the ratio of water velocity to wind velocity varied from a maximum of 4 per cent in winter to a minimum of 2 per cent in summer.

The Institute gave what information was available about wind drift at the surface of the sea round the British Isles to the Ministry of Transport and Civil Aviation to help with the investigation of oil pollution, and was given financial assistance for extensive experiments with drift cards. These cards, measuring $5\frac{3}{4}$ by $3\frac{1}{2}$ inches and printed in eight languages, were enclosed in plastic envelopes and dropped in bundles of 10 every 10 miles from R.A.F. planes flying low over a long track between the Bay of Biscay and the Faeroe Islands, passing approximately 300 miles west of Ireland. A reward of half-a-crown or the equivalent in foreign currency is offered to the finder of every card for its return to the Institute.

Those put out in December have been arriving at a much lower rate than the ones put out previously, and the difference can be attributed to " adverse " winds over the ocean west of the British Isles for several months after the flight. Cards have been recovered from places separated as widely as Reykjavik (Iceland), Hammerfest (northern Norway), north of Goteborg (Sweden) and the Portuguese coast south of Lisbon. A report is being prepared for the Ministry of Transport and Civil Aviation, and the data seem to afford very promising material for the study of the surface drift in relation to the wind. A preliminary analysis using 63 of the most rapid drifts selected from all the material shows that the envelopes follow the direction of the gradient wind (obtained from the isobar spacing on the daily weather charts) at a speed which is approximately 2·2 per cent of the computed gradient wind speed; this indicates that the drift of the surface film of water in the region depends mainly on the day-to-day changes of the wind.

The programme of current and wind measurements on British lightvessels has been increased to provide readings every hour, and three French, Belgian and German lightvessels and four Netherlands vessels follow the same routine. It is expected that the new system will lessen the effect of errors of observation and allow the more detailed analysis of smaller but important features of the records.

Exchange of Energy between Sea and Air

Analyses were made of wind profiles over a water surface, the results of which will form a background for further research.

Work has been done on problems of radiation and heat balance for the Atlantic, Pacific and Indian Oceans, and also on the effect of wind stress.

Water Circulation in the Oceans

One set of deep-current measurements was made in 42½°N., 20½°W., by following the track of a slowly sinking acoustic transmitter by the differences in the time of arrival of each transmission at a pattern of moored sono-radio buoys. The velocities measured at depths between 1,000 and 2,000 metres over 12 hours were mainly directed ENE. with speeds varying up to 1/3 knot. Estimates of the average current over three days made by following large drogues supported from small surface floats by 1,000 and 2,000 metres of piano wire gave 0·1 and 0·05 knot in the same general direction. Calculations based on the density distribution as shown by normal hydrographic stations made at the four corners of a square of 10-mile side indicated a flow into the square across one pair of opposite sides and out of it across the other pair. This unexpected result was probably due to tidal changes in the slopes of the isobaric surfaces.

The general conclusion reached from these preliminary experiments was that the method using the sinking acoustic transmitter is too complicated for extensive use, and transmitters have been fitted in neutral-buoyancy floats whose weight and compressibility can be adjusted so that they will float at predetermined depths.

Experiments have been made with current meters towed at speeds of approximately 2 knots at great depths. The velocities of the water relative to the meter could be measured with an accuracy of 0·05 knot. The movements of the ship and meter which have to be known to calculate the absolute water velocity could be measured with somewhat greater accuracy.

Natural Oscillations and Storm Surges

The Institute has undertaken to do research on behalf of the Meteorological and Oceanographic Advisory Committee of the Minister of Agriculture, Fisheries and Food which is implementing the recommendations of the Departmental Committee on Coastal Flooding, particularly on the problems of the response of the sea surface to winds of different intensity, duration and fetch, the modification of long waves in shallow water and the natural oscillations possible in the North Sea.

The section on marine physics concludes with a description of the proposed oceanographical work for the International Geophysical Year 1957–58. Next comes a description on the progress in marine biology. The report also includes a description of the Commonwealth Oceanographic Conference held at the Institute in October 1954, and a description of the R.R.S. *Discovery II* and its work during the year, including a month's duty as a relief weather ship at ocean station K.

P. R. B.

EXCELLENT AWARDS TO CANADIAN OBSERVING SHIPS

We have recently received a letter from the Controller of the Canadian Meteorological Division, extracts of which are given below.

