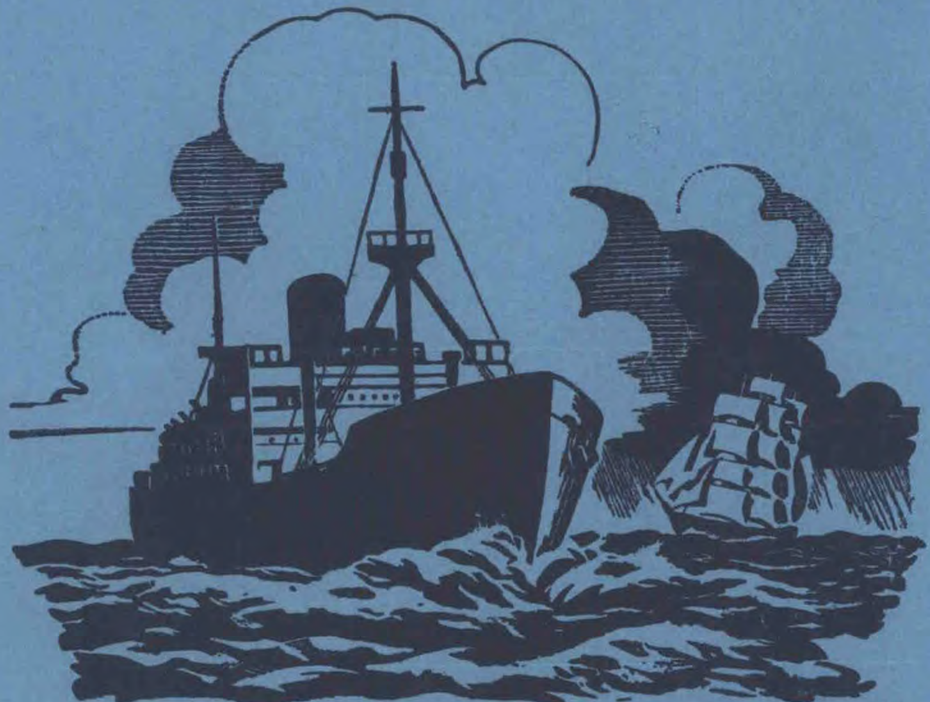
M.O. 638

The Marine Observer

A quarterly journal of Maritime Meteorology



Volume XXVIII No. 180

April 1958

SIX SHILLINGS NET

M.O. 638 AIR MINISTRY

THE MARINE OBSERVER

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

VOL. XXVIII No. 180 APRIL 1958

TABLE OF PRINCIPAL CONTENTS

Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer," Meteorological Office, Headstone Drive, Harrow, Middlesex

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

To be purchased direct from H.M. Stationery Office at any of the following addresses: York House, Kingsway, LONDON, W.C.2; 423 Oxford Street, LONDON, W.1; 13a Castle Street, EDINBURGH, 2; 109 St. Mary Street, CARDIFF; 39 King Street, MANCHESTER, 2; Tower Lane, BRISTOL, 1; 2 Edmund Street, BIRMINGHAM 3; 80 Chichester Street, BELFAST, or from any bookseller.

PRICE 6s. NET or £1 5s. 8d. per annum (including postage)

Editorial

The British Shipbuilding Research Association carried out in October and November 1953 some rather unusual service performance trials in the North Atlantic aboard a British Selected Ship, the *Cairndhu*, during a voyage from Grangemouth to Montreal and back to Newcastle on Tyne. The object of the trials was to study the performance and behaviour of a dry-cargo ship at sea under as many different weather conditions as possible, so as to provide accurate performance data with which to examine methods of analysis and at the same time the powering allowances necessary to maintain the designed service speed. To achieve this it was necessary to measure the ship's propulsion performance as accurately as possible and to record simultaneously the various factors likely to affect that performance. The results of these trials are contained in a paper* which was read at the North East Coast Institution of Engineers and Shipbuilders in November 1957 and they make interesting reading.

The paper points out that the North Atlantic is accepted as being able to provide both the worst weather likely to be met on any sea route and also the greatest variety, and it is because the *Cairndhu* is always on that trade that she was chosen for the trials.

Shaft revolutions, rudder angle, angle of roll and pitch, ship's speed by pitometer log and wind speed and direction were recorded autographically; other observations such as wave height and wave length were made visually, supplemented by stereographic photographs. The anemometer and wind vane were mounted on a special 20-foot mast on top of the wheelhouse. This exposure seems to have been far from ideal, but checks of the readings were made with a hand anemometer. These wind observations were later compared with the visual observations recorded in the ship's log and were generally not far different, but on one occasion the ship's log showed Beaufort force 4, whereas the anemometer reading was force 7—the wind being on the port quarter!

The paper shows that the estimation of wave heights and wave lengths was difficult, as is usually the case, particularly in confused seas, and it was found that the best method of estimating height was to look at the wave crests and compare their heights with known heights of certain objects aboard the ship. Wave lengths were estimated with reference to the ship's length or observer's position relative to the bow or stern. The ship's officers were always consulted about wave observations. One wonders if period would have been an easier observation to make than length.

During the outward passage the wind was mainly from ahead. On six out of eight days winds of Beaufort force 6 and above were recorded, the maximum being force 11. On the homeward passage the winds were mainly following and generally somewhat lighter in force. The authors state that " it was very noticeable that the state of sea for a given wind force agreed very closely with the description given in the Beaufort scale . . . ". The greatest estimated wave heights during the voyage were between 25–35 feet during the outward passage, with an occasional wave probably exceeding 40 feet—and having a length of about 500 feet. Tabulated weather data included in the paper show that prior to this observation winds had been mainly westerly (force 7 to 9), so that waves of these dimensions could have reasonably been expected to occur. The maximum roll of the ship which was recorded throughout the voyage appears to have been about 25°. The natural period of pitch of the vessel under way during the outward passage, when she was in a fairly " light " condition, was 6·1 seconds and homeward 9 seconds: the periods of roll were found to be 10·2 seconds outward and 12·2 seconds homeward.

As for the result of the trials, the authors say in conclusion " Under very bad conditions the speed of a vessel fluctuates considerably about the mean speed, the

*N.E.C. Inst., Volume 74, Page 115.

fluctuation amounting at times to ± 12 per cent. The mean speed was at times 25 per cent below the corresponding still water speed. . . . As may be expected, the speed loss in following seas is not so high as when the seas are from ahead. Approximate figures from the power time diagram showed that the increase in power necessary to maintain a given speed from the U.K. to Father Point would be of the order of 25 per cent, but on a winter voyage from U.K. to St. John, N.B., the increase would be between 40 and 50 per cent depending upon the severity of the weather."

There seems little doubt that practical observations of this nature made by experts under service conditions aboard a ship at sea provide valuable information for Naval architects and for the shipping industry generally. But accuracy in making the observations is important and often difficult to achieve. The skill which ships' officers can attain in making accurate observation of wind and waves can contribute quite a lot towards the success of such experiments, and statistical data taken from meteorological logbooks of voluntary observing ships can undoubtedly provide valuable background data for such investigations.

MARINE SUPERINTENDENT.

THE MARINE OBSERVERS' LOG

April, May, June

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.

MARINE LIFE

Gulf of Panama

M.V. *Sussex*. Captain N. A. Thomas. Auckland to Balboa. Observer, Mr. B. W. Anstey, 2nd Officer.

27th May, 1957, 1700 G.M.T. While steaming at reduced speed, several forms of marine life were seen quite clearly. There was no wind, the sea smooth and the sun's rays penetrated the water to some depth. A large fish (see sketch opposite page 72) was seen darting at high speed after a flying fish. Its colours were very bright and on breaking the surface it was seen that they did not appreciably change. The length of the fish was approximately 4 ft but it was very narrow by comparison. The body, which appeared to be semi-transparent, was bright green with a darker coloured green head and light mouth.

About this time there was an abnormal amount of flotsam drifting down from a NE'ly direction. As one piece of wood passed close to the ship a turtle was observed floating alongside the wood with its head resting on it, while the legs were slowly moving. Around and below the turtle were objects which looked like flat fish. The turtle was about 3 ft in diameter and coloured light brown, with a red patch toward the hind part of the shell.

Position of ship at 1800 G.M.T.: 6° 00'N., 81° 24'W.

Note: Mr. N. B. Marshall of the Natural History Museum comments:

"The large leaping brightly coloured fish seen by the M.V. *Sussex* was undoubtedly a Dolphin Fish (*Coryphaena*) which occurs in sub-tropical and tropical seas and grows to a length of about 6 ft. Dolphin fishes are ferocious and seem to have a preference for flying fishes. When the latter take to flight the Dolphin may hurl itself out of the water in pursuit. The Kon-Tiki men saw this."

TURTLES

North Atlantic Ocean

M.V. *Cambridge.* Captain P. P. O. Harrison. Curaçao to London. Observers, the Master and all Officers.

29th May, 1957. Between 0900 and 1100 S.M.T. six turtles were seen, two of which were heading north. The largest was about 5 ft long and one, the smallest, about 3 ft in length. The colour was light brown, with definite tortoise design on the shell; the throat and underpart of the neck were white while the flippers were a brown colour.

Also present were sea scum (fish spawn?), dolphins, Portuguese men o' war, whales, petrels, seaweed, sharks, sword fish and driftwood. Air temp. 64°F, sea 64°. Wind E., force 2.

Position of ship: 41° 53'N., 32° 37'W.

Note 1. Dr. H. W. Parker, of the Natural History Museum, comments:

"The turtles, by their brown colour and size, seem to have been the Atlantic sea-brown loggerhead."

Note 2. Regarding the concentration of plankton and marine life around the Azores, Mr. N. B. Marshall of the Fish Section of the Natural History Museum states:

"Being the steep-sided remains of volcanic eruptions, the Azores must have considerable influence on the local water movements. Part of a current hitting an island probably rises towards the surface. In his paper on sperm whales of the Azores, Clarke suggests that the islands, by interrupting currents, give rise to vertical mixing; hence to nutrients reaching the surface.

"There is certainly evidence of considerable organic production around the Azores (see Clarke's *Discovery Report*, for instance). Murray and Hjort, in *The Depths of the Ocean*, make some mention of abundant planktonic life, e.g. salps and medusae."

PORTUGUESE MEN O' WAR

North Atlantic Ocean

M.V. *San Veronico.* Captain S. Miller, O.B.E. Curaçao to Rotterdam. Observer, Mr. L. Coutts, Chief Officer.

13th May, 1957, 1200 G.M.T. While the ship was stopped for engine repairs, many Portuguese men o' war were observed. These took the form of a blue and pink bladder, of various sizes up to 8 in., floating above the sea surface. These were joined to a jelly-like body, from which grew half a dozen or so tentacles. On puncturing the bladder of one caught in a bucket it was observed to deflate partially. The hole quickly sealed as the bladder listed over, immersing the puncture in the water, and within a couple of minutes reinflation had taken place. The tentacles were found to be very elastic and capable of stretching as much as approximately 48 in. See *A* and *B* in the photograph (opposite page 72), which shows a tentacle stretched right round the bucket. Air temp. 68°F, sea 66·5°.

Position of ship: 36° 28'N., 36° 28'W.

Note. Mr. A. K. Totton of the Natural History Museum comments:

"The part of the extract that is of great interest concerns the puncturing of the bladder, its partial deflation and subsequent inflation. The evidence for this is perhaps not quite as clear as one would wish. But a similar story was published more than a hundred years ago by a French scientist, and I have myself, with a colleague, made attempts in the Canaries to repeat his experiment. We took out air with a hypodermic syringe but we got no clear evidence that the volume of air subsequently increased. There is of course a circular patch below the inner gas sac which secretes air, especially as it grows. Captain Miller's note on deflation may record the lowering of the crest (a frequent occurrence) without a loss of total volume of air, and subsequent raising of crest without increase of total volume. It would be of great interest if he could, on a future occasion, draw out a third of the air (the sac is, as he says, self-sealing) and then note if the sac reaches its original size again.

"For the last two years, I have been preparing a memoir on these animals. The chief subject on which we now need information is the distribution and circulation of this animal on the high seas, and in this work constant observation from ships would be most valuable.

"At the end of August and beginning of September last there was obviously an exceptionally large number of these *Physalia* in the Channel approaches and the Channel itself, as well as in the Bay of Biscay. Observations on the subject for that area and time would be of value in trying to follow this particular swarm of *Physalia* to the west. For instance on September 10th at least 100 specimens reached as far up Channel as Hastings. Where did they come from?

"As you know these animals are drifted along by the wind, so that we need the wind record at the place of observation as well. It is important not to confuse *Physalia*, the only animal of the sort with a big bag-like float, with other 'jellyfish' some of which have a small ridge-like float (*Velella*).

"I feel that if we can concentrate on the movement of one big 'wave' of *Physalia*, like the recent one that came up Channel, we shall be able to make a start on the question of its distribution and circulation."

TIDE RIP

Off East London

M.V. *Glenorchy*. Captain R. A. Hanney. Colombo to Cape Town. Observer, Mr. J. D. Williams, 3rd Officer.

15th May, 1957, 1030 G.M.T. We were steaming at a speed of about 17¼ kt in a moderate sea with a heavy s'ly swell, when I observed a very pronounced straight line on the radar screen, cutting the heading line at approximately 45° at a distance of about 5 miles. On looking out ahead we could see a line of white foam, presumably a tide rip. We crossed the rip about 17 min after first seeing it on the radar screen, and, having crossed, we found ourselves in comparatively calm waters with a rippled sea surface, moderate s'ly swell and light airs, in place of the moderate breeze previously experienced.

DISTURBED WATER

East China Sea

M.V. *Eumaeus*. Captain H. C. Large. Pusan to Hong Kong.

7th May, 1957. At 0650 G.M.T. a patch of violently disturbed water was seen, which was about 40 sq. ft in area. It closely resembled a squall or shoal of jumping fish, but no fish were to be seen. Similar patches were sighted at 0710, all about the same size. The echo sounder gave 54 fm. Wind NE'N., force 5.

Position of ship: 27° 43'N., 123° 20'E.

DISCOLOURED WATER

North Atlantic Ocean

M.V. *Wanstead*. Captain A. J. Cox. Adelaide to Hamburg. Observers, Mr. J. Lough, 2nd Officer, and Mr. R. Arnott, 3rd Officer.

14th June, 1957. The vessel was first noticed to be steaming in discoloured water at 0800 G.M.T. The water was amber in colour, but in the wake, stirred up by the propeller, it was a deep frothy brown. Broad shiny streaks were present on the surface along the direction of the wind and there was a faint fishy smell. The discoloured water continued until the onset of darkness at 1900, the vessel having steamed through it a distance of 140 miles. The smell disappeared about 2100 and there was no trace of discoloration at daylight the following morning. Soundings varied between 180 and 1250 fm during the period, but the depth was over 650 fm for the greater part of the time. The vessel was never nearer to the land than 42 miles and there were no river mouths marked on the chart for this area.

Position of ship: 18° 46′N., 17° 49′W. to 21° 03′N., 17° 51′W.

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments:

" This report seems a model of what such notes should be. What a pity she did not take any samples.

" From the position along the edge of the shelf along the Mauritanian coast one might suspect that the generally rich phytoplankton in the tail end of the Canary current, that commonly leads to greenish discoloration of coastal waters slightly farther north, might be involved, but perhaps *trichodesmium thiebautii* is more likely. This seems to be one of the most extensive discolorations yet recorded in the open Atlantic."

LINE OF DEMARCATION

East Cape, New Zealand

S.S. *Southern Cross.* Captain Sir David Aitchison, K.C.V.O. Suva to Wellington. Observer, Mr. S. T. Greer, 5th Officer.

6th April, 1957, 2105 G.M.T. The vessel, approaching East Cape, New Zealand, crossed a line of demarcation of greeny-blue coloured water in position 37° 41′S., 178° 40′E.

Note. Similar observations by M.V. *Port Pirie* and M.V. *Cambridge* were published on page 140 of the July 1957 number and page 206 of the October 1957 number respectively.

PHOSPHORESCENCE

Beachy Head

S.S. *Beaverglen.* Captain N. C. H. Scallan, R.D. Montreal to London.

28th June, 1957. At 2200 G.M.T., when approaching Beachy Head, brilliant green lines and balls of phosphorescence were observed in the bow wash. Green phosphorescence of lower intensity was also seen in the bow waves of passing ships.

Note. This is interesting as we very rarely have observations of phosphorescence from British waters.

Cape Verde Islands

M.V. *Geelong Star.* Captain J. S. Crowe. Cape Town to Tenerife. Observer, the Master and Mr. E. G. Bee, 3rd Officer.