" We have recently made the selection of ships' officers whose work in marine observing in Canadian selected and supplementary ships during 1955 has merited the presentation of our annual Excellent Awards. This year the award is the Canadian Oxford Atlas.

" This year the prize was presented to the master and officers of each ship whose meteorological observations had been above the average of all ships during 1955. A total of 38 ships participated in the voluntary observing programme last year, and we found that 16 of these have made observations which were above the average in both quality and quantity. The award for these ships will be placed in the ships' library for the benefit of all officers.

" In recognition of the valuable work performed by the radio officers in the winning ships, an award was also made to the radio officer who had transmitted the greatest number of reports.

" In order to reward truly outstanding work performed by individual observing officers, the ten principal observers, among all ships, who had made the greatest number of high-quality observations during the year, were singled out for individual prizes. Their work was assessed not only for quantity provided, but also for accuracy and completeness."

Award Winners in Canadian Observing Ships

Ship gaining Award	Radio Officer
S.S. *Cyrus Field* (Western Union Telegraph Co.)	C. Jackson
S.S. *d'Iberville* (Department of Transport)	C. J. Seaman
S.S. *Esso San Juan* (Imperial Oil Shipping Co.)	M. Kelly
S.S. *Imperial Edmonton* (Imperial Oil Shipping Co.)	R. Anderson
S.S. *Imperial Toronto* (Imperial Oil Shipping Co.)	M. Kelly
M.V. *Irvingbrook* (Kent Lines, Ltd.)	H. Grums
S.S. *Lakonia* (Donaldson Lines, Ltd.)	G. Foster
S.S. *Lord Kelvin* (Western Union Telegraph Co.)	W. Martell
M.V. *Mattawunga* (Trans-Atlantic S.S. Co.)	U. Svensson
S.S. *Paloma Hills* (Shell Canadian Tankers)	H. A. Horwill
S.S. *Pinnacles* (Shell Canadian Tankers)	J. Weir
S.S. *Rincon Hills* (Shell Canadian Tankers)	D. Brady
S.S. *Waihemo* (Union S.S. Co. of New Zealand)	C. Ward
S.S. *Waikawa* (Union S.S. Co. of New Zealand)	R. J. Prosser
S.S. *Wairuna* (Union S.S. Co. of New Zealand)	B. Sword
S.S. *Waitomo* (Union S.S. Co. of New Zealand)	J. Whiteside

Principal Observing Officers gaining Award	Ship
C. A. Bradshaw	S.S. *Rincon Hills*
A. H. Campbell	S.S. *Imperial Toronto*
J. S. Crouse	S.S. *Rincon Hills*
G. A. Gordon	S.S. *Wairuna*
M. Lever	S.S. *Pinnacles*
A. Lundquist	M.V. *Mattawunga*
A. McLean	S.S. *Lakonia*
M. Quinton	S.S. *Waikawa*
E. Wagner	S.S. *Imperial Alberta*
G. H. Warren	S.S. *Lord Kelvin*

INSTITUTION OF EXCELLENCE AWARDS TO SELECTED SHIPS BY THE AUSTRALIAN BUREAU OF METEOROLOGY

The following report has been received from Mr. L. J. Dwyer, Director of Meteorology for the Commonweath of Australia.

A system of Excellence Awards to Australian weather reporting ships has been instituted by the Bureau of Meteorology as a means of giving concrete recognition of the co-operation of ships' captains and officers in the provision of daily weather reports on a voluntary non-allowance basis. This action has been taken in pursuance of the resolution adopted at the 1955 Conference of Commonwealth Meteorologists in London, recommending that the practice of making awards to those selected ships which consistently maintain a high standard in their weather observations and reports should be adopted by each Meteorological Service of the British Commonwealth.

An Excellence Award will be limited to cases in which a high standard has been maintained in the performance of meteorological observations, the maintenance of a weather log, and the transmission of regular reports, over a minimum period of five years, and will take the forms of:

(*a*) a framed colour print of an Australian scene suitably inscribed together with a citation for presentation to the ship;

(*b*) a book on an Australian subject suitably inscribed for presentation to the ship's observing officer or radio operator.