30th April, 1957, 2345 G.M.T. Soon after picking up the Cape Verde Light at a distance of 26 miles, the sea around the vessel suddenly lit up with large and small patches of flashing phosphorescence. It was so bright that the visibility ahead seemed a matter of yards yet Cape Verde was still visible at about 20 miles. The crests of the waves were a brilliant green and, in the disturbed water along the ship's side, fish about the size of mackerel could be clearly seen darting in towards the light. The whole display lasted till 0120 on 1st May when the phosphorescence had largely disappeared. Air temp. 66°F, sea 64°.

North Atlantic Ocean

S.S. *John Holt.* Captain J. G. Jones. Liverpool to West Africa. Observer, Mr. D. J. Edwards, 3rd Officer.

19th February, 1957. At 2100 G.M.T. vivid phosphorescence, which initially appeared as spots in the bow-wave, was observed around the ship. At 2145 the phosphorescence intensified. Large spots could be seen which had the appearance of bursting on reaching the surface, and, closer to the ship at varying depths, there were patches of phosphorescence, the shape of which was hard to distinguish owing to their being visible for only a fraction of a second. Those which could be observed were circular and sometimes as much as 4 ft in diameter. The vivid bright spots were visible at distances up to 200 ft from the ship, but the underwater patches could be seen only up to 50 ft. At this time a school of porpoises appeared and each one could be seen by its wake. By 2200 there were only occasional flashes of phosphorescence, still bright and circular in shape. At 2215 it intensified so greatly that an area about 100 ft in diameter, composed of vivid bright patches each about 6 ft in diameter, all seemingly twinkling, was observed as the ship passed it. After this brilliant display only occasional spots were noticed until 2230 when large flashes were seen, under the surface, visible in the bow-wave at no more than 15 ft from the ship's side. During the whole of the period the sky was clouded over but at 2300 the moon rose and broke through. The phosphorescence then disappeared except in the breaking of the bow-wave. A sample of the sea water was examined in a bucket but no phosphorescence could be seen. Air temp. 66·4°F, sea 67·8°. Wind NNW., force 4. Waves and swell, NW; mean height 6 ft.

Position of ship: 16° 40′N., 17° 42′W.

S.S. *John Holt*. Captain J. G. Jones. Las Palmas to Takoradi.

23rd April, 1957. From dusk onwards, vivid phosphorescence in the form of breaking waves could be seen all round the ship for distances of about 5–7 miles. This gave the sea the appearance of being very rough, when actually there was only a slight sea running, making it hard at first to distinguish ships' lights, on the horizon, from breaking waves. At this time, due to haze, the visible horizon was about six miles distant. At 2050 large patches of phosphorescence were seen at various distances. These seemed to change in shape with the wave movements but as the ship passed through them it could be seen that the patches were shoals of small fish which darted away on being disturbed. The phosphorescence was so brilliant that, although small, each fish could be seen individually. At times the bow-wave was brilliant green in colour, like the hands of a luminous watch, but otherwise it remained a brilliant white, like snow on a dark night. When the sea temperature was taken the water in the bucket was examined; it was very vivid, the whole bucket being full of bright spots. Air temp. 68·2°F, sea 67°. Wind NW., force 2. Sea slight with NW. swell—mean height 3 ft.

Position of ship: 12° 30′N., 17° 30′W.

S.S. *Baron Maclay*. Captain W. Warden. Rotterdam to Takoradi. Observer, Mr. James Morrison, Chief Officer.

1st May, 1957. At 0305 G.M.T. a brilliant display of phosphorescence was seen which was quite breathtaking in its intensity. At first a faint and uniform luminosity covered the sea surface, which later became a blaze of vivid lights twinkling and flashing in an amazing manner, and of sufficient intensity to illuminate the ship's side. By 0330 the phosphorescence had disappeared. During the period of activity, it was noticed that there was a strong smell as of stagnant seaweed. Air temp. 68°F, sea 72°—a rise of 4° in the past 6 hours.

Position of ship: 12° 18′N., 17° 36′W.

South Atlantic Ocean

S.S. *Nestor*. Captain E. W. Studley. Durban to Las Palmas. Observer, Mr. M. J. Mahoney, 3rd Officer.

3rd May, 1957. At 2120 G.M.T. a bright band of phosphorescence was seen about ½ mile ahead of the vessel. It was followed by many more similar bands, which were about 6 ft wide and stretched for a considerable distance in a NW.–SE. direction. Between each band there was approximately 200 yd of water which was entirely free from phosphorescence. The phosphorescence was a bright silver green in colour, with pieces varying in size from a table-tennis ball to a full-sized tennis ball.

The display lasted for half an hour, during which time 71 distinct and separate bands were counted. Air temp. 76°F, sea 78°. Wind ESE., force 4.

Position of ship: 11° 03′S., 01° 48′W.

Panama waters

M.V. *Otaki.* Captain J. D. Bennett. Balboa to Curaçao. Observer, Mr. E. Norman, 3rd Officer.

19th April, 1957. At approximately 2030 S.A.T. large balls of phosphorescence were seen, but only in the bow-wave which appeared to energise them. They glowed with an intense green light and continued to do for some seconds as the ship left them behind. In this respect they were unlike most examples of this type of phosphorescence which dies out at once after the initial glow imparted by the wave action. Air temp. 80°F, sea 81°. Wind N., force 4.

Position of ship: 9° 56′N., 78° 55′W.

Mouth of Gambia River

S.S. *New Australia.* Captain J. W. Hart. Dakar to Durban. Observers, Mr. P. Hogg, 3rd Officer, and Mr. I. M. R. Wilkie, Apprentice.

21st May, 1957, 2200 G.M.T. Frequent large patches of bright phosphorescence were seen, presumably caused by shoals of tiny fish. As the ship approached the patches they were observed to disintegrate quickly. In the same area the luminous wakes of porpoises or dolphins were often seen.

Air temp. 73°F, sea 70°. Wind NW., force 3.

Note. It is unusual for phosphorescent patches to disintegrate on the approach of a ship. Perhaps, as the observer suggested, they were produced by shoals of tiny luminous fish.

Arabian Sea

S.S. *Muristan.* Captain E. E. Dunn. Bahrein to Mauritius. Observers, Mr. J. F. Ockleford, Chief Officer, Mr. M. S. Fleming, 2nd Officer, and Cadet D. Mackinnon.

9th April, 1957, 0200–0500 S.M.T. Although phosphorescence was glowing faintly in the lights from the ship's accommodation, none was seen in the bow-wave, and only occasional flashes were visible against the side of the ship.

The Aldis lamp was directed on the water and a very bright patch of phosphorescence formed on the spot where the beam struck. Within this patch the surface of the sea was dotted with red spots of light resembling the glowing ends of cigarettes. The light from the Aldis acted almost immediately as a stimulus and lines and patterns could be traced on an otherwise dark sea while the glow persisted for about 15–20 sec. As an experiment, the green filter was used on the lamp and this resulted in a greatly reduced display: with the red filter on, there was almost no phosphorescence at all. Throughout the period of observation the phosphorescence continued to glow with varying degrees of intensity. Air temp. 81°F, sea 83°. Wind E'ly, force 2.

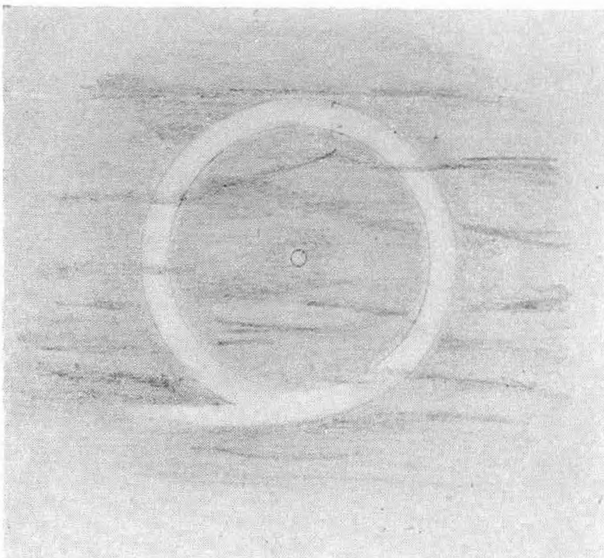
Position of ship: 11° 36′N., 59° 05′E.

Australian waters

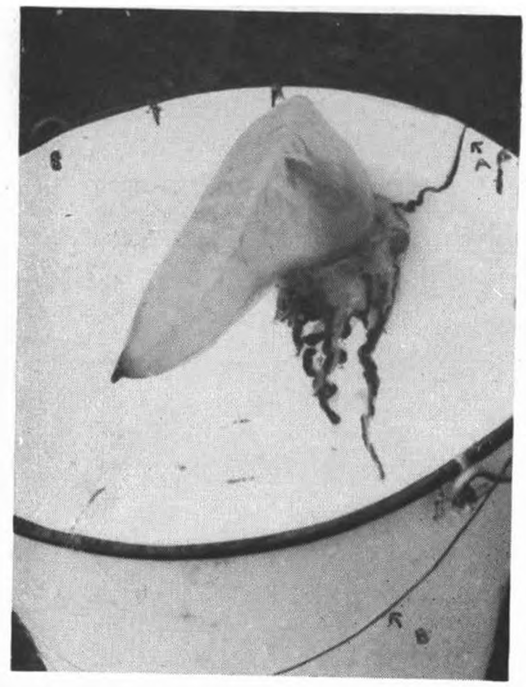
M.V. *Port Hobart.* Captain F. J. Lavers. Melbourne to Cape Town. Observers, Mr. L. K. Peggram, 3rd Officer, and Mr. P. Kellway, 4th Officer.

28th–29th April, 1957. At infrequent intervals during this period, the vessel passed through several lines of phosphorescence of great intensity, which lay in a 210°–030° direction. These resembled the crests of great waves and extended from horizon to horizon. They were about 20 ft wide and lit up the ship as the full moon would have done. Wind W'S. Heavy SW'ly swell.

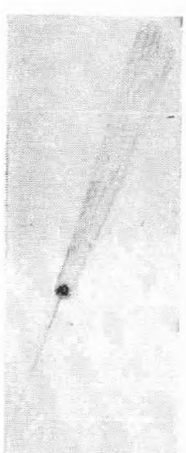
Position of ship: Off SW. coast of Australia in lat. 35° 30′S.



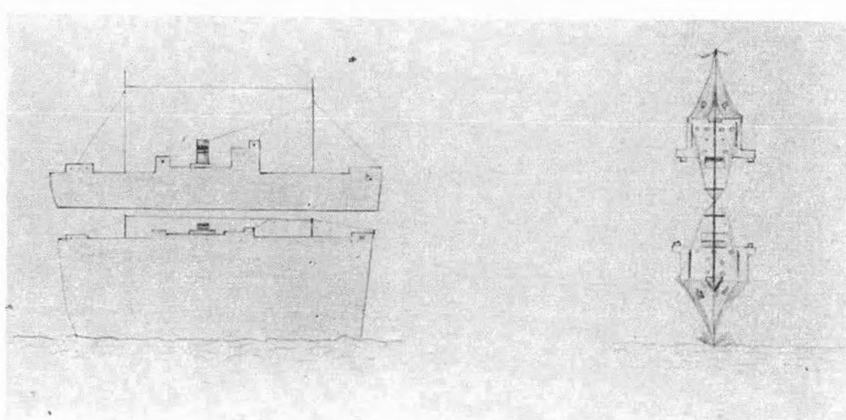
Lunar halo and lower arc of contact, as observed from S.S. *New Australia* (see page 78).



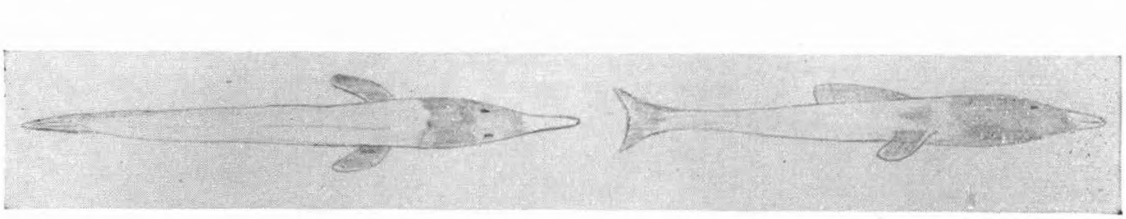
Portuguese man o' war (see page 68).



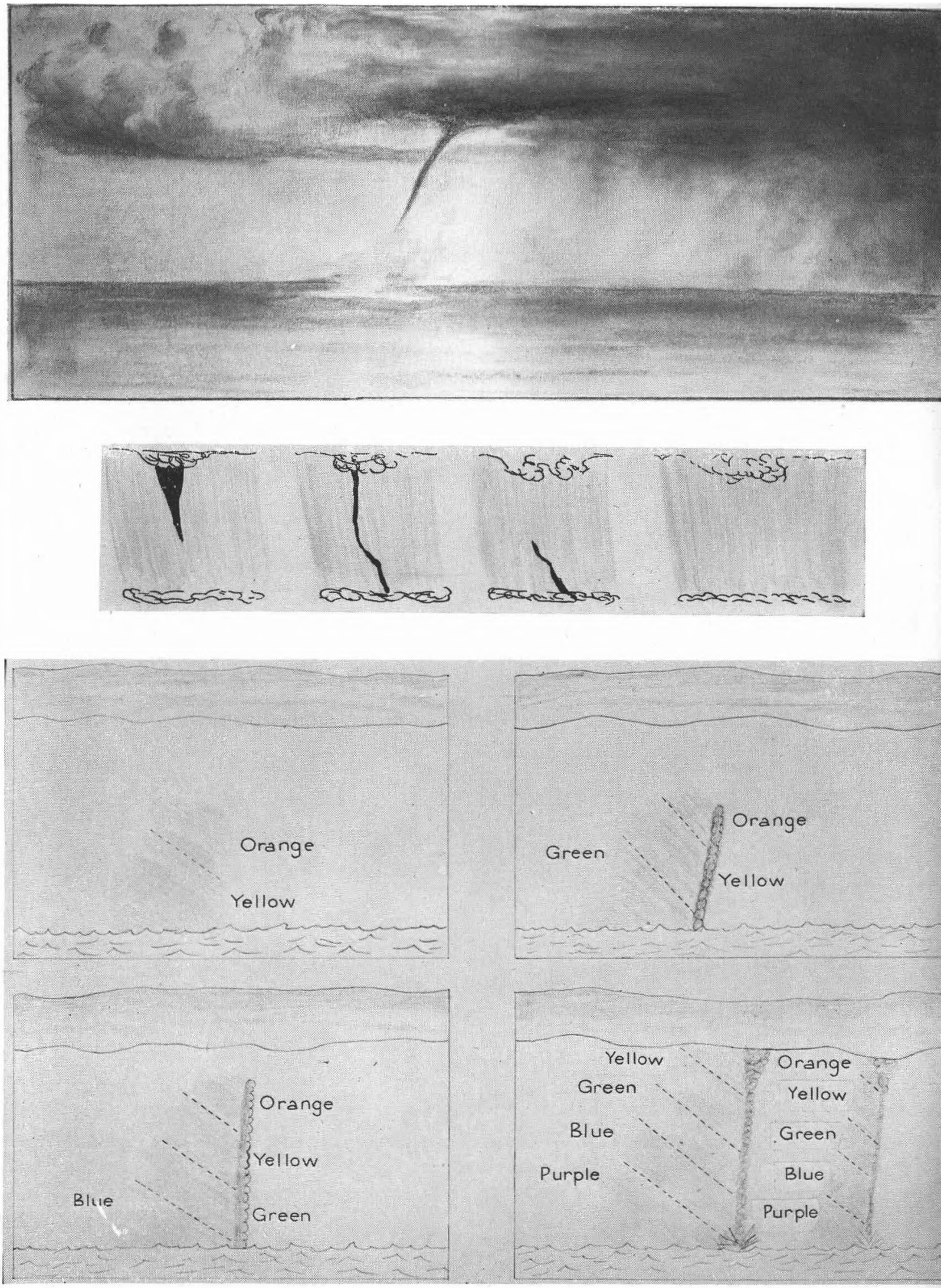
Comet Arend-Roland, as observed from M.V. *Otaki* (see page 94).



(1) (2)
Abnormal refraction observed from S.S. *Lismoria* (see page 76).



Dolphin observed from M.V. *Sussex* (see page 67).



Waterspouts observed from M.V. *Haparangi* (top), S.S. *Prospector* (centre) and M.V *Limerick* (bottom), (see opposite page).

(*Opposite page* 73)

North Pacific Ocean

M.V. *Cingalese Prince*. Captain R. C. Proctor, O.B.E. Kawasaki to Hong Kong. Observers, the Master and Officers.

6th April, 1957. Between 1045 and 1130 G.M.T., breaking overfalls were observed, approximately 3 ft high, showing intense phosphorescence, which was visible for at least 3 miles. Very heavy rain was falling, and the impact of the drops striking the sea caused the whole surface to glow intensely. At approximately 1130 the wind freshened, clearing the cloud and rain, and simultaneously the phosphorescence began to decrease, though it was still visible at a distance of about 6 miles for a further 20–30 min. Sea temp. 69°.