The first ship and the first ship's officer selected to receive the awards were the M.V. *Duntroon* and its radio officer, Mr. D. G. Eadie. These awards were presented at a ceremony held on board M.V. *Duntroon* on 23rd March, 1956, by the Director, Commonwealth Bureau of Meteorology (Mr. L. J. Dwyer). The award to the ship, which was received by the master (Captain L. N. Fry), consisted of a National Gallery of Victoria colour print of an early water-colour painting, *Swanston Street, Melbourne*, 1861, by Henry Burn, and a formal citation. A book entitled *Australian Legendary Tales* by K. L. Parker was presented to Mr. Eadie. The photograph on page 200 depicts the actual presentation by Mr. Dwyer.

Initiation of this award emphasises the importance placed by the Bureau of Meteorology on ships' reports received not only from Australian waters but also from the vast spaces in the Indian, Pacific and Southern Ocean areas and its desire to encourage ships' captains and officers to report as regularly and accurately as possible. It is gratifying to note the increasing number of reports being received from selected ships, this increase being summarised in the following table.

Year ending	Total number		Daily average		Av./ship/day
	Ships	Reports	Ships	Reports	
30.6.51	5,655	12,185	15·5	33·5	2·15
30.6.52	6,178	14,214	16·9	38·9	2·30
30.6.53	7,163	17,182	19·7	47·2	2·39
30.6.54	7,783	18,452	21·3	50·6	2·37
30.6.55	7,993	19,130	21·9	52·4	2·39

At the present time, reports are received from 27 ships comprising the Australian reporting fleet of which 16 are of Australian and 11 of overseas register. Since many of the ships on the Australian register are practically wholly engaged in the coastal trade, it is uneconomic to recruit and equip them as selected ships, but every opportunity is taken to encourage all ships to report during storm and cyclone periods and to utilise the forecasting services available from the various offices of the Bureau of Meteorology.

ANTARCTIC VOYAGE OF M.V. *OLUF SVEN*

On 22nd May, 1956, the M.V. *Oluf Sven*, 900 tons, Captain J. C. Ryge, arrived back in London after a voyage of 16,000 miles down to the remote Graham Land Peninsula of the Falkland Islands Dependencies in the Antarctic. This Danish ship had been chartered by Huntings Aerosurveys Ltd. to help in surveying 60,000 square miles of this little known British territory. This ship sailed from London on 21st October, 1955, with stores, two helicopters and the main party of the expedition under the leadership of Mr. Peter Mott. Deception Island was reached on 4th December, from where the work of compiling sufficient information, both by aerial photography and ground survey, to make topographical maps of the Graham Land Peninsula was commenced.

This is the largest undertaking, so far, to obtain accurate maps of any large part of the Antarctic Continent. The two helicopters were used to fly the ground surveyors and their equipment over high cliffs and to reach remote mountain peaks. These surveyors have to work out their positions during the short Antarctic night by astro fixes made with a high order of accuracy. The fix obtained is within three seconds of arc and the azimuth of the base line is also accurate to three seconds of arc and the length of the base line is measured to 1/10 millimetre.

Of the 60,000 square miles to be surveyed only a relatively small amount was covered after the setting up of the base during this last Antarctic summer, and the main work will continue during the next season when the *Oluf Sven* will again be chartered to proceed south to Graham Land with the main party to carry on this extensive survey.

By arrangement with the Director of the Danish Meteorological Service the *Oluf Sven* was equipped as a voluntary observing ship for the duration of the voyage.

J. C. M.

Letters to the Editor

BROWN'S NAUTICAL STAR CHART

(The correspondence below arose as a result of review of *Brown's Nautical Star Chart* which appeared in the April 1956 number of *The Marine Observer.*)

SIR,—The chart is not intended for the novice or for " the young officer to learn to find his way round the heavens ". *It is* intended as a substitute for the Star Globe but, unless you can get inside this, even a Star Globe is not particularly good for that purpose. What is clearly stated on the cover and on the Star Chart itself is that it is " for use at any time in any part of the world, to find what stars are suitable for observation and their approximate altitudes and azimuths ", and that it consists of " one large chart for finding altitudes and azimuths " and " seven smaller ones for identifying important stars ". (The smaller ones are printed on the back of the large one.) It is therefore an aid to the navigator when preparing stellar observations. . . .

As for the somewhat quibbling criticisms of nominative and genitive forms: all the stars with proper names (as distinct from letters) are written in capitals and spelt as given in the Nautical Almanac (except the two misprinted letters which I am glad to have had pointed out). The constellations are written in small letters and given in the genitive because the identifying letters are also placed against the stars. Thus we see Acrux written below α Crucis and Centauri written between β (Hadar) and α (Rigil Kent).

Cdr. P. C. H. CLISSOLD,
R.D., R.N.R. (Retd.).

Sarisbury Green, Hants.

SIR,—I originated this Star Chart and used it personally with perfectly satisfactory results for 10 years before it was first offered for sale. . . .

Your reviewers appear to have missed the point of its purpose entirely. It was never intended to be a guide to the stars for the uninitiated, but rather an invaluable aid to the experienced navigator at sea, in finding the approximate altitude and bearing of any star at any time from the chart, without calculations other than the calculation for the D.R. position of the ship.

Capt. A. J. TWEDDELL,
M.INST.P.I.

World Fenders Ltd.,
London.

SIR,—The impression gained on reading the review is that the publication under discussion is something new. In fact I believe this Star Chart has been on sale for at least 20 years and has, during that time, adequately served the primary purpose for which it was originally designed.

The purpose was not, as might be supposed from the review in your columns, to enable young officers to find their way round the heavens. It was—to the best of my knowledge and from my own experience—to furnish those who had already got to know the stars most used in stellar navigation, and who were required to make observations regularly, quickly and accurately, with a means for readily placing upon their sextants the approximate altitude of the star to be observed, and of knowing in which direction to look for it.

The simplicity of the method used in order to get this information was, I think, not sufficiently brought out in the review. . . .

The criticisms your reviewers make on astronomical grounds and on the question of nomenclature would appear to be unnecessarily pedantic, given that the main purpose of the chart is understood. The designers were not, I should think, too much concerned with nominative or genitive cases or with spelling and pronunciation. They designed a utilitarian article which does its job.

Capt. M. S. HODSON,
R.D., R.N.R.

Bitterne, Southampton.

Note. The review criticised the Chart as being unsuitable for the novice. It is a pity that it carries no note to this effect, nor information as to its original date of publication. One has to remember that a sea-going officer has little opportunity to study books in shops and has often to buy with the catalogue as his only guide. The reviews in *The Marine Observer* are designed to help him in his choice of literature.

The main target of the astronomical criticism was the inconsistency in the use of the nominative and genitive cases of the constellation names in the various parts of the publication. We find from ships' meteorological logbooks that some officers are confused between them and use them wrongly. It is therefore felt that such criticism can hardly be dismissed as pedantic or quibbling. There is nothing wrong in deviating from the accepted rule by giving the names on the main chart in the genitive case if this is considered to be helpful to the user, providing that a note stating that this has been done is added in the chart margin.

L. B. P., E. W. B.

Book Reviews

A Mariner's Meteorology, by C. G. Halpine and H. H. Taylor. 9¼ in. × 6 in. pp. xi + 371. *Illus.* D. Van Nostrand Co. Ltd., 1956. 57s.

This book is written by two American naval officers and, as stated in the Preface, it was " prepared primarily as a textbook for Midshipmen at the U.S. Naval Academy ", but the authors go on to say that " all the material contained herein is applicable in its broad sense to everyone who goes to sea, whether professional or amateur ".

The book is no doubt of value to the naval officer, particularly if he wishes to study the rudiments of the application of meteorology to aviation. As an informative treatise on meteorology for merchant seamen or for yachtsmen it seems to have a rather limited value. Its chief fault seems to lie in the fact that it attempts to cover so many varied aspects of meteorology without any attempt at specialisation, and for some unknown reason it devotes almost as much attention to the meteorology of the United States mainland as it does to that of the oceans. For example, the question of tropical storms is dealt with in 12 pages (in which are included seven diagrams), whereas " Weather Reports " takes up 35 pages. The specimen synoptic maps in the appendices are entirely related to the United States mainland and the relative text (discussing a particular forecast) blandly says: " On account of the lack of observations over the Atlantic Ocean the size of the area of bad weather cannot be determined accurately. . . ." Such a statement is scarcely encouraging to the large number of voluntary observing ships which regularly provide quite a reasonable network of observations in the relevant portion of the Atlantic Ocean.