Position of ship: 30° 17′N., 131° 31′E.

WATERSPOUT

North Atlantic Ocean

M.V. *Haparangi*. Captain D. H. Chadwick. Curaçao to London. Observer, Mr. C. J. Highfield, 3rd Officer.

21st April, 1957. At 1740 G.M.T. the waterspout shown in the drawing on opposite page was observed about 1 mile to leeward of a heavy rain shower. It did not appear to touch the surface, but the sea within a radius of about 8 ft directly beneath it was considerably agitated, the spray rising to an approximate height of 7 ft. The spout had a very pronounced curve to the eastward. Air temp. 76°F, wet bulb 71°, sea 77°. Wind NE., force 3. 3/8 Cb, 2/8 Cu and 1/8 Ac.

Position of ship: 21° 54′N., 60° 07′W.

Note. The above observation was accompanied by an excellent drawing which could not be reproduced as it was made on the paper of the logbook. The drawing here reproduced is a careful copy of the original, made by a member of the staff of the Marine Division.

Caribbean Sea

S.S. *Prospector*. Captain W. Lawton. Houston to Manchester. Observers, the Master and Mr. R. L. Hammond, 2nd Officer.

7th June, 1957, 1740 G.M.T. A waterspout was observed at a distance of 5 miles, beginning to form (see drawings on opposite page). There was great agitation of the sea during a rain squall, and at 1742 a thin black column was seen falling from Cb towards the agitated water. By 1744 the waterspout met the sea. Immediately, the spout was seen to telescope downwards, growing in diameter as it fell. By 1745 the column and the agitated area of water had both disappeared.

Position of ship: 21° 15′N., 81° 40′W.

Indian Ocean

M.V. *Limerick*. Captain R. Willcocks. Melbourne to Durban. Observers, the Master, Mr. H. L. W. Upton, 2nd Officer, and Mr. J. F. Holder, 3rd Officer.

12th June, 1957. At 0800 G.M.T., colour which appeared to be a fragment of a rainbow, in the form of orange and yellow wedges, was seen against a background of blue sky, beneath a layer of lenticular Sc, which stretched in approximately an E.–W. direction (see drawings on opposite page). About 30 sec later, a waterspout began to form alongside the coloration, moving upwards from the sea surface. Green coloration appeared below the yellow, and finally blue and purple were seen, forming the whole spectrum, as shown in the sketches. After about 2 min a second waterspout formed beside the first, and it was then seen that other spouts were forming along the line of cloud, each new spout being to the westward of the one previously formed. Several were accompanied by rainbow hues, but none was as vivid as the original. At one time there were as many as 10 waterspouts visible. The phenomenon lasted for about 13 min. Air temp. 68°F, dewpoint 57°, sea 70°. Wind N'ly, light airs. 4/8 Cu. Visibility 30 miles.

Position of ship: 28° 01′S., 54° 50′E.

Note. This is a very interesting observation and we do not remember ever having had a similar one. From the information given, it can be deduced that the sun was approximately in the north on the meridian, at an altitude of about 39°, and that the waterspouts and coloration were to the south of the vessel. Although rainbows could be formed in the south in these circumstances, only the apex of the primary bow could have been seen, which would be low on the horizon on account of the sun's altitude; with an altitude of 42° or more the primary bow cannot be formed. The altitude of the top of the waterspout is not given, but the coloration could not have been part of the primary bow, since the visible apex of this would have the colour bands parallel to the horizon, not oblique as shown in the sketches. The secondary bow, if formed, would be at higher altitudes and parts of it could therefore have shown oblique colour bands. Unfortunately this cannot be the explanation of the phenomenon, since the sequence of colour in this bow is reversed, with the orange and red at the lower part of the bow. It is of importance to put this and other unidentified phenomena on record, since explanations may some day be forthcoming.

HURRICANE AUDREY

Texas City

M.V. *British Splendour.* Captain J. Dryden. Swansea to Texas City.

26th June, 1957. At 1230 G.M.T. when the vessel berthed at Texas City the wind was a little N. of E., force 3, the barometer approximately 1007 mb and the temperature 82°F. Throughout the day the wind, which was squally, increased steadily and the sky became completely overcast. From 2200 onwards, rain squalls were frequent, with the wind, which had been E′N., force 5, rising to force 9.

By 0400 on 27th, the wind had increased to force 12 or over, with continuous rain and spray driving horizontally. Soon afterwards the wind began to back fairly quickly, accompanied by continuous torrential rain. At 1000 the barometer reached its lowest level observed during the passage of the hurricane (988 mb) and soon began to rise. By 1100 the wind had become N., force 9, and the rain was decreasing. The backing of the wind continued, until by 1400 it was W., force 8.

During the height of the storm the sea level rose by 8–9 ft above chart datum (the normal spring rise is about 2 ft maximum). This phenomenal rise in level inundated the land around the ports of Galveston and Texas City. At Cameron the results were catastrophic as the storm was centred there for 1½ hours and there was a heavy tidal wave.

At 1200 the density of the water at the American Oil Company's berth was 1000, whereas records on board from previous voyages show that the normal density is about 1023. This was due to the heavy rain before and during the hurricane.

On passage to Galveston Bar numerous stranded barges were seen, many being high and dry on the breakwater. At one place a travelling crane was overturned and lying half submerged.

The ebb from the flood waters was extremely strong and in Bolivar Roads was estimated to be about 5 kt. Between Galveston Bar and the 10 fm line, the sea and swell were short, sharp and vicious, with an observed current of 090½°, 1·2 kt. Between the 10 fm line and the 100 fm line SW. of the Mississippi delta, course was set allowing 4° leeway for a S. wind of force 5–6, but it was subsequently found that the effect of wind and sea was completely overcome by the current.

Even 48 hours later and 300 miles away from the track of the hurricane, the sea and swell were still steep, short and confused, the predominant swell being from SSE., with a lighter cross swell from SW. The wind was S., force 4–5.

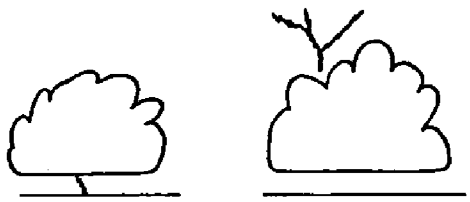
RARE FORM OF LIGHTNING

South Pacific Ocean

M.V. *Cumberland.* Captain L. W. Fulcher. Balboa to Auckland.

24th May, 1957. At sunset, lightning was seen flashing from towering banks of

Cb lying on the SW. horizon. From 1900 to 2245 S.M.T. the flashes, which were of the rocket type, became exceptionally brilliant and frequent, and as many as 36 flashes per minute were counted at one stage. Sometimes two or three occurred



simultaneously and some of these could quite clearly be seen forming as they rose into the sky. The sketches illustrate particularly unusual phenomena observed. The lightning shown in the first one could not be said to flash, but seemed rather to hang between the cloud and sea for a perceptible interval of time. The second sketch shows a flash which appeared to form slowly as it rose into the sky. After forking once it was seen to do so again, breaking away from the most S'ly arm of the flash. This was seen to happen three times and on each occasion the same sequence was followed. At first the lightning was distinctly yellow, but later, in very heavy rain, it became blue in colour.

Position of ship: 20 miles S. of Tatakoto Island.

Note. Observations of abnormal forms of lightning are interesting and uncommon. Three previous cases of lightning seen to shoot upwards from behind a cloud will be found as follows: page 123 of the July 1952 number (M.V. *Kaipaki*), page 194 of the October 1952 number (M.V. *Ajax*) and page 80 of the April 1957 number (M.V. *Port Hobart*).

SEA FOG

Strait of Hormuz

S.S. *Tenagodus*. Captain T. W. A. Webster. Old Kilpatrick to Abadan.

12th June, 1957. At 0330 G.M.T. the vessel entered a bank of dense fog, with visibility down to 50 yd, in a position 5 miles NW. of Jazirat Tunb lighthouse. The bank was about 300 ft thick with sharply defined edges. The sea temperature was taken and found to be 81°F; the average sea temperature of this region in June is 87°F: the air temp. was 80·6° and the wet bulb 79·6°. At 0550 the vessel ran out of the fog banks. These dispersed during the day but re-formed at night, and the vessel was running into and out of them every few minutes between 2130 and 0100 on 13th June.

Position of ship: 26° 18'N., 55° 24'E.

Note. This is an interesting observation. True fog in the Persian Gulf is stated in the Admiralty Pilot to be infrequent in all months and almost unknown between May and August.

VISIBILITY OF ICEBERGS

North Atlantic Ocean

M.V. *Fresno City*. Captain J. M. Cox. Limerick to Seven Islands. Observers, all the ship's officers.

12th June, 1957. During the morning while passing several large icebergs and numerous growlers in dense fog, the largest bergs were just visible at a quarter of a mile, as no more than a slightly darker patch in the fog. A temperature drop of 5° was observed while among the ice. This was most marked, and was commented upon by all the ship's officers. The many growlers passed were all in compact groups, suggesting that large icebergs had broken up recently in the area.

Position of ship: 47° 35'N., 49° 13'W.

13th June, 1957. At 0130 S.M.T. an iceberg estimated to be 20 ft high and 30 ft long was sighted right ahead of the ship at a distance of 4–5 miles. The moon was bearing about six points on the port bow and there was a slight haze. Due to the reflection of the moonlight, the berg exhibited a glow which, in the mist, was first mistaken for a ship's lights. As long as the iceberg, which we passed to starboard, was forward of the beam it was most clearly visible, but when abaft the beam so that the moon was behind the observer and the berg against the slightly lighter northern sky, it was lost sight of, even with the aid of binoculars, at a distance of not more than $\frac{1}{2}$ to $\frac{3}{4}$ of a mile.

Position of ship: Off St. John's, Newfoundland.

ABNORMAL REFRACTION

English Channel

S.S. *Edinburgh Castle.* Captain H. A. Deller. Cape Town to Southampton.

27th June, 1957. At 1845 G.M.T. a double, inverted image of a vessel was

observed, bearing 007°, but 5 min later only one image was visible. Numerous other examples of abnormal refraction were seen during the afternoon on a course up Channel. Air temp. 59·5°F, wet bulb 56·5°, sea 59°. Wind SE'E, force 1.

Position of ship: 50° 04'N., 1° 57'W.

Note. This is an unusual form of mirage effect. Normally if there is more than one image, an erect one is seen over the inverted one.

Cabot Strait

S.S. *Lismoria.* Captain J. L. McQueen. Montreal to Glasgow. Observers, Mr. A. McGugan, Chief Officer, Mr. R. S. McLundie, 3rd Officer, and Cadet J. McPhedran.

31st May, 1957, 0900 G.M.T. Two examples of abnormal refraction were observed around sunrise. In the first case (Fig. 1, opposite page 72), the ship concerned was 6 miles away; the second ship (Fig. 2) was 8 miles distant. Air temp. 40°F, sea 38°. Wind SE'ly, force 2.

South Pacific Ocean

S.S. *Ceramic.* Captain F. A. Smith. Panama to Wellington. Observers, Mr. R. L. Reid, 2nd Officer, and Cadet A. Temperley.

14th May, 1956. At 0856 G.M.T. Jupiter was on the point of setting and becoming progressively redder in colour on approaching the horizon. When approximately its own diameter above the horizon it was observed through binoculars to assume the shape of a red pillar, touching the horizon. Within a few seconds the pillar shrank and the colour changed to a whitish green; this seemed to take place when full contact was made with the horizon, the planet setting immediately afterwards. The horizon was hard and clear and there was a full moon. Air temp. 75·7°F, wet bulb 70·0°.

GREEN FLASH

South Pacific Ocean

M.V. *Otaki.* Captain J. D. Bennett. Napier to Balboa. Observer, Mr. E. Norman, 3rd Officer.

12th April, 1957. At 0053 G.M.T., the green flash was observed under almost perfect conditions. There was no evidence of any abnormal refraction, the sun sinking uniformly below the horizon without distortion. There was, however, a more striking series of colour changes than is normally seen. Just before the top edge of the sun's disc finally disappeared, the green coloration quickly changed to blue, from pale blue to intense blue and finally to a purple, almost violet, shade, as the last rays of light vanished.

Position of ship: 15° 52'S., 104° 50'W.

Note. Observations of the violet flash are rare because light of such short wavelength is almost always absorbed in passing horizontally from the setting sun through the lower atmosphere. The blue light is usually absorbed also, although observations of the blue flash are not so rare. A number of observations of the blue flash have been published in this journal, also a few of the violet flash. In some of these cases the change of colour from green to blue or from blue to violet was seen, but as far as we can remember we have never had an observation before in which the whole change from green, through shades of blue, to violet was seen, and Mr. Norman is to be congratulated on having observed what must have been a very beautiful spectacle. There is evidence that the rate of colour change in this phenomenon varies on different occasions, for in an observation by S.S. *Asia*, published on page 211 of the October 1954 number, the whole change seems to have been telescoped into a split second, the flash being described as " greenish-purple ".

North Atlantic Ocean

M.V. *Essex.* Captain S. Andrews. Curaçao to Liverpool. Observers, Mr. D. Moran, Chief Officer, and Mr. J. Rice, 4th Officer.

18th May, 1957, 0810 G.M.T. The sun rose, bearing 067°, with a brilliant green flash, plainly visible without the aid of binoculars for approximately 1 sec. The rim of the sun remained green until the semi-diameter was above the horizon.

Position of ship: 30° 50′N., 57° 35′W.

S.S. *Warkworth.* Captain G. T. Dobson. Montreal to London. Observer, Mr. J. A. Cotton, 3rd Officer.

13th June, 1957. A green flash was observed, visible to the naked eye, as the sun set at 2030 G.M.T. The flash lasted 1–2 sec only, just as the upper limb touched the horizon, and a slight green arc of about 4° span and 3° altitude was seen. Visibility excellent. Cloud, 4/8 As.

Position of ship: 49° 56′N., 10° 18′W.

GREEN AND RED FLASHES

South Pacific Ocean

M.V. *Cambridge.* Captain P. P. O. Harrison. Wellington to Balboa. Observers, the Master, Mr. P. Bower, Chief Officer, and Mr. L. Money, 4th Officer.

2nd May, 1957. When the sun rose at 0700 S.M.T. a green flash was plainly seen. There was a bank of cumulus whose base was one sun's diameter above the horizon and as the sun disappeared behind the cloud a red flash occurred lasting fully 3 sec.

Position of ship: 38° 51′S., 175° 10′W.

GREEN FLASH AT SETTING OF VENUS

Bay of Biscay

S.S. *Waynegate:* Captain I. Mills. Observer, Mr. M. G. Highley.

11th June, 1957. As Venus was setting at 2132 G.M.T. an image of the planet rose to meet it when it was about half a diameter above the horizon, as shown in the sketch. Both Venus and the image were blood-red in colour. When Venus actually set, a green flash occurred which lasted for half a second. Visibility was over 30 miles, the wind calm and the sea smooth, with a slight swell.

Position of ship: 45° 57′N., 7° 24′W.

LUNAR HALO

Caribbean Sea

S.S. *Cotopaxi.* Captain J. D. Richards. Cristobal to Liverpool. Observer, Mr. D. G. Pugh, 3rd Officer.

12th May, 1957. A lunar halo of 17° radius was observed at 0215 G.M.T. It

remained visible for 10 min, after which Sc obscured the moon. The altitude of the moon was 58° and the bearing 150°.
Position of ship: 14° 04'N., 72° 32'W.

Southern Ocean

S.S. *New Australia*. Captain J. W. Hart. Fremantle to Melbourne. Observers, Mr. P. Hogg, 3rd Officer, and Mr. I. M. R. Wilkie, Apprentice.

14th June, 1957, 1500 G.M.T. The sketch (opposite page 72) represents the lunar halo and lower arc of contact as observed for several minutes. The moon, altitude 55°, bore 060° while the end of the arc bore 045°, decreasing in luminosity with distance from the point of contact. The halo, which was distinct and plain white, had a radius of 22°. 6/8 Cs.
Position of ship: 37° 53'S., 130° 27'E.

ST. ELMO'S FIRE

North Atlantic Ocean

S.S. *Esso Exeter*. Captain H. Brice. Fawley to St. Kitts. Observer, Mr. D. Maudsley, 3rd Officer.

20th April, 1957. At 0130 G.M.T. a line squall 50 miles long and 5 miles wide was seen, on the radar screen, to be approaching the vessel. Just before the squall passed over, St. Elmo's Fire was observed on the main aerial, in the form of pure white globes. There were approximately 20 of these on the 120 ft span of wire; they vanished with the commencement of rain. No lightning was seen or thunder heard, but there was an excessive amount of " static " on the radio receivers.
Position of ship: 33° 38'N., 44° 15'W.

Gulf of Mexico

M.V. *San Velino*. Captain R. R. Griffith. Tarafa to Corpus Christi. Observer, Mr. K. Bramley, 2nd Officer.

29th April, 1957, 0933 G.M.T. During thunder and lightning, accompanied by light rain, the lookout man reported a blue light on the fo'c'sle head. On investigating, a pale blue light (sometimes two) was seen on the stem bar. At close quarters it was seen that the light surrounded each corner of this bar. On touching with a broom, the light ceased for a time then recommenced. Again, on rubbing the bar with the hand the light disappeared, but it soon glowed again even more brightly. No shock was felt. The glow disappeared finally when the rain stopped at 1000.
Position of ship: 27° 04'N., 94° 47'W.

South Pacific Ocean

S.S. *Tekoa*. Captain F. C. Taylor. Wellington to Panama. Observer, Mr. R. G. Williams, 3rd Officer.

22nd May, 1957, 1300 G.M.T. A violent thunderstorm passed over the vessel and the lookout reported seeing St. Elmo's Fire on the Suez Canal searchlight fairlead. The discharge was blue, approximately 6 in. by 1½ in. in size, and persisted for about ¾ hour, during which time it made a continuous buzzing sound. The 4th Officer also saw dim light-blue balls of luminescence on both shoulders of the fo'c'sle head. These also lasted for ¾ hour.
Position of ship: 25° 36'S., 133° 00'W.

AURORA

River St. Lawrence

S.S. *Carinthia*. Captain E. A. Divers, O.B.E., R.D., R.N.R. Liverpool to Montreal. Observers, Mr. J. V. Clemenson, 3rd Officer, and Mr. C. T. Burtonshaw, Junior 3rd Officer.

On 19th April, 1957, between 0000 and 0400 G.M.T., a particularly brilliant display of aurora was observed, which took the form of long curtain-like streamers of light running roughly N. and S. and stretching from horizon to horizon. They varied in colour from white to pale green and pink, but white was the predominant colour. Later, the curtains gave way to rather large formless patches and streaks of white light, covering the whole sky and constantly flickering and changing in shape. There were also occasional isolated rays resembling searchlight beams. Although the whole display weakened after 0400 G.M.T., it persisted until daylight at 0830 G.M.T.

Position of ship: Vicinity of Father Point, River St. Lawrence.

Australian Bight

S.S. *Southern Cross*. Captain Sir David Aitchison, K.C.V.O. Fremantle to Melbourne. Observers, Mr. W. Newport, Chief Officer, and Mr. S. R. N. Alty, 4th Officer.

30th June, 1957, at 1845 G.M.T. The sky to the S. was observed to become pale in an arc extending from 160° to 200° and to an altitude of about 30°. There was a dark segment between the horizon and the arc. Shortly afterwards, rays of white light shot up, flickering rapidly and continuously changing position within the above-mentioned arc. These rays varied in length, number and brilliance until they reached a climax at 1915 G.M.T., when the largest reached an altitude of about 35°. There were eight rays in four pairs and they were brilliant enough to obliterate α and β Centauri. After about 30 min the rays decreased in length to about 25° and at their upper ends became pale pink. This coloration became more pronounced over a period of about 3 min until the upper parts were a reddish purple and the lower half luminous green. The aurora remained coloured for about 10 min then faded and died away to an intermittent flickering. The whole phenomenon disappeared shortly before daylight.

Position of ship: 37° 25′S., 133° 27′E.

New Zealand waters

S.S. *Ceramic*. Captain F. A. Smith. Wellington to New Plymouth. Observers, Mr. D. R. Pochin, 3rd Officer, and Mr. R. L. Reid.

26th June, 1957, at approximately 1200 G.M.T. Aurora was seen to the southward over the South Island of New Zealand. The display was predominantly red and had the appearance of a red sheet hanging without any folds. Several vertical streaks were noticed which were more intense than the glow of the background display. The weather was fine and clear with little cloud.

Position of ship: In Cook Strait, New Zealand.

METEOR

North Atlantic Ocean

S.S. *Lalande*. Captain E. D. Spooner. Dakar to Takoradi.

4th May, 1957. At 0240 G.M.T. a brilliant meteor appeared just S. of Altair and disappeared in the vicinity of Kaus Australis, after a flight of about 2 sec. A vivid trail was left which remained visible for 30 sec. The brilliance of the meteor was far greater than that of the moon.

Position of ship: 4° 32′N., 3° 23′W.

South Atlantic Ocean

S.S. *Muristan*. Captain E. E. Dunn. Cape Town to U.K. Observer, Mr. M. S. Fleming, 2nd Officer.

4th May, 1957. A very bright meteor was observed moving slowly from bearing 010°, altitude 29°, to bearing 350°, altitude 28°. It appeared suddenly with a magnitude of −2·0. The light increased and in about 2 sec the core was a brilliant blue with a short orange tail. After about 4–5 sec the meteor disintegrated into several orange-coloured pieces.

Position of ship: 22° 15′S., 8° 17′E.

Indian Ocean

M.V. *Dominion Monarch*. Captain K. D. G. Fisher, G.M. Fremantle to Cape Town. Observers, Mr. A. R. Smith, 3rd Officer, and the 1st Electrician.

3rd April, 1957. At 1600 G.M.T. a brilliant meteor was observed which illuminated the ship and the surrounding sea. It first appeared about 5° below Rigel at an altitude of approximately 20° on a bearing of 275°, and moved vertically downwards, disappearing at about 7° altitude, possibly behind low cloud on the horizon, after a fall of 4–5 sec. The magnitude of the meteor was comparable to that of the full moon and it appeared to be close ahead of the vessel. The meteor and its trail, which were merged together, gave out a bluish-green light. The trail dispersed immediately.

Position of ship: 31° 51′S., 71° 46′E.

S.S. *Magdapur*. Captain J. P. Jackson. Colombo to Cape Town. Observer, Mr. A. M. Warren, 3rd Officer.

16th April, 1957. At 2120 G.M.T. a large meteor, of brilliance comparable to Jupiter, appeared at a point midway between Arcturus and Spica and finished near β Herculis. The reddish trail covered an arc of 4° 45′ (measured by sextant) and lasted for about 2–3 sec. At 2135 two other meteors, of approximately the 3rd magnitude, were seen to the SW., appearing from the same direction as before. They had faint white tails and were visible for about 1½ sec. At 2141 another large meteor as brilliant as Jupiter, and with a white tail, was observed. It travelled from Rigel Kent to Kaus Australis and lasted for 1½ to 2 sec.

Position of ship: 32° 08′S., 29° 40′E.

South Pacific Ocean

S.S. *Gothic*. Captain L. J. Hopkins. Auckland to Balboa. Observer, Mr. R. O. Guille, 2nd Officer.

2nd May, 1957. At 0905 G.M.T. a vivid meteor was observed bearing 015° at an altitude of approximately 25°. It disappeared on almost the same bearing at an altitude of about 8° after a flight of 2 sec. The meteor was a bright harsh white, at least five times brighter than Jupiter. It emitted a trail which was white at first, becoming " reddish-gold " in colour towards the end. The trail lasted for 3 min. Many other meteors were observed during the night, mainly in this area, but none of such brilliance or with such persistent trails.

Position of ship: 2° 49′S., 91° 16′W.

M.V. *Cambridge*. Captain P. P. O. Harrison. Wellington to Balboa. Observers, the Master and Mr. R. Jordan, 3rd Officer.

10th May, 1957, 0645 and 0655 G.M.T. we observed two exceptionally large meteors. The first appeared about 35° altitude from Etanin (γ Draconis) and headed downwards towards Polaris. The head was a brilliant bluish-white, while the trail had a bronze colour. Before reaching the horizon the meteor changed to a light green in colour, and increased so greatly in brilliance that it lit up the whole sky in the manner of a lightning flash. The second one, although not quite so bright, remained a brilliant bluish-white, estimated to be about 2½ times the intensity of Jupiter. It travelled over an arc of about 40° in the region of Cygnus and in a direction of 260°. The light disappeared once for a fraction of a second towards the end of the arc, but it reappeared momentarily and then vanished completely.

Position of ship: 25° 04′S., 124° 42′W.

S.S. *Tekoa*. Captain F. C. Taylor. Wellington to Panama. Observer, Mr. R. G. Williams, 3rd Officer.

25th May, 1957. At 0420 G.M.T. a brilliant meteor was seen bearing approximately 010°, altitude 30°. It burned with an intense blue-green light which lit up the whole horizon and blacked out all but the brightest stars. The helmsman reported that the wheelhouse was illuminated as though by lightning. The duration of flight was only about 2 sec.

Position of ship: 18° 15′S., 116° 46′W.

FALL OF METEORITE

South Atlantic Ocean

M.V. *St. John*. Captain C. Bradley, O.B.E. Las Palmas to Rio de Janeiro. Observers, Mr. J. G. Black, 2nd Officer, and Cadet Scanlan.

3rd June, 1957. At 0330 S.M.T. an unusually bright meteor flashed across the sky from the NW. and appeared to drop directly towards the ship. It missed by perhaps 200 yd, and as it hit the sea a distinct splash was heard. The colour was whitish, but at about the height of the bridge (some 50 ft above the water) the brilliance was extinguished. No discoloration of the sea was noticed where the meteorite fell.

Position of ship: 19° 24′S., 39° 06′W.

Note. This is a very interesting observation. Most of the many millions of meteors which enter the earth's atmosphere daily are no larger than grains of sand. These are completely disintegrated by the friction of their rapid passage through the upper atmosphere. Larger meteors do occur and some of these may be of such size that a part survives the disintegrating process and falls on to the land surface or into the sea. It is only on rare occasions that an observer is sufficiently close actually to see the fall, and most meteorites on the land surface have been discovered subsequently to their fall.

There is an increasing tendency in recent logbooks for observers to call an ordinary meteor a meteorite. The latter name should not be used except when, as in the observation above, there is positive evidence that something has fallen.

UNIDENTIFIED PHENOMENON

North Atlantic Ocean

S.S. *Corrales*. Captain T. C. Crane. Santa Isabel to Liverpool. Observers, the Master, Mr. J. H. Crossley, 3rd Officer, Mr. A. Campbell, Senior Radio Officer, and the Lookout.

7th August, 1957. At 2150 G.M.T. what appeared to be the loom of three lights appeared on the eastern horizon. The central loom was the most distinct and bore 098°, the others were 2° on each side of it. It was thought at first that the phenomenon was due to the reflection of moonlight from the clouds, but the source of light appeared to be below the horizon and was not steady. The moon bore 168°.

No echoes showed on the radar screen on this bearing, though the echo of a ship at a distance of 15 miles showed clearly, and also those of rain squalls over 30 miles away, so it would appear unlikely that the source of the lights was associated with a ship, or ships. As the nearest land, Cape St. Vincent, was 200 miles distant, it was difficult to relate the lights to anything on the land. The central light persisted for 40 min, until 2230; its bearing became more N'ly and was 080° when it disappeared. The lesser lights lasted 30 min, until 2220. Air temp. 71°F, wet 68°, 7/8 Sc.

Position of ship: 36° 13′N., 13° 10′W.

Note. No explanation of these lights can be given. Apart from the distance of the ship from land there is another indication that they were not lights on land. As the ship was proceeding northward, the bearing of anything on land would have changed to a more southerly one, not to a more northerly one as observed.

Sea Ice and its Relation to Surface Supply Problems in the American Arctic*

By CHARLES C. BATES

(Acting Director of the Division of Oceanography, U.S. Navy Hydrographic Office, Washington)

As far back as the fourteenth century, sea ice had a major effect on Arctic supply operations, for the increased concentration of coastal ice in those years appears to have been related to the sudden disappearance of the Viking civilisation in Greenland. In the subsequent 600 years, the mariner has repeatedly joined battle against this floating, fluctuating barrier while in search of fame and fortune.

In the present century, during " good " ice years, the following operations have all proved economical: the shipment of wheat out of Churchill, Manitoba; the movement of supplies and men along Russia's Northern Sea Route; the shipping of coal from Spitsbergen; and the operation of whalers north of Alaska. In " bad " ice years, restricted shipping periods and numerous ships damaged, lost, or frozen in the ice made Arctic shipping a questionable venture.

Accordingly, the United States, with ports customarily open the year round, and attractive financial ventures concentrated in more moderate climates, has been slow in developing an Arctic supply concept. To nations bordering on the Baltic and North Seas and adjoining waters, sea ice has been more of a problem, but even here small icebreakers could normally cope with the winter requirements of marine commerce. Only in the U.S.S.R. did shipping problems require full attention to the combating of sea ice, with the resultant need for full utilisation of large icebreakers, development of ice seamanship doctrine, and formation and expansion of an ice reconnaissance and forecasting service. Such was the situation until World War II.

The momentous change brought on by the war, wherein the United States changed from a domestic to an international power, created totally new and relatively massive requirements for supply of military bases in southern Greenland, Baffin Island, Labrador and northern Alaska. The " Wind " class icebreaker came into being; an ice service was established by the U.S. Coast Guard in Newfoundland to assist in convoy routing; and informal ice reconnaissance began to be conducted in 1944 for the handful of ships needed to establish and then annually re-supply the Naval Petroleum Reserve Number 4 Camp at Point Barrow, Alaska. From 1946 through 1950 the supply effort into American Arctic waters continued to expand in areal coverage with the growth of the joint Canadian-United States weather station net. However, this particular supply effort was small enough to fall primarily into the role of a scientific mission. There was little emphasis on maintaining shipping schedules. In fact, this period could be labelled as one with a philosophy of " Ice is where you find it ". Ice conditions were like other " acts of God ", and supply operations were carried out with little advance planning but large amounts of patience and perseverance. To any student of the environment, however, for every effect there must be a cause. Consequently, determining the cause of fluctuations in the extent and behaviour of sea ice provided an excellent challenge to the recently founded Division of Oceanography of the U.S. Navy Hydrographic Office.

As far back as 1900, the annual report of the U.S. Navy Hydrographic Office stated:

> In the more northern coast (Branch Hydrographic) offices during the ice season in the North Atlantic, few shipmasters would leave port without visiting the officer in charge for the latest information as to ice conditions.

Throughout the years, the Hydrographic Office specialised in distributing iceberg information received from the International Ice Patrol. By 1945, it was possible to publish Hydrographic Office Publication No. 550, *Ice Atlas of the Northern*

* The opinions expressed in this paper are those of the author as an individual and are not to be construed as necessarily reflecting the official views of the U.S. Navy Department.

Hemisphere. Data in this atlas were primarily descriptive and climatic, rather than quantitative and synoptic. Accordingly, the atlas was chiefly of value for general planning, rather than as a basis for long- and short-term logistic planning for a given ice season.

To provide such synoptic ice information, the Hydrographic Office, with the assistance of the Air Weather Service, Corps of Engineers, Officer of Naval Research, Navy Electronics Laboratory, and institutional contractors, was actively developing by 1949 publications which standardised ice terminology and ice seamanship; an ice mechanic's field test kit, and techniques for detailed aerial and surface ice observations, were also being developed. In 1950 experimental observing techniques, developed on Air Force " Ptarmigan " flights to the North Pole, were first put into routine use by Hydrographic Office civilian ice observers, flying with specially assigned Royal Canadian Air Force Lancaster aircraft over the Canadian Arctic Archipelago. In 1951 came the first employment of this observing system aboard United States aircraft, when flights were made with Military Air Transport Service aircraft supporting Operation " Bluejay ". This particular operation required a large task force to penetrate the Baffin Bay pack and initiate the building of the air base at Thule, Greenland. Because of inadequate control of flight paths by the ice reconnaissance specialists during this operation, quality of ice reconnaissance and consequent ship scheduling were not all that could have been desired, and ice damage costs were phenomenally high. Consequently, the U.S. Military Sea Transport Service requested the Hydrographer of the Navy to expand the ice observation service in 1952 over the entire Labrador Sea–Davis Strait–Baffin Bay area and to issue tentative long- and short-range ice forecasts.