Nevertheless, the book has some very good points. For example, there is an admirable graphic drawing showing the characteristics of the earth's atmosphere, in which the authors have included a wealth of information about heights up to 1,000 miles from the earth's surface. There is an excellent composite drawing of cloud formation from stratus to cirrus and some fine cloud photographs, alongside each of which is shown the appropriate symbol and a little drawing bringing out their characteristics, and a " thumb nail " description of the salient features. There is an admirable diagrammatic sketch showing the general circulation of the earth's atmosphere (on a globe) extending from the surface to the tropopause. There are also some good drawings and a simple and straightforward text describing the Coriolis force. The sections through frontal surfaces are also graphic (the best are taken from *Life* magazine). Some photographs are included to illustrate the Beaufort scale. A good idea, but some of these are badly chosen as they fail to give a realistic impression of the actual sea state to which they are meant to refer.

There is an extremely brief chapter on climatology (in which are included ocean currents) and another brief chapter on oceanography; all three subjects seem to be rather inadequately dealt with. There is a very interesting and well-written chapter entitled " Weather at War " which includes a well-illustrated section concerning the dangers of radio-active " fall out ". At the end of the book is a reasonably comprehensive glossary.

It is rather surprising that in the introduction to a book on maritime meteorology no mention is made of Maury (1854), although Leverrier's activities for collecting meteorological data for Europe in 1855 are quoted. When discussing the aneroid barometer, the authors refer to " certain types of minor errors ". They make no reference to the necessity of frequently comparing it with a mercurial instrument. When talking about pressure tendency, the complication of the ship's progressive movement is not taken account of. A serious omission for the mariner occurs in a description of the signs indicating the approach or development of a tropical cyclone, where no mention is made of the large diurnal variation of pressure found in the tropics, and the mariner is not shown how the magnitude of a pressure fall due to an approaching and developing tropical cyclone can be distinguished from a normal pressure fall due to diurnal variation of pressure in the region. The description of the creation of a tropical cyclone is rather over-simplified. When discussing upper-air observations, although radio sonde is mentioned, a description of radio wind technique is surprisingly omitted. On the subject of Arctic smoke, no mention is made of the large temperature difference between air and sea which is essential for its formation. The authors claim that " it rarely presents a hazard to shipping ". In extreme cases Arctic smoke can reduce visibility to less than ¼ mile and can extend to a considerable height. There is also the icing danger on the ship's structure to be associated with it.

The Beaufort scale as shown in this book is complicated somewhat by showing some equivalent wave heights for a United States Navy " Sea State Code " and the World Meteorological Organisation's " International State of Sea Code ". On the other hand, the height equivalents officially approved by the W.M.O. for association with the Beaufort scale are not shown. The visual storm warning signals shown in this book only refer to the United States waters and no reference is made to the existence of an international visual warning system which is used to some extent by most other countries.

Under the chapter entitled " Weather Reports ", a suggestion is made that " before departing for areas of the world unfamiliar to him, the mariner should obtain climatological information of these areas from the nearest weather central ".

An officer in a tramp ship would have a rather busy time if he carried out this procedure. Quite a lot of information of this nature is fairly readily available from Sailing Directions. When discussing weather maps, reference to observations from ships is conspicuous by its absence.

The chapters concerning the basic physics of the atmosphere are the best feature of this book. They are written in a very interesting and readable manner and easily understandable by the student having only elementary scientific knowledge.

C. E. N. F.
R. F. M. H.

Merchant Ships: World Built, Vol. IV, 1956. (Ships of 1955.) 6 in. × 9 in. pp. 264. *Illus.* Adlard Coles Ltd., and Harrap & Co. Ltd. 30s.

To all interested in merchant ships this attractive and well-arranged little volume is a useful and comprehensive reference on new construction. The photographs and plans will be especially appreciated.

The various tables given in Section I are an interesting study. The remarkable progress of Germany and Japan has no doubt been noted with some disquiet by British shipbuilders. Germany's deliveries of export tonnage account for nearly half of her total deliveries of 928,569 gross tons. Japan shows the highest figure of any country in the world for export tonnage with 53 ships totalling 583,146 tons. With the rising cost of new tonnage built in the United Kingdom, together with the uncertainty of delivery dates, increasing competition can be expected from these countries.