With such high-level support, technological progress in the Hydrographic Office's ice programme came rapidly during 1952. The first naval aircraft were assigned on a full-time basis under guidance of civilian ice reconnaissance specialists; the first long-range ice forecasts for shipping conditions in the Labrador area were issued in March; and the first maintenance of a master synoptic plot of ice conditions from Newfoundland to the Arctic Ocean became possible. In 1953 the

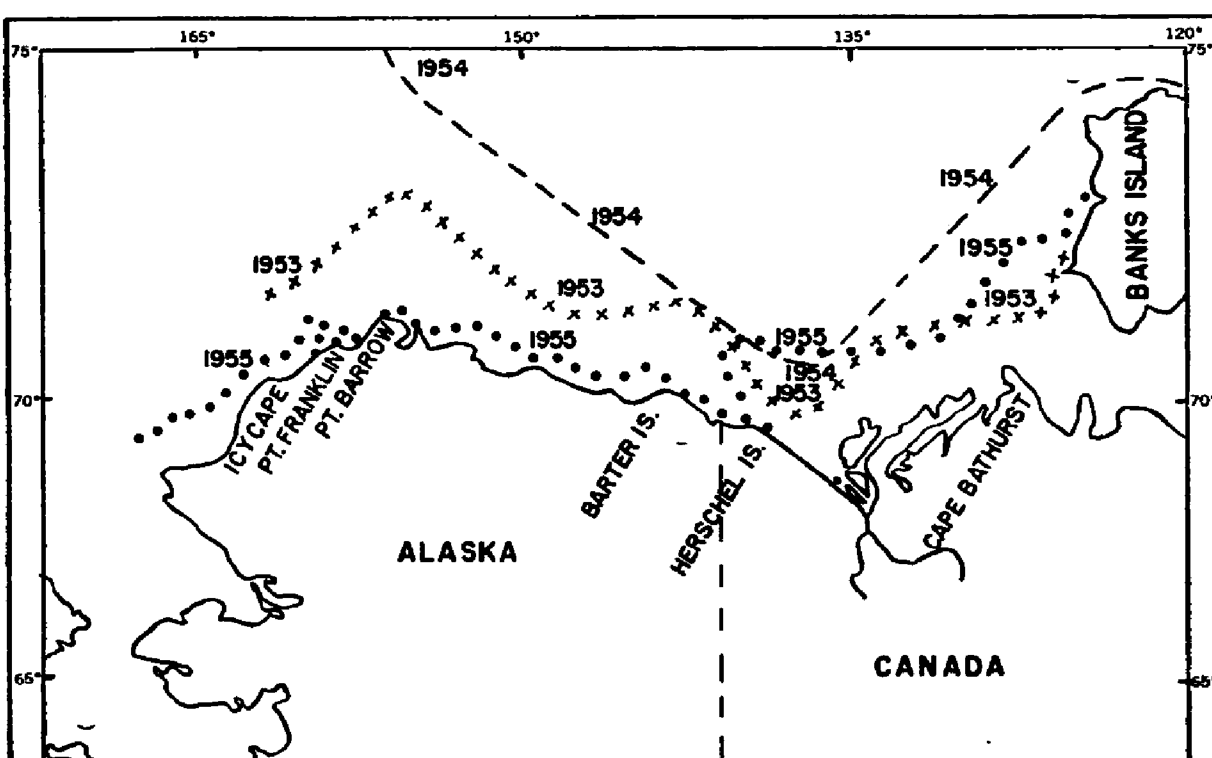


Fig. 1. Location of boundary of polar pack-ice off northern Alaska in early September of 1953, 1954 and 1955.

observing programme expanded westward to include the western Canadian Archipelago and northern Alaska. Development and testing of forecasting techniques for ice of the open sea also advanced, particularly in the use of U.S. Weather Bureau 5- and 30-day mean pressure and temperature charts. Meanwhile, the Simpson-Lee system of forecasting freeze-up, according to the expected rate of heat loss of water columns of known salinity and temperature, underwent successful trial tests for Labrador sites of the Northeast Air Command.

Nineteen fifty-four was the year of consolidation for the Navy's ice programme. In January the Office of the Chief of Naval Operations issued an instruction which said in part:

> Aerial ice reconnaissance has been vital to the success of these (Arctic) operations in that it has enabled the task force commanders to utilise all possible time available for movement of ships during the very short shipping season. The aircraft, ice observers and the ice forecasts required for support of these operations have been provided on a temporary basis from year to year. Experience has proved the desirability of providing for these services on a routine and continuing basis in order that firm planning can be completed by responsible commanders well in advance. . . . To insure the availability of ice observers when needed, the present civilian ice observers, who have been serving on a volunteer basis, must be replaced by naval personnel.

With this programme established, the Hydrographic Office trained 15 naval aerological officers and enlisted men in ice observing techniques. Patrol squadrons using ice observers attached to Fleet Weather Centrals at Kodiak (Alaska) and Argentia (Newfoundland) were assigned ice reconnaissance duties when surface shipping was operating in nearby ice-infested waters. The bases used and areas

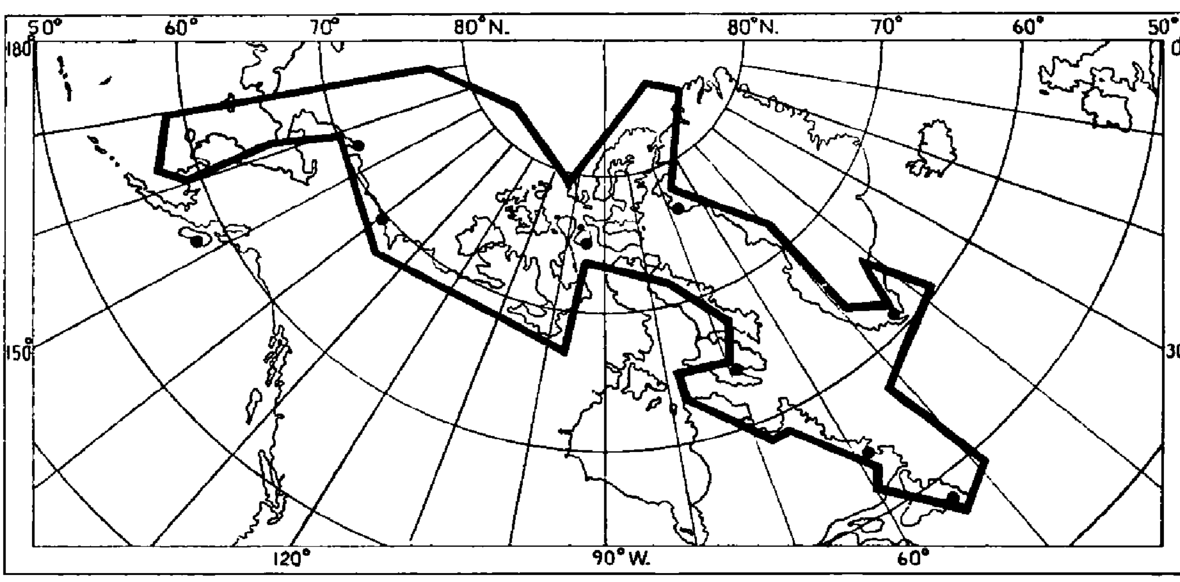
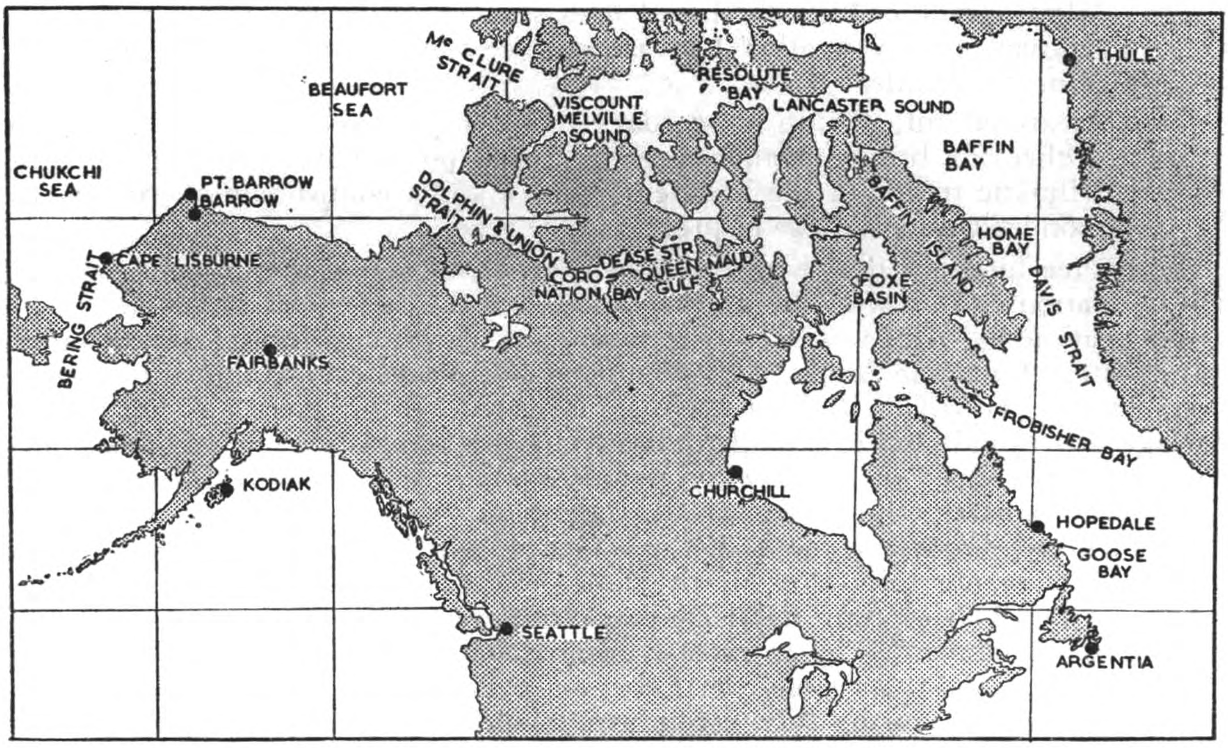


Fig. 2. Bases used and area covered in American Arctic by Canadian and U.S. aircraft conducting aerial ice reconnaissance during 1953.

covered are shown in Fig. 2. Basically, aerial ice reconnaissance was conducted as follows:

(*a*) Labrador Sea–Davis Strait–Baffin Bay Areas: A U.S. Naval patrol squadron out of Argentia (Newfoundland) began flights during January in the lower portion of area; as the season advanced and shipping moved northward, flights were increased in number and scope, and the planes eventually moved northward to base temporarily at Air Force stations such as Goose Bay (Labrador), Frobisher Bay (Baffin Island) and Thule (Greenland) as conditions required.

(*b*) Canadian Arctic: The primary coverage was that using U.S. Naval ice observers aboard Lancaster aircraft of the Royal Canadian Air Force, operating from Resolute Bay, Northwest Territories. When Canadian



Map of the area covered by Military Sea Transportation Service operations.
(See also the map on page 83.)

aircraft were not available, U.S. Naval ice reconnaissance aircraft substituted and also based at Resolute Bay.

(*c*) Alaskan Arctic: Late winter and spring reconnaissance of the Bering Sea coast was conducted out of Kodiak (Alaska) by Naval patrol aircraft. In July, emphasis was shifted to waters north of Bering Strait, and long-range P2V-type aircraft shifted to Ladd Air Force Base, Fairbanks, Alaska, until all shipping had left the Chukchi and Beaufort Seas.

In 1954 these aircraft flew more than 500,000 nautical miles. Two important objectives were accomplished: first, tactical support was provided to ships crossing ice-infested waters, for the normal shipboard helicopter range is but 15 miles. Such support is conducted either by direct air-to-ship communication, often monitored by tape recorder, or by standard radio message giving percentage of ice-covered water, percentage of various ice types (brash, block,* giant floes, etc.), ice age, amount and direction of hummocking, puddling, rafting, and size and orientation of open water features such as leads and polynyas. Second, the aerial observations, supplemented by shore and shipboard ice observations, provided the necessary data which established the synoptic ice picture used by the ice forecasters and headquarters planners.

During 1954, four basic types of ice forecasts were issued:

(*a*) Daily short-range forecasts up to 48 hours' duration from both the Hydrographic Office and appropriate Arctic field stations as Goose Bay (Labrador), Thule (Greenland), Resolute Bay (N.W.T.), Kodiak (Alaska). Field forecasters are generally able to maintain better liaison with operational commands and to increase the effectiveness of basic data and forecasts for tactical purposes because of shortened communication transmission time and the avoidance of Arctic radio blackouts.

(*b*) Semi-weekly long-range forecasts up to 5 days' duration prepared at the Hydrographic Office and based on the prevailing ice picture and the U.S. Weather Bureau 5-day weather forecast.

(*c*) Semi-monthly extended forecasts up to 30 days' duration prepared at the

* In American usage, a block was defined as a fragment of sea ice ranging in size from 6 to 30 feet across. In the International Ice Nomenclature now in use, this would be called an ice-cake.

Hydrographic Office and based on existing ice conditions, the U.S. Weather Bureau 30-day weather forecast, surface water temperature, and current climatic trends.

(*d*) Seasonal outlooks up to 150 days in length prepared at the Hydrographic Office for break-up and freeze-up based on recent oceanographic data, climatic trends of the past few months, and a comparison of existing ice conditions with those of preceding ice years.

These ice forecasts deal with three main problems facing the mariner, namely, the formation and growth, the disintegration, and the movement of sea ice.

Navigationally, 1954 was one of the most open ice years known off Alaska and in the Western Canadian Arctic. The first deep draft vessel ever to transit the northwest passage, H.M.C.S. *Labrador*, circumnavigated North America on her maiden voyage; her captain has informally indicated that ice forecasting and reconnaissance aid the ship's speed of advance by as much as 50 per cent while in ice-covered waters. Almost as impressive were the operations of the U.S. Navy icebreakers U.S.S. *Burton Island* and the U.S. Coast Guard icebreaker *Northwind* in McClure Strait, an area normally choked with polar ice from the Beaufort Sea. In the Labrador Sea–Davis Strait–Baffin Bay area, however, preliminary aerial ice reconnaissance, supplemented by an extensive climatological analysis, indicated by April 1954 that ice conditions along the Labrador coast during June and the route to Thule (Greenland) during July would be more difficult than normally experienced. This proved to be true.

In late 1954 a joint research project was initiated at Hopedale, Labrador, 150 miles north of Goose Bay, in conjunction with the Northeast Air Command, Terrestrial Sciences Laboratory of the Air Force Cambridge Research Centre, the Snow, Ice and Permafrost Research Establishment of the U.S. Corps of Engineers, and the Canadian Defence Research Board. This continuing project is to measure completely the variation of the physical and engineering properties of sea ice as it forms and then disintegrates during a given season, as well as to determine by actual tests the loading capabilities of sea ice with special reference to landing and parked aircraft.

The impact of the high-level decision to establish a chain of radar warning stations, i.e. the " Dew " Line, across the North American continent north of the Arctic Circle, was first felt by the Navy's ice programme during late 1954. The most direct passage between Baffin Bay and Beaufort Sea (Lancaster Sound–Barrow Strait–Viscount Melville Sound–McClure Strait), lying just south of 75° North latitude, had been transited section by section at various times by deep-draft icebreakers. Ice data, however, indicated an annual re-supply operation could not be guaranteed year after year even if the ships were special Arctic cargo and tankers (still in the design stage).

Once the decision was made to utilise the more southerly combination water-overland route along the north shore of the mainland, a major shipping effort was scheduled to enter the totally uncharted and probably shoal waters of Foxe Basin, Shepherd Bay, Queen Maud Gulf, Dease Strait, Coronation Gulf, and Dolphin and Union Strait. To the mariner, there was probably no greater hazard than the combination of sea ice, shoal water, and strong currents present for hundreds of miles along the courses to be steamed. To eliminate as much of this hazard as possible, the U.S. Navy Hydrographic Office doubled its ice forecasting staff and developed 10 six-man teams of civilian hydrographers and Navy " frogmen " to be flown into the area for early survey work. An expanded course in ice observing was also conducted early in 1955, to provide personnel for the necessary reporting system, a course which five Canadian Arctic specialists also attended.

The ice reconnaissance and forecasting service already described for 1954 was repeated for 1955. Technical additions to the service included expanded use of radio facsimile transmission to Fleet and MSTS vessels of ice summary charts and forecasts prepared in Washington, D.C., and Fairbanks, Alaska; assignment of

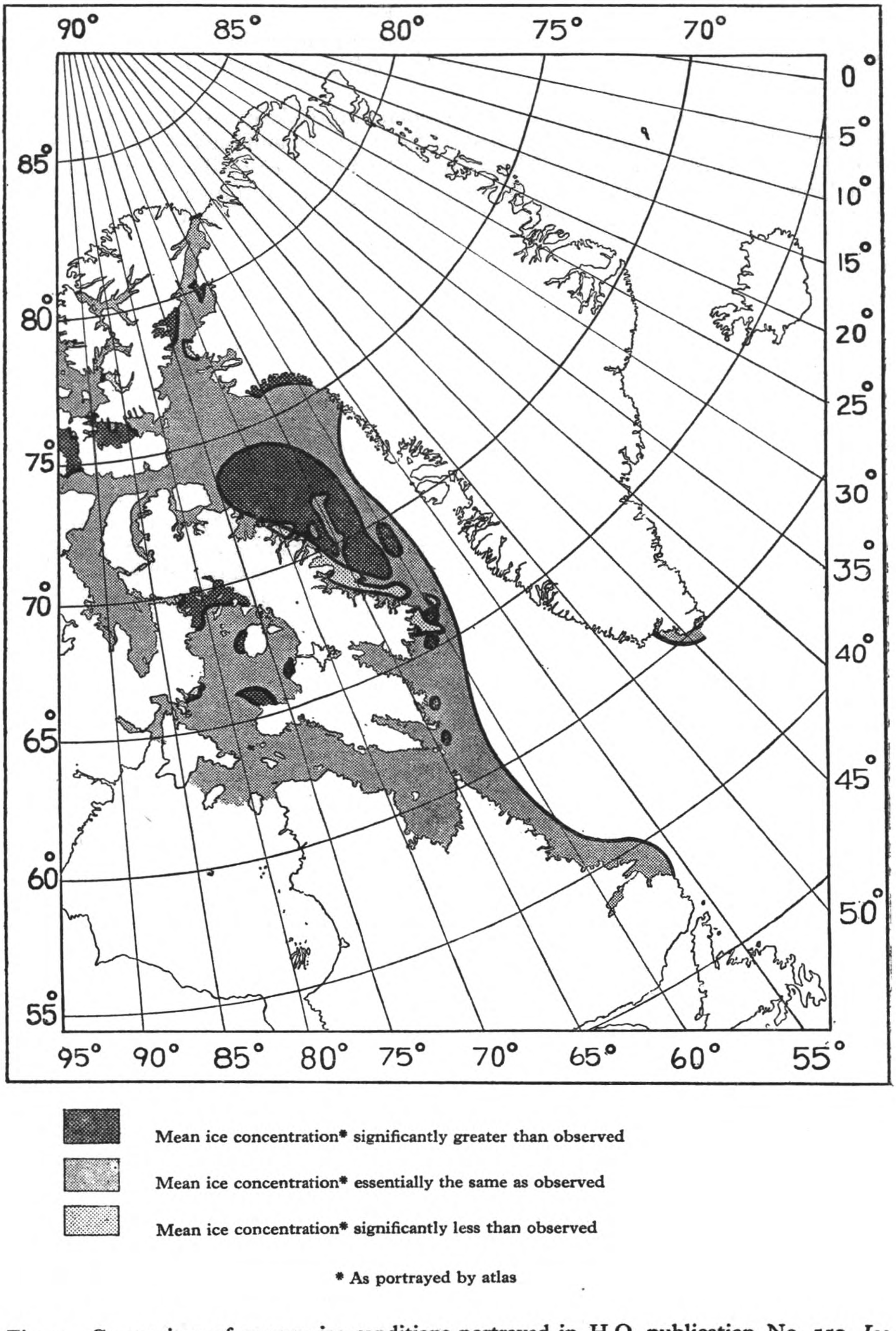


Fig. 3. Comparison of average ice conditions portrayed in H.O. publication No. 550, *Ice Atlas of Northern Hemisphere*, with actual ice conditions in Baffin Bay and adjoining waters during mid-August 1955.

an oceanographic consultant to Commander, Task Group 5.1 aboard the command ship, U.S.S. *Mount Olympus*, and of naval medium-range aircraft to Point Barrow, Alaska, as a supplement to the long-range aircraft again based at Ladd Air Force Base, Alaska.

The magnitude of the summer supply operation, code-named Project 572, was historic. These 126 ships were manned by 9,061 officers and men of the U.S. Navy, Royal Canadian Navy, and U.S. Coast Guard, and by 3,481 civilians of the Military Sea Transport Service and the U.S. Merchant Marine. Accompanying these ships were 6,105 officers and men of the U.S. Army Transportation Corps to provide stevedore and other services. As an example of the impact on ports, Seattle experienced its largest volume of outbound shipping since the Korean War when the Arctic supply vessels were loading.

Routine supplies to already established bases as far north as Thule went on without a major hitch, although coastal ice along Labrador was particularly severe. Units of Task Force 6 aboard the U.S. Coast Guard Icebreaker *Eastwind* were delayed in entering the Home Bay sector of eastern Baffin Island for about two weeks because the pack was close inshore; storms gradually disintegrated and moved the ice offshore, so that unloading operations began by mid-August 1955. In Foxe Basin, the Canadian task group worked its way northward along the western side of the basin when westerly winds and southerly currents moved the winter ice into the southern and eastern quadrants of the basin. Fig. 3 indicates typical deviations of actual ice conditions during mid-August 1955 from those given by the Hydrographic Office ice atlas, by the 120-day ice forecast, and by the 30-day ice forecast. The ice atlas blocked in inaccurately was roughly 85,000 square statute miles, the 120-day forecast 48,000 square statute miles, and the 30-day forecast 30,000 square statute miles at a time when the ice-covered area totalled roughly 385,000 square statute miles.

In contrast to eastern operations where the ice, excluding icebergs, is less than one year old, the 57 ships assigned to the western portion of Project 572 operated in waters exposed to the polar pack where the average ice age is about eight years. During the latter part of 1955, cargo and survey ships of the task force transited, with some icebreaker assistance, the critical area between Point Barrow and Herschel Island on schedule. East of Herschel Island, open water, though sometimes shoal, extended for hundreds of miles, and ice became a problem again only when the eastern half of Queen Maud Gulf was reached. River run-off, shoal water, warming of the air by the surrounding landmass, dust on the ice, and related factors all contribute to reduce the ice hazard of this section of the Canadian Arctic to a minimum if the shipping enters and leaves in a single season.

It was along the northern coast of Alaska that the most dramatic moments of Project 572 took place. As mentioned above, the polar pack has been slowly retreating off the coast east of Point Barrow in the customary manner during the first week of August. On August 8th the 30-day ice forecast stated in part:

> Increased puddling and weakening polar pack ice. Rapid widening shore lead due reduction concentration and offshore movement polar pack. Position main pack located approximately 60 miles off coast Barrow narrowing to 20–30 miles vicinity Barter Island by end period. Expect 10–20 miles wide area open water adjacent coast vicinity Barrow 5–10 miles vicinity Barter. Concentration between pack and open water area variable 1–5 tenths except area Jones Island to Barter Island 4–6 tenths. Area along coast Barrow to Icy Cape rapidly become ice free.

By the time eight days passed, however, it was apparent that the 30-day mean pressure pattern forecast by the U.S. Weather Bureau would not materialise, and the polar pack had stopped its offshore retreat. Moreover, the circumpolar cyclonic vortex was rapidly developing in strength and orienting storm paths in such a manner that an almost continuous onshore flow of cold air was guaranteed for the next week or so. Two days later, on August 19th, the Hydrographer released a message to Commander, Military Sea Transport Service, stating in part:

U.S. Navy

Ships of the Military Sea Transportation Service beset in pack-ice off Northern Alaska, during annual re-supply of " Dewline " sites.

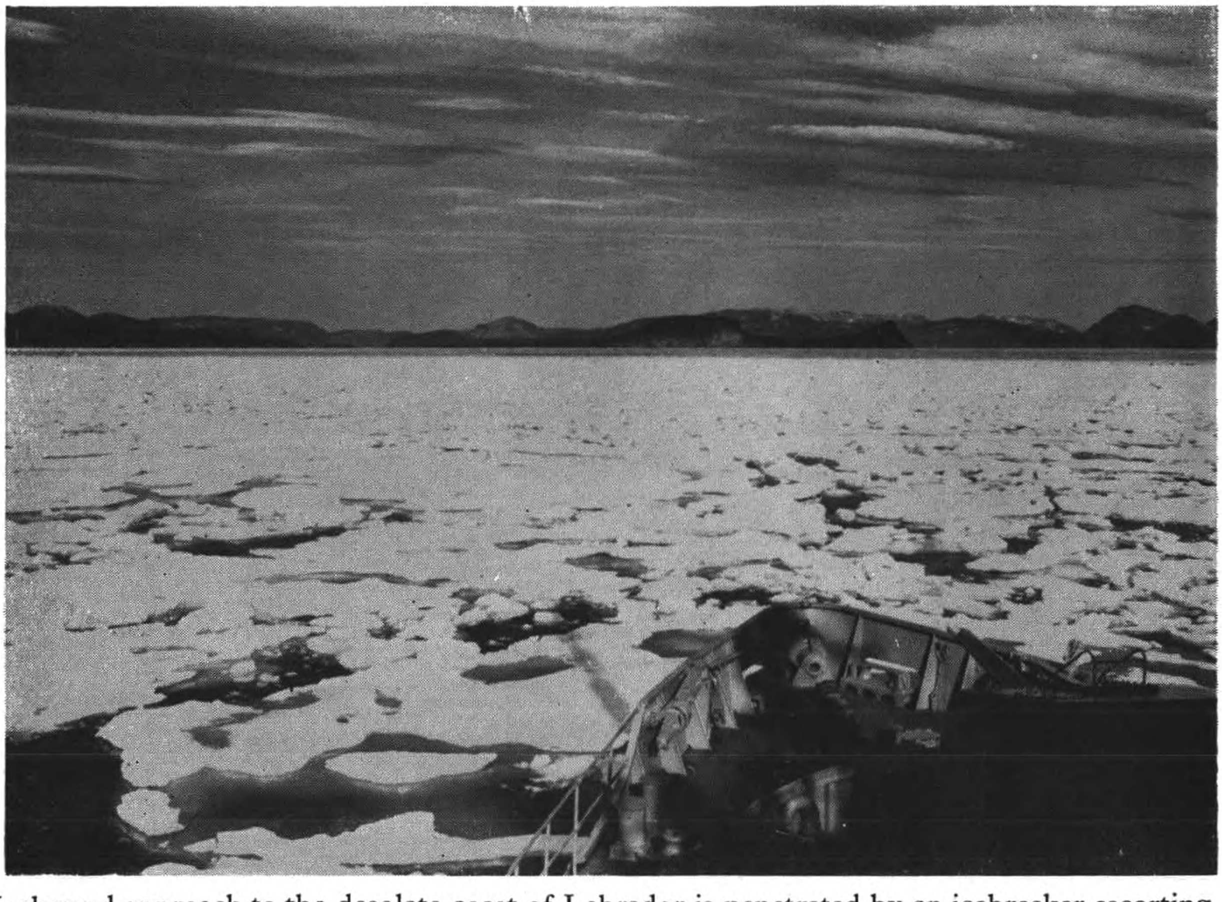
U.S. Navy

Unloading site at Point Barrow, Alaska, with U.S. Army landing craft unloading oil drums in the foreground, and tank landing ships in the background.

(*Opposite page* 88)

Singapore Information Services Photo

Presentation of Malayan "Excellence Award" to Captain H. W. Richardson, master of the *Kimanis* (see page 100).



Icebound approach to the desolate coast of Labrador is penetrated by an icebreaker escorting Project 572 East ships.

Special analysis mid-August ice conditions North Alaska coast. Ice recon conducted 16–17 August shows ice conditions more severe than during like periods 1953, 1954 . . . present state ice and predicted trend suggest slow clearing shore lead Cross Island to Brownlow Point. Unless ice conditions rapidly improve this area during period 15–31 August early closing may be expected.

In fact, the Arctic pack not only moved in to the shore at Point Barrow in late August, but also moved onshore at Point Franklin, approximately 50 miles to the south-west and to within 40 miles of Cape Lisburne, 200 miles farther south-west. After a temporary retreat offshore a few days later, the pack again moved on to the coast west of Point Barrow on 1st September.

In addition to the long-range ice forecasts issued from Washington, the staff oceanographer aboard the *Mount Olympus* had continued to advise the commander of the task group that, although the normal weather pattern which would contribute to offshore movement of the pack had been delayed about three weeks, it could still be expected to occur. In early September, the circumpolar vortex began to decrease in intensity. When a slow moving but major storm moved across the Aleutian Chain to stagnate in the Bering Sea on 6th September, the meteorological situation finally became conducive for the long hoped-for offshore winds.

Meanwhile, recommendations as to how ships might be wintered in had already been prepared. However, on 8th September, release of pressure on the pack coupled with outstanding ice seamanship by the captain of the U.S.S. *Staten Island* permitted the first of the 42 ships held east of Point Barrow to be brought around the point. Although conditions in the anchorage off the Barrow beachhead also improved, small U.S. Coast Guard icebreakers such as the *Bittersweet* had to hack out a 2,700-yard channel through polar ice grounded at the 20-foot depth curve before landing craft could move shoreward. On 17th September, the last ship cleared Barrow. The *Mount Olympus* then sent a message while off Cape Lisburne that she had entered a polynya known to extend to San Diego and was anticipating the large amounts of " cube ice " known to exist near that particular harbour.

The hazards encountered in this overall Arctic supply operation can perhaps best be visualised by mentioning that 63 vessels reported a total of 154 ship casualties, and that only four of 57 ships moving along the north Alaskan coast reported no damage. Yet no ships were lost, and only two had to be towed out. In addition, no fixed-wing aircraft were lost, although ice reconnaissance flight hours alone totalled roughly 3,400. Losses of landing craft and helicopters were one each. One life was lost as a man-overboard casualty. Concerning the overall conduct of the operation, the commander of the task force wrote:

In our first major battle in the mass delivery of cargo to the top of our continent against the very real enemies of ice, snow, fog, and low temperatures, a victory was achieved by American and Canadian demonstration at all levels of the fundamental qualities of determination, leadership, and co-operation.

As to the future, it is certain that even with the partial warming of the Arctic that has taken place since 1900, ice will still be the major problem in scheduling and conducting Arctic supply missions. Already placed on bid for MSTS use are a 480-foot roll-on, roll-off vehicle cargo ship, three 250-foot ice-strengthened cargo ships, two 290-foot ice-strengthened tankers, and one 450-foot ice-strengthened cargo ship (dock). The cargo ships in particular will utilise certain concepts incorporated into the Danish *Kista Dan*, newest of the cargo-passenger ships specially constructed for navigation in Arctic waters. The rapidly increasing foreign fishing fleet operating on banks between Greenland and Labrador are also expanding their requirements for ice information. In fact, arrangements are currently being made for the U.S. Navy's ice observations to become available to the Danish Meteorological Institute in a manner that will permit improved and rapid dissemination to these dozens of private vessels.

Technically, the most overdue study is that of sea ice physics, particularly with relation to the fracturing process, a field in which only now prototype investigation are being carried out at the U.S. Navy Electronics Laboratory. It is also evident that a better understanding of the polar pack's boundary is mandatory. Had the pack's edge in 1955 lain a hundred or so miles north of Point Barrow as it sometimes does, a single period of onshore winds would not have opened or closed the nautical supply route to the central Canadian Arctic as occurred this year. Yet, our ideas on the basic mechanisms operating to define the broad limits of the pack's boundary in August and September are still mere conjectures. With reference to this particular problem, it is worth noting that a Russian news release mentions that the 1955 shipping season along the western portion of the Northern Sea Route was very favourable, but that shipping schedules in the Chukchi Sea were considerably delayed by heavy ice. Moreover, in a Russian broadcast beamed to Europe in November 1955, the Russian icebreaker *Litke* is reported to have set a new " farthest north " record for free navigation by reaching 83° 11′ North latitude. On this 6,000-mile cruise, much of it between 82° and 83° North latitude, the *Litke* circumnavigated Zemlya Frantsa-Iosifa and sailed along the northern shore of Svalbard. When extremes in ice limits such as these are reported during the same year, it becomes evident that the International Geophysical Year should provide an excellent opportunity for pooling meteorological and oceanographic data towards a better understanding of the basin-wide behaviour of the polar pack.

In summary, it is reiterated that sea ice is still considered the greatest natural hazard facing Arctic surface supply. However, today's technology is already at the stage where dozens of thin-skinned ships can conduct efficient, scheduled operations in ice-infested waters. With continuation of the present technical effort, improvement is assured in planning and execution of marine projects in the American Arctic. During our lifetime, these waters should develop into an important highway for defence and commercial purposes.

BIBLIOGRAPHY

DENEBRINK, F. C. Cargo Ships Penetrate the Arctic. *National Defense Transportation Journal*, **11**, No. 6, 1955, pp. 30–34.

Using the Shipping Forecasts—Coastal Waters

By K. BLOWERS

Reproduced by kind permission of the Editors of *Weather*

(Mr. Blowers is the meteorological correspondent of the *East Anglian Daily Times*. His main interests are aviation, meteorology, and British climatology. He is at present a newspaper artist.)

The improved and more technical weather bulletins for shipping, issued on the B.B.C. Light Programme, which were introduced in April 1956, were intended primarily for the use of seamen but are no doubt proving useful for many weather enthusiasts. Though containing less detail than the former Airmet broadcasts, the general synopsis and the station reports now given in the revised bulletins enable anyone with a basic knowledge of meteorology to obtain a general indication of the existing weather situation over the British Isles, and often much of the Atlantic, together with its probable development.