The streamlining of superstructure and raked stem of much of the new construction gives a graceful and pleasing appearance, spoilt in a few cases by a somewhat bizarre shape of the funnel. This tendency to streamlining emphasises the use that is made nowadays by ship designers of models for testing in ship research tanks and in wind tunnels. It also emphasises the realisation that wind force at sea is still an extremely important element—an item which cannot be lost sight of in these days of high fuel costs. The queer shapes of funnels have been in some cases a result of research into means of getting the smoke clear of the ship's decks—an important item in the case of a passenger ship.

The importance of speedy cargo handling is shown by the fitting of bipod masts in so many new ships and mechanically operated steel hatch covers together with the much improved design and arrangement of winches. It is perhaps surprising that wooden hatch covers have remained popular for so long considering how potentially vulnerable they are to damage in heavy weather. It seems that before many years have passed the wooden hatch cover on the weather deck will have gone to join the rod and chain steering gear.

The ore-tanker is gaining favour. To Japan goes the distinction of having built, in 1955, the largest vessel of this type afloat, the *Sinclaire Petrolore*, of 35,131 gross tons. Negotiations are well advanced for even larger ships of this type to be built by Japan for an American owner, likely to be about 87,000 tons deadweight.

The new Shaw Savill passenger ship *Southern Cross* is proof that the British designer is not afraid of a complete breakaway from conventional design when advantage is seen in so doing. This unique ship, with the machinery aft and carrying no cargo, permitted the inclusion of every refinement of comfort for passengers and crew.

Marine observers will be interested to know that 15 of the new ships built for British ownership have been recruited as selected ships.

A. D. W.

The World's Tankers, by Laurence Dunn. 9¾ in. × 7½ in. pp. 176. *Illus.* Adlard Coles Ltd., and Harrap & Co. Ltd., 1956. 35s.

The Meteorological Office was but three years old when the first well which was specifically drilled for oil was sunk in 1857 at Titusville in Pennsylvania. A year later the ocean transport of oil from America to the United Kingdom began, very unobtrusively, as a few sample barrels in a general cargo. Within three years, however, an Isle of Man shipowner had built the first iron-hulled sailing tanker, the *Ramsay*, for the carriage of oil in bulk. There can be no doubt that meteorology played its part in the design of this ship, for changing air and sea temperatures through which she was to sail during her voyages would alter the volume of the oil and to allow for this was one of the problems which the designer had to solve. The tanks were equipped with a siphon, one end of which was dipped into water in an adjacent tank. Expansion of the oil forced water up into the breathing pipe of its own tank and, on contraction, the water level returned to normal and both tanks were kept " pressed up ". In the case of the *Atlantic*, another vessel specially built in the same year, the problem was solved by the fitting of hollow iron masts which dipped into the oil tanks themselves.

When we read in *The World's Tankers* of the almost meteoric expansion of the oil-carrying fleet from these vessels of small size and somewhat crude design to the magnificently equipped and highly-developed tankers of today, we cannot but feel proud that we grew up together, and that the co-operation of those early days still lives in the invaluable help which we receive from the 51 tankers in the British Voluntary Observing Fleet and in the advice we are able to give tanker-owning firms regarding ocean routes or the possibility of laying moorings in little-known anchorages, etc.

The history and development of the oil tanker is in itself a fascinating subject to which Mr. Dunn has given full justice. The book is divided into 13 sections: The First Oil Ships; Pioneer Tankers; Anglo-American and Shell; Oil Sailers and Barges; Tankers 1900–1919; The Twenties and Thirties; Standard Tankers of the Second War; Post-War Developments; Whalers; Harbour Coastal and River Tankers; Specialised Tankers; Super Tankers; and brief histories of some of the leading tanker firms of today.

Over 200 excellent photographs of tankers of all types and periods, together with particulars and a concise history of each, ably supplemented by drawings and silhouettes by the author himself, make this a book well worthy of a place on the shelves of anyone interested in ships and shipping. The price is reasonable for it is wholly produced on art paper.

L. B. P.

Notices to Marine Observers

Radio Weather Messages in the Pacific Ocean

Ships in the Guam area (5°–25°N., 180°–130°E.), who have weather messages for "Fleet Weather Central Guam" and cannot raise station NPN on medium frequencies, may re-address their messages to "Weather Manila" and forward them through shore stations DZC, DZG or DZR.