Having obtained the comments of many listeners, including several mariners, I find that the major complaint about this service is the problem of taking down the details of the " general synopsis " as it is read at normal (or often, rather rapid) speed by the announcer. Like many who are unable to write shorthand I found it necessary to devise a simple method of abbreviation which would enable the synopsis to be taken down.

These broadcasts were introduced in their present form on 22nd April, 1956, and I found it quite simple to take down the synopsis using abbreviations which I had previously devised and which are illustrated by the following example:

" Com L (1002) between Scot and Ice X to persist and deepen. Wave 5625 W mov quick SE X Fin early tomorrow. H (1022) Sweden ridge to N. Sea. Low (999) nr Cape St. Vincent & another over Balearics mov N slow."

After the broadcast the general synopsis could then be written in full, as follows:

"A complex depression with central pressure 1002 millibars centred between Scotland and Iceland is expected to persist and deepen. A wave depression at 56°N., 25°W. is moving quickly SE. and is expected to reach Finisterre early tomorrow. An anticyclone (central pressure 1022 millibars) is centred over Sweden with a ridge of high pressure extending to the North Sea. A depression (central pressure 999 millibars) near Cape St. Vincent and another over Balearics are both moving slowly N."

Using a set of coloured chinagraph crayons (red for warm fronts, blue for cold fronts and a double red and blue line for occlusions) and a perspex- or celluloid-covered map of the Atlantic and north-western Europe containing lines of latitude and longitude to the nearest degree, I find it advisable to mark in first the positions of high- and low-pressure centres together with the central pressure readings. A map of the Atlantic and north-western Europe can be traced and redrawn from any good atlas and the lines of latitude and longitude measured off to the nearest degree. Next I plot the position of any fronts and finally insert the appropriate number of

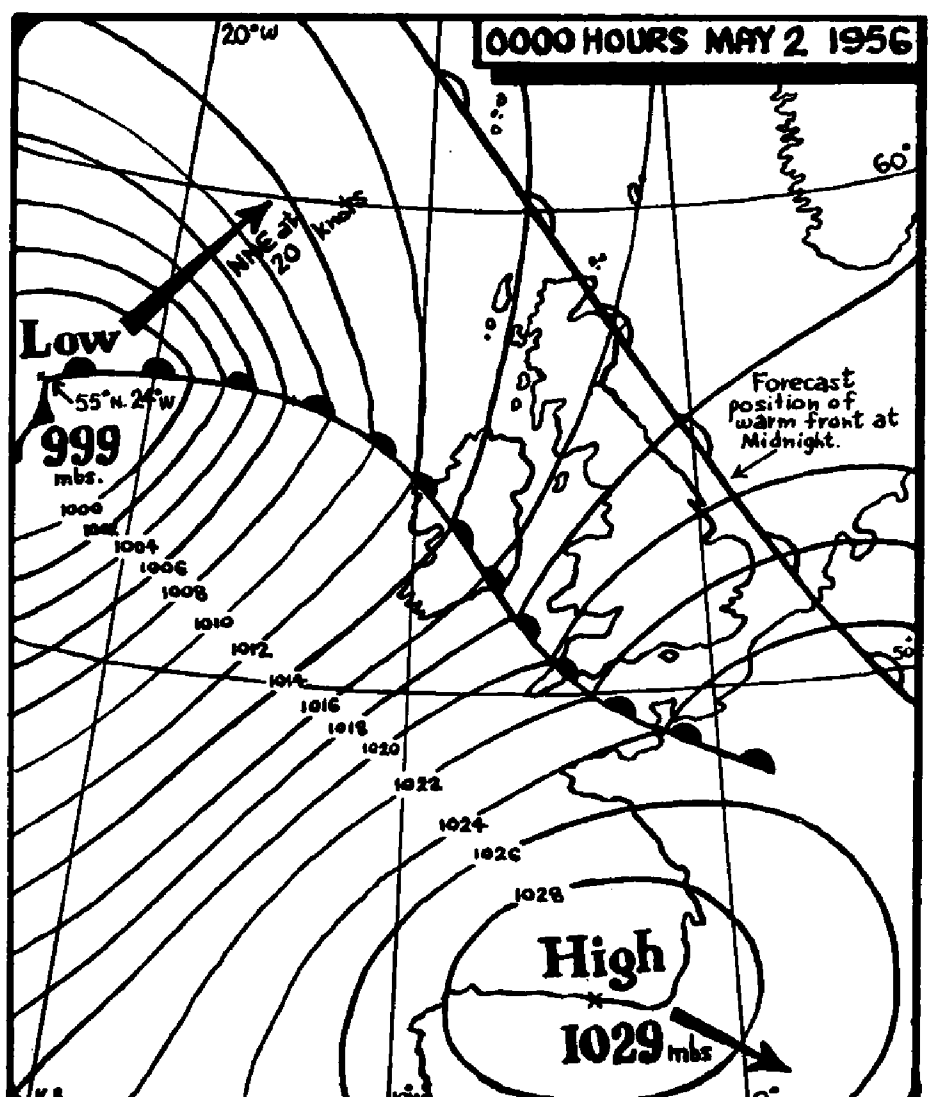


Fig. 1

isobars (in black crayon) between the central pressure readings. In Fig. 1, for instance, 15 isobars at two-millibar intervals are required between the anticyclone over Spain and the Atlantic depression.

Although this method of drawing isobars is by no means precise, it does provide the amateur with a good indication of the general pressure distribution, the flow of winds and the pressure gradient. A dry cloth should be used to remove the china-graph markings from the celluloid and this is more efficient if damped with petrol or paraffin. It is advisable to have two or three maps in use so that a comparison of charts is possible.

The eight station reports given at the end of the five-minute shipping bulletins can normally be taken down quite easily provided a sheet of paper containing the names of the stations in order of reading, and the headings for the observations, is prepared in advance. I take down a wind direction of " south by west ", as S'W and " north-west by west " as NW'W. The barometric tendency can be abbreviated to FR for falling rapidly, S for steady, FS for falling slowly, and RS for rising slowly, etc. Despite the fact that the barometric pressure readings at the coastal stations are not for the same hour as the general synopsis they can often be used to advantage in determining the general run of isobars over the British Isles to assist in the completion of the chart. If the weather enthusiast has a reliable barometer (I use an ex-R.A.F. Mark 14 altimeter, price 12s. 6d., and find it to be almost as reliable as an expensive mercurial type) he can, of course, plot the pressure at his own location on the map!

Every amateur (with the exception of those who are able to read morse) will want to find more station reports to assist in drawing a chart of weather over the British Isles. I found the answer to this problem by purchasing in kit-form a simple one-valve battery-operated radio receiver which can be constructed by anyone in less than two hours. No knowledge of radio is necessary and the cost of the receiver (advertised in many radio magazines) is less than 30 shillings.

On this type of short-wave set, which measures about 6 inches by 4 inches and operates on headphones, I regularly receive plain-language weather reports from Shannon Air Radio which gives details of existing weather at Shannon Airport, Dublin Airport, London Airport, Amsterdam and Brussels every 15 minutes past the hour. At 5 minutes to the hour I receive Paris Air Radio which provides actual weather reports from Paris (Orly), Geneva and several other continental airfields. The announcer speaks with a strong French accent but the broadcast is in English and in plain language.

Both Shannon and Paris give the wind direction in degrees, the wind velocity in knots, visibility in nautical miles or kilometres, barometric pressure and cloud type, amount and base.

I also regularly listen to the Dutch radio station at Scheveningen (approximately on 2,182 kc/s) broadcasting in English at 0834 G.M.T. and 2034 G.M.T., which gives a number of station reports together with an invaluable general inference. The data given by this station on the positions of fronts and pressure systems and their expected movement is of great help in drawing a weather chart of the adjacent continent.

During the past few months I have also received a plain-language message from the Ocean Weather Ship *Cumulus* and many weather reports from lightships in British coastal waters. Several of the station reports in the map in Fig. 2 were received on the simple radio set. Many domestic radios are, of course, capable of receiving the trawler band and an increasing number containing this waveband are now appearing.

The chart in Fig. 1 was drawn by the method I have already described from the information given in the general synopsis of the shipping forecast broadcast at 0745 B.S.T. on 2nd May, 1956. The synopsis was as follows: "A depression of

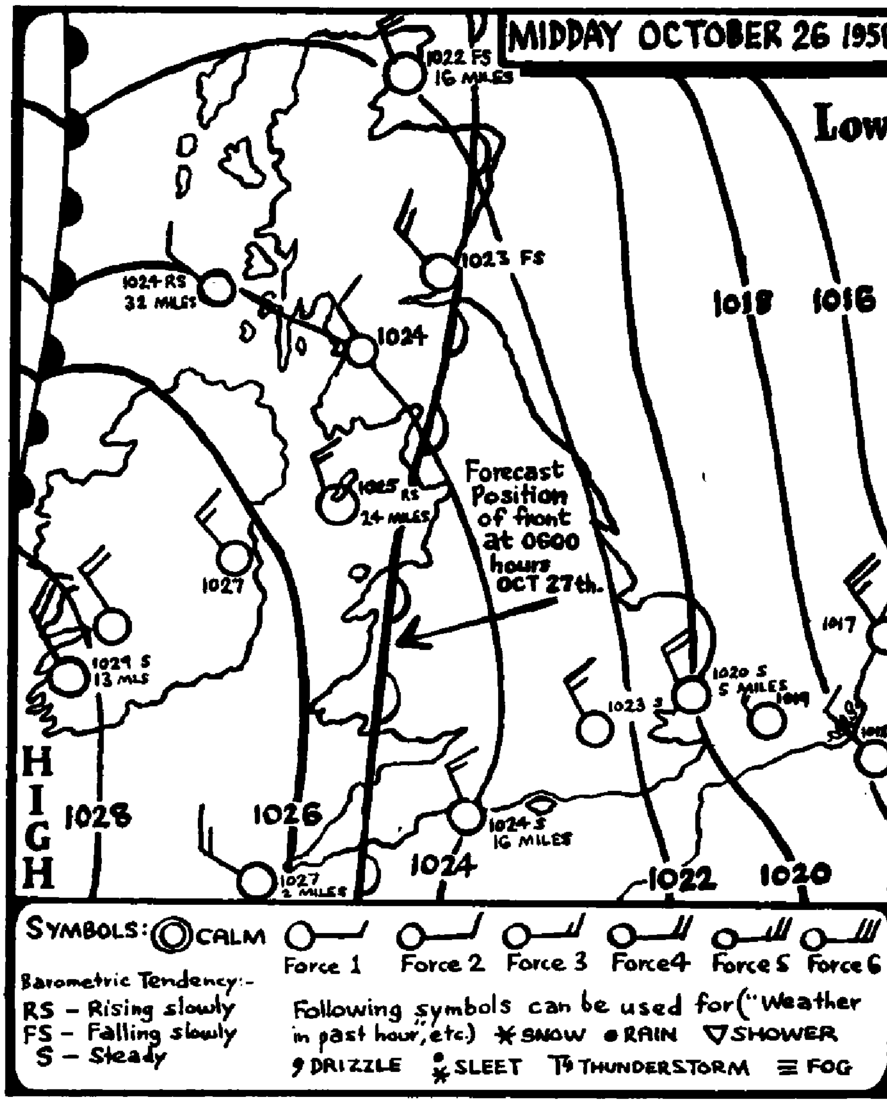


Fig. 2

999 mb centred at 55°N., 24°W. was moving NNE. at 20 kt. An associated warm front from the centre to 56°N., 15°W. to Blacksod Point to Cork to Cherbourg is expected to reach a position South Iceland–Wick–Ostend by midnight. An anticyclone of 1029 mb over the North Spanish coast is drifting slowly SE."

In Fig. 2 the chart was drawn from information given in the shipping bulletin at 1340 G.M.T. on 26th October, 1956. The forecast position of an approaching warm front has also been plotted from the general synopsis. The station reports were as follows:

Station	Wind Direction and Force	Visibility (Miles)	Barometric Pressure and Tendency
Wick	NNW., 4	16	1022 falling slowly
Tiree	NW'W., 2	32	1024 rising slowly
Valentia	NW'N., 4	13	1029 steady
Ronaldsway	NW'N., 3	24	1025 rising slowly
Scilly	NW'W., 3	2	1027
Portland Bill	N'W., 3	16	1024 steady
Felixstowe	NNW., 4	5	1020 steady
Leuchars	NW., 3	—	1023 falling slowly

Comet Arend-Roland, 1956 h

The appearance of a new bright comet is entirely a matter of chance. The loose agglomeration of matter constituting a comet moves round an elliptic orbit, having the sun at one of its foci. Most comets move in such very extended elliptical orbits that the period of one complete revolution is many hundreds or even thousands of years, so that they have not been seen before during the period of recorded human history. On the average several new comets are found each year but very few become bright naked-eye objects.

By good fortune, two new comets brightly visible to the naked eye were seen in 1957, Comet Arend-Roland, 1956 h, and Comet Mrkos, 1957 d. The dates attached to the names refer to the years in which they were first discovered as telescopic objects. An account of Comet Mrkos will be given in the next number of this journal. There has been a dearth of bright comets visible in the northern hemisphere during the present century and these two new comets were the brightest so visible since the very bright comet of 1910. It is therefore remarkable that they both appeared within a period of four months. The southern hemisphere has been more fortunate in the visibility of bright comets during the last 50 years and accounts of ships' observations of two of these since the war, 1947 l and 1948 n, will be found in the 1948 and 1949 volumes of this journal.

Comet Arend-Roland was well visible to the naked eye in the southern hemisphere, before sunrise in the first half of April. It was not then as bright as had been predicted, but somewhat exceeded first magnitude on 12th–14th April, when the comet passed nearest to the sun. A week later it began to be visible in the northern hemisphere and became a really fine object when seen in a dark sky. On 21st April the brightness of the head of the comet was estimated to be between zero and first magnitudes and by 26th April the tail was at least 30° long. The brightness gradually lessened and after about the first week of May the comet could only be seen with telescopic aid.

The main tail of a comet is directed away from the sun but occasional comets show a diffuse light extending from the head towards the sun, known as the " beard ". For a few days Comet Arend-Roland had a most unusual beard, giving the appearance of a second tail, on the opposite side of the head, almost in line with the main one. Apart from the length of this, several degrees, its most remarkable feature was a brilliant spike near its eastern edge extending, as photographed, 7° or more from the comet's head. This spike was clearly visible to the naked eye on 25th April.

The comet was observed by 54 voluntary observing ships, which are listed below. The first report received was a radio message sent on 1st May by the master of S.S.

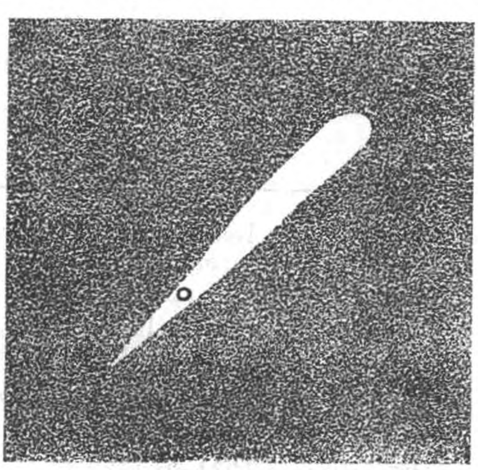


Fig. 1

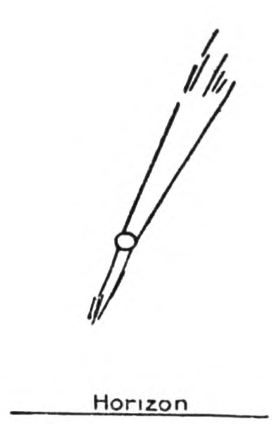


Fig. 2

Fig. 3

Comet Arend-Roland, as observed from *Arabistan* (Fig. 1), *San Felix* (Fig. 2) and *Chantala* (Fig. 3).

Hyrcania, in lat. 18° 10′N., long. 66° 54′E. The beard was seen by eight ships between 24th and 28th April; five of these sent sketches including it. The four best of these are reproduced here (one is opposite page 72). The ships' observations were on the whole disappointing. A number gave only a bare statement that a comet had been seen. An account of comets and their nature, and what can usefully be observed at sea when a naked-eye one appears, will be found on pages 89 to 90 of *The Marine Observer's Handbook*. Of these, one of the most important is the estimate of the brightness of the comet's head by comparison with suitable stars. The nine ships marked in the list with asterisks made this brightness estimation.