B.B.C. Television Service

The B.B.C. transmit on their television service a chart of wind and visibility for the coastal areas of the British Isles for the benefit of inshore fishermen and yachtsmen. This chart is broadcast at the end of the programmes, usually sometime between 2230 and 2300 clock-time.

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.

Thames Fog Warnings

A recent Admiralty Notice to Mariners draws attention to a scheme whereby warnings are issued by radio from North Foreland (GNF) when visibility is less than ½ mile in the vicinity of Gravesend Reach. Another warning is issued when visibility is restored. The warnings are scheduled and provision is also made for the convenience of hours of watch of ships carrying only one radio officer.

A similar arrangement has recently been introduced by the Netherlands authorities in the New Waterway for ships bound for Rotterdam, see Admiralty List of Radio Signals, Vol. V.

Observations of Ice Conditions

Under the International Convention for Safety of Life at Sea, drifting ice, derelicts and all other floating dangers to navigation are reported by all means at the disposal of the master. (See pages 96–98 of the *Marine Observer's Handbook*, seventh edition.)

However, as regards ice, more detailed information than can be given in a TTT message would be of value to the Meteorological Office. If marine observers could note the condition of ice, either drifting or fast, in the pages at the end of the meteorological logbook or on Form 912, which may be obtained on application to Port Meteorological Officers or Merchant Navy Agents, it would help in research work ashore and for Admiralty charts and sailing directions.

In the North Atlantic ships are requested not only to record the presence of ice, but also during the ice season if they have encountered no ice. In this way it can be ascertained when the tracks have been free from ice.

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ERRATUM

In the April 1956 number of *The Marine Observer* it was stated on page 89 that the *Lorella* and *Roderigo* were Grimsby trawlers. They were, in fact, from the port of Kingston-on-Hull, the owners being the City Steam Fishing Co. and Hellyer Bros. Ltd., respectively.

INDEX TO VOLUME XXVI, 1956

ABRIDGED LIST OF PUBLICATIONS OF THE METEOROLOGICAL OFFICE

Publications may be ordered from the bookshops of Her 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, reprinted 1953.) 2*s.* 6*d.* (2*s.* 8*d.*)

Handbook of Meteorological Instruments. Part I. Instruments for surface observations. (M.O.577.1956). 45*s.* (46*s.* 6*d.*)

Handbook of Weather Messages, Codes and Specifications. (M.O. 510.)

Part I. Transmission schedules and station index numbers. (2nd edition, 1955.) 6*s.* (6*s.* 4*d.*)

Part II. Codes and Specifications. (2nd edition, 1954.) 4*s.* 6*d.* (4*s.* 11*d.*)

Part III. Coding, decoding and plotting. (2nd edition, 1954.) 4*s.* 6*d.* (4*s.* 9*d.*)

(*Amendments issued as necessary and priced separately*)

Instructions for the Preparation of Weather Maps with tables of the specifications and symbols. (M.O. 515, 2nd edition, 1954.) 1*s.* 9*d.* (1*s.* 11*d.*)

International Meteorological Code adopted by the International Meteorological Organisation, Washington, 1947. **Decode for use of shipping,** incorporating the code for weather reports from and to ships and the analysis code for use of shipping. (M.O. 509, 3rd edition, 1955.) 1*s.* 6*d.* (1*s.* 8*d.*)

Marine Observer's Handbook. (M.O. 522, 7th edition, 1950, reprinted 1952.) 10*s.* 6*d.* (11*s.* 3*d.*)

Meteorological Glossary. (M.O. 225ii, 3rd edition, 1939, reprinted 1953.) 12*s.* 6*d.* (13*s.* 5*d.*)

Meteorological Handbook for Pilots and Navigators. (M.O. 448, 2nd edition, 1942, reprinted 1952.) 3*s.* 6*d.* (3*s.* 9*d.*)

Meteorology for Aviators. By R. C. Sutcliffe, Ph.D. (M.O. 432, 1940, reprinted 1953.) 10*s.* (10*s.* 11*d.*)

A Short Course in Elementary Meteorology. By W. H. Pick, B.Sc., F.C.P., F.Inst.P. (M.O. 247, 5th edition, 1938, reprinted 1953.) 4*s.* 6*d.* (4*s.* 9*d.*)

Weather Map. An introduction to weather forecasting. (M.O. 595.) *In the press*

Prices in brackets include postage

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