*Amakura, *Arabistan, Argentina Star, Aureol, Baron Elphinstone, British Escort, British Splendour, Cape Grafton, Caltex Oslo, Ceramic, *Chantala, City of Chester, City of Liverpool, City of Pretoria, *Dartmoor, Debrett, Devonshire, Discovery II, Durham, Empress of Britain, Esso Cambridge, Geelong Star, Grelmarion, Hyrcania, Highland Monarch, Imperial Star, Lalande, Lingula, Loch Ryan, Manchester Progress, Manchester Venture, New York City, *Nova Scotia, *Otaki, Otranto, Pacific Fortune, *Paparoa, Parthia, Perthshire, Prospector, Powell, *Ramsay, Reynolds, Rochester Castle, *Runswick, Sacramento, *San Felix, San Velino, San Veronico, Sneaton, Trelyon, Trevince, Umtata, Volvula, Wendover.*

E. W. B.

Weather Charts Plotted at Sea—Oceanic Areas

Adverse weather conditions are at best an inconvenience to the mariner and at worst a potential threat to his safety. It is important, therefore, that he should be as well informed about the weather as possible. Although the forecasts for shipping provide all the essential information about the weather they suffer certain obvious restrictions, the chief of which is that their wording must be general enough to apply to the complete area for which the forecast is issued. For this reason Part IV of the Atlantic Weather Bulletin, issued daily by the Meteorological Office, contains enough data to allow the mariner to draw up his own weather chart, thus enabling him to make much greater use of the latest available forecast.

The master of a merchant ship and his deck officers must, of necessity, study the weather very closely and will no doubt be acquainted with the publication *Meteorology for Mariners*, in which a detailed account is given of the weather map, its construction, and the manner in which it can be related to personal observations. Since incorrect information is often more dangerous than no information at all, it is essential that care should be exercised in plotting and drawing up the chart. Although experience is undoubtedly the best teacher in this field, there are certain fundamental rules which must be observed and a number of errors, notoriously easy to make, which the plotter should always try to avoid.

These rules and typical errors have been discussed in a previous note in *The Marine Observer*,[1] with particular reference to a weather chart plotted aboard a selected ship. Two more such charts have now been selected from some recently sent to us by Captain J. Hogg of the S.S. *Cairnavon* and drawn up by her radio officer, Mr. P. Grantham. We feel that considerable credit is due to Mr. Grantham for his keenness and for the painstaking manner in which he has prepared these charts. This is the first opportunity we have had of seeing such maps prepared by a radio officer. A radio officer aboard a ship has no specific need to know much about meteorology—unlike the deck officer he does not have to study it for his certificates. But there seems to be little doubt that if he does take an interest in the subject and studies the available literature (including *Meteorology for Mariners*—a copy of which will be found aboard each selected ship) there is no reason why he should not become very proficient at the art of drawing up a weather map from radio bulletins, thus providing the master of the ship with very useful information. This is a task which is interesting and fascinating and one which can be done during the inactive periods of a radio watch. (An article on this general subject appeared in the *Marconi Mariner*.[2]) Mr. Grantham takes the weather bulletin issued by Washington as well as that from Dunstable, fitting the two together to

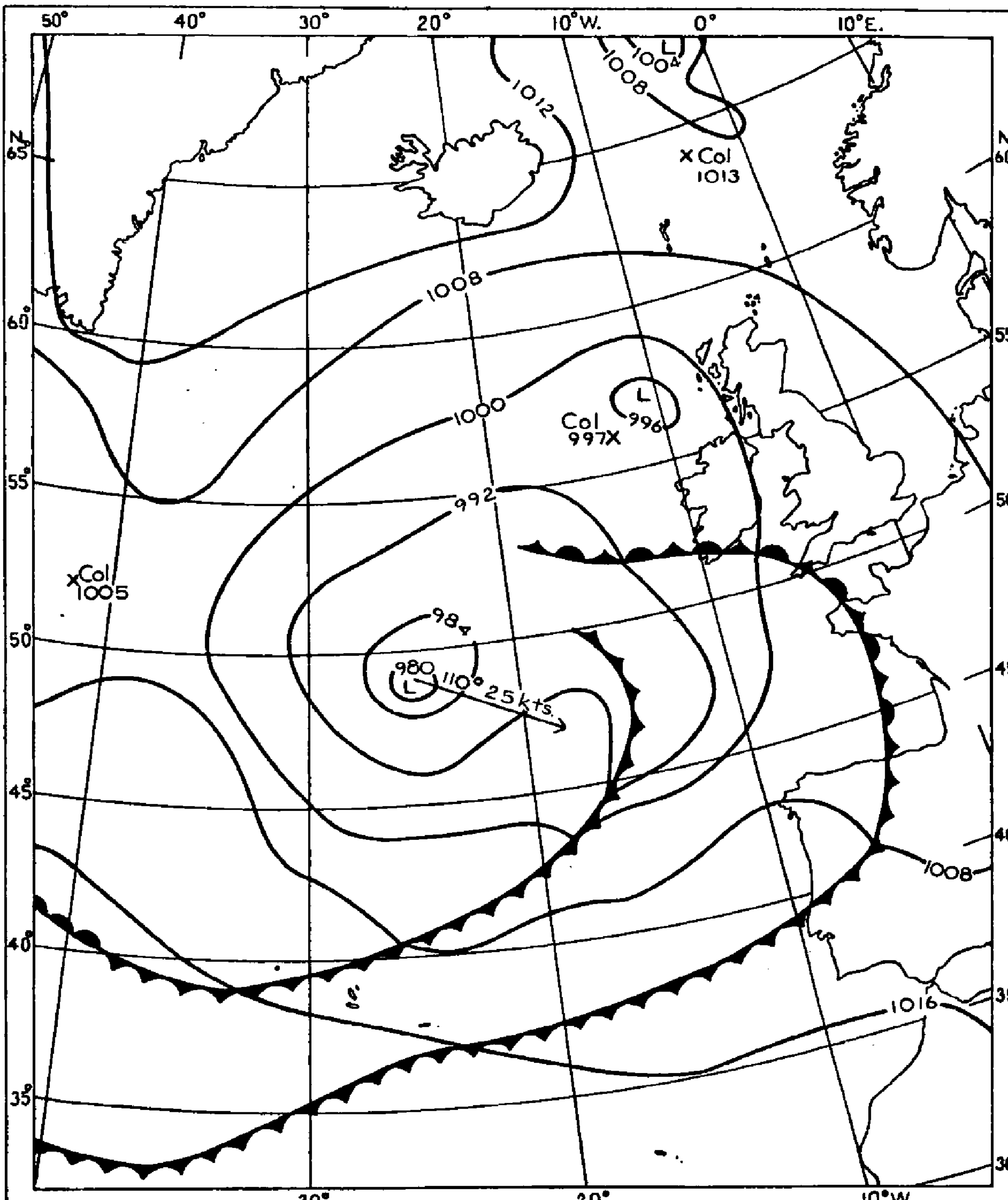


Fig. 1. The 0600 G.M.T. chart for 10th May, 1957, as drawn aboard *Cairnavon.*

give a complete North Atlantic chart. We have illustrated only the sections east of 40°W. here in order to save space They are shown in Figs. 1 and 3, and for purposes of comparison Figs. 2 and 4 respectively show similar charts drawn up in the Marine Division using the same information. The comparison is a favourable one and the comments which follow are intended, not as a criticism of the charts shown, but as a help to the mariner in drawing up even better weather maps.

When all the information given in the bulletin has been plotted and the fronts and selected isobars drawn in, the missing intermediate isobars should be inserted at 4 mb intervals. This is important because it gives a clear picture of the pressure gradients and hence of the wind speeds. The spacing between consecutive isobars should be fairly even, or show a uniform increase or decrease. If the ship reports, contained in Part V of the bulletin, have already been plotted on the chart, as has

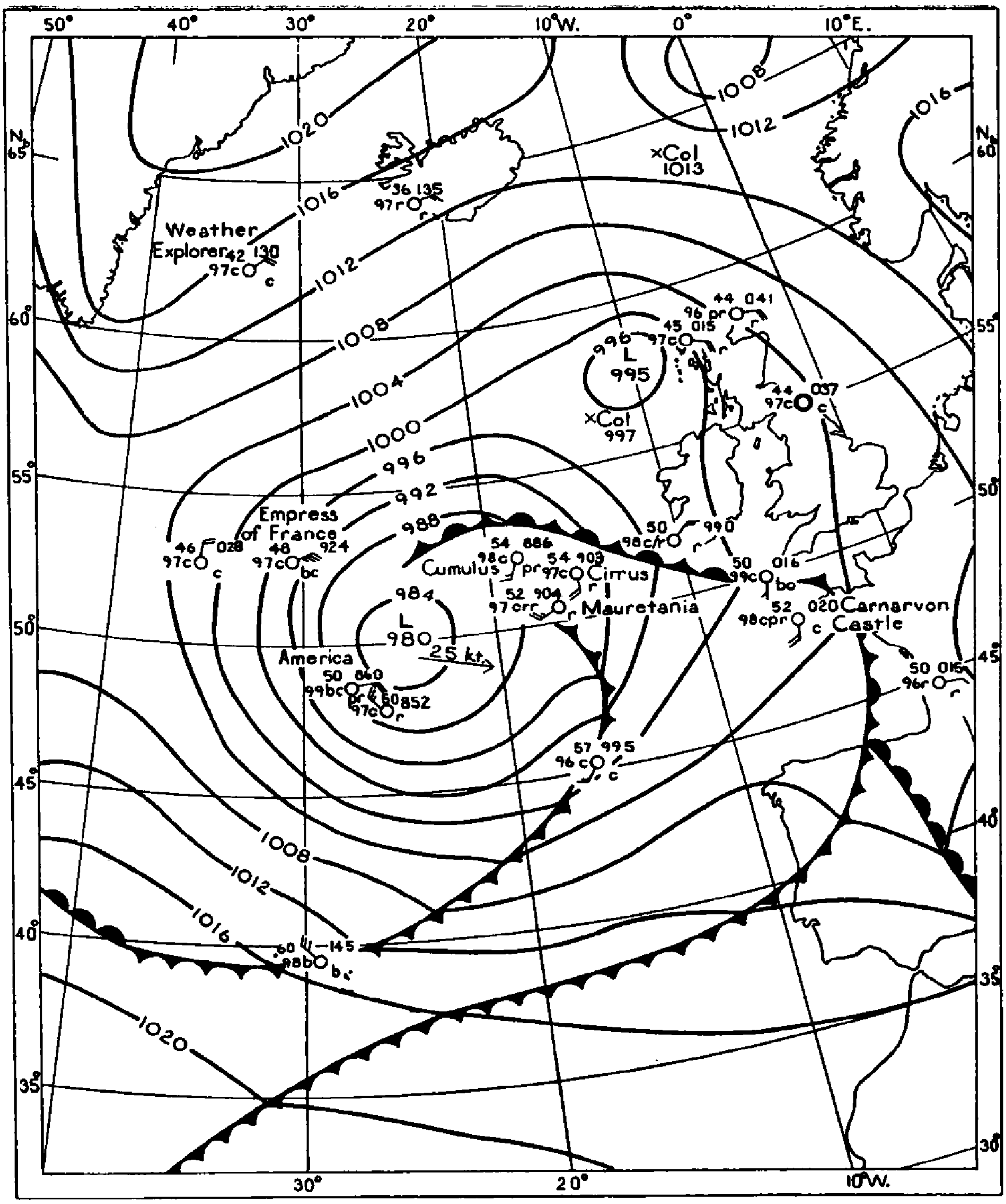


Fig. 2. The 0600 G.M.T. chart for 10th May, 1957, as drawn in the Marine Division.

been done in Fig. 2, the task of drawing in these intermediate isobars is made easier. When an isobar crosses a front it often shows a kink, sometimes quite pronounced, the apex of which points towards the area of higher pressure. In Fig. 2 the change in direction of the 1,000 mb isobar in the region of 50°N., 7½°W. illustrates this point. Apart from these differences the chart plotted aboard the S.S. *Cairnavon*, shown in Fig. 1, agrees closely with that plotted in the Marine Division, shown in Fig. 2.

A number of other differences occur between the charts shown in Figs. 3 and 4. These result from errors in plotting which are very easy to make but which can usually be avoided as increasing familiarity with weather maps is attained. They are the plotting of positions east, instead of west, of Greenwich, or vice versa, and errors of five or ten degrees in latitude or longitude. When this type of error occurs it often results in anomalies in the chart which more experienced plotters will easily

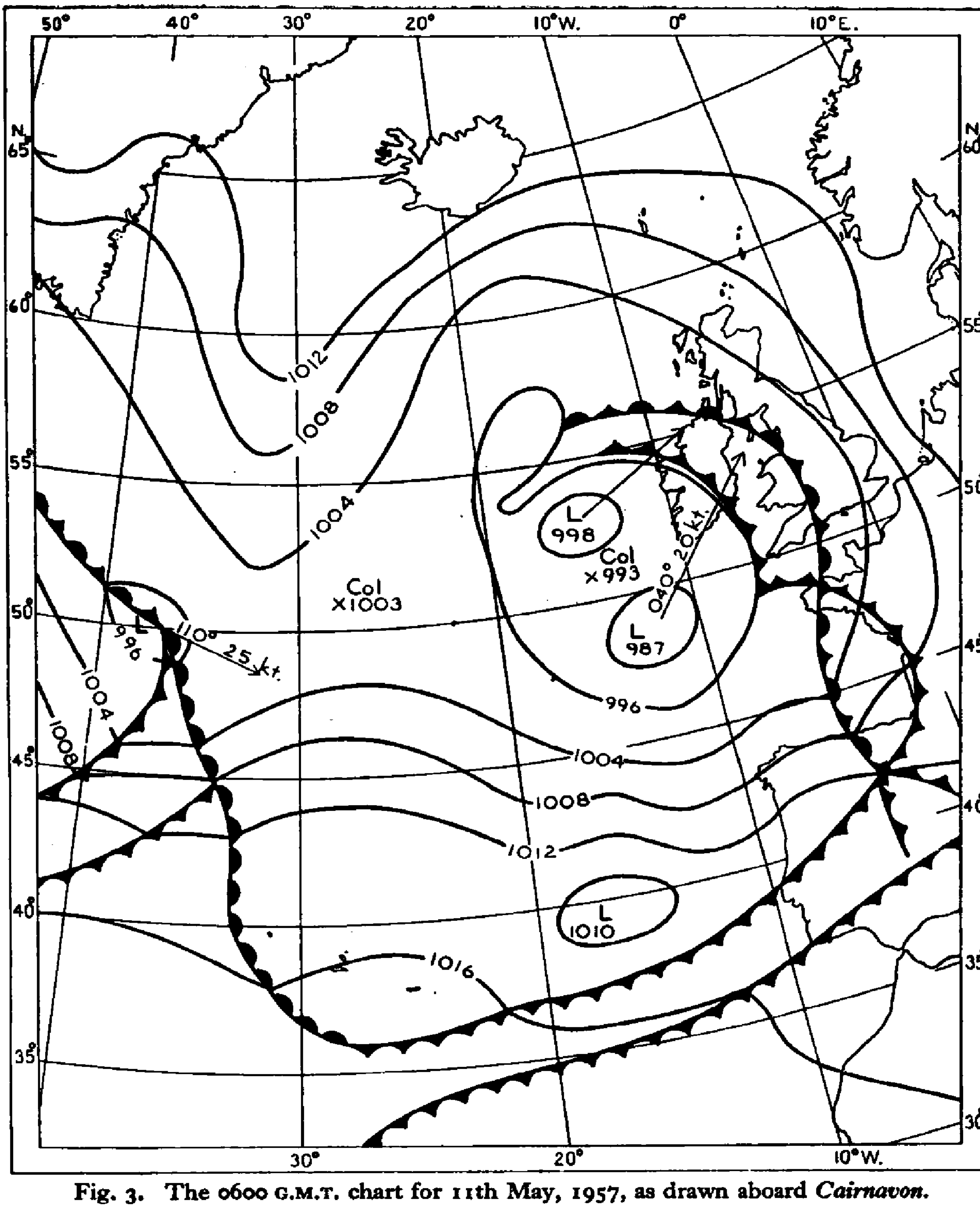


Fig. 3. The 0600 G.M.T. chart for 11th May, 1957, as drawn aboard *Cairnavon.*

detect and correct. Some such anomalies are seen in Fig. 3. On a weather map one front often meets another, as at position 50°N., 37°W., but never cuts across it, as at position 48½°N., 3½°W. In this case the mistake arose in plotting positions west, instead of east, of Greenwich. The suspiciously tortuous path traced out by the isobar of 996 mb in the region of 54°N., 19°W. could also have resulted from a similar cause, although in all cases such as these coding or transmission errors might, alternatively, be responsible. The " low " drawn in Fig. 3 at 40½°N., 16½°*W*. was coded as at 40½N., 16½E., which is unfortunately off the map! Difficulty is sometimes experienced in drawing isobars in the region of a col. Such difficulties are avoided if it is borne in mind that the col pressure given in the bulletin must be consistent with the isobars, e.g. a col of 1013 mb must have a 1012 mb isobar between it and each low pressure area, and a 1016 mb isobar between it and each high pressure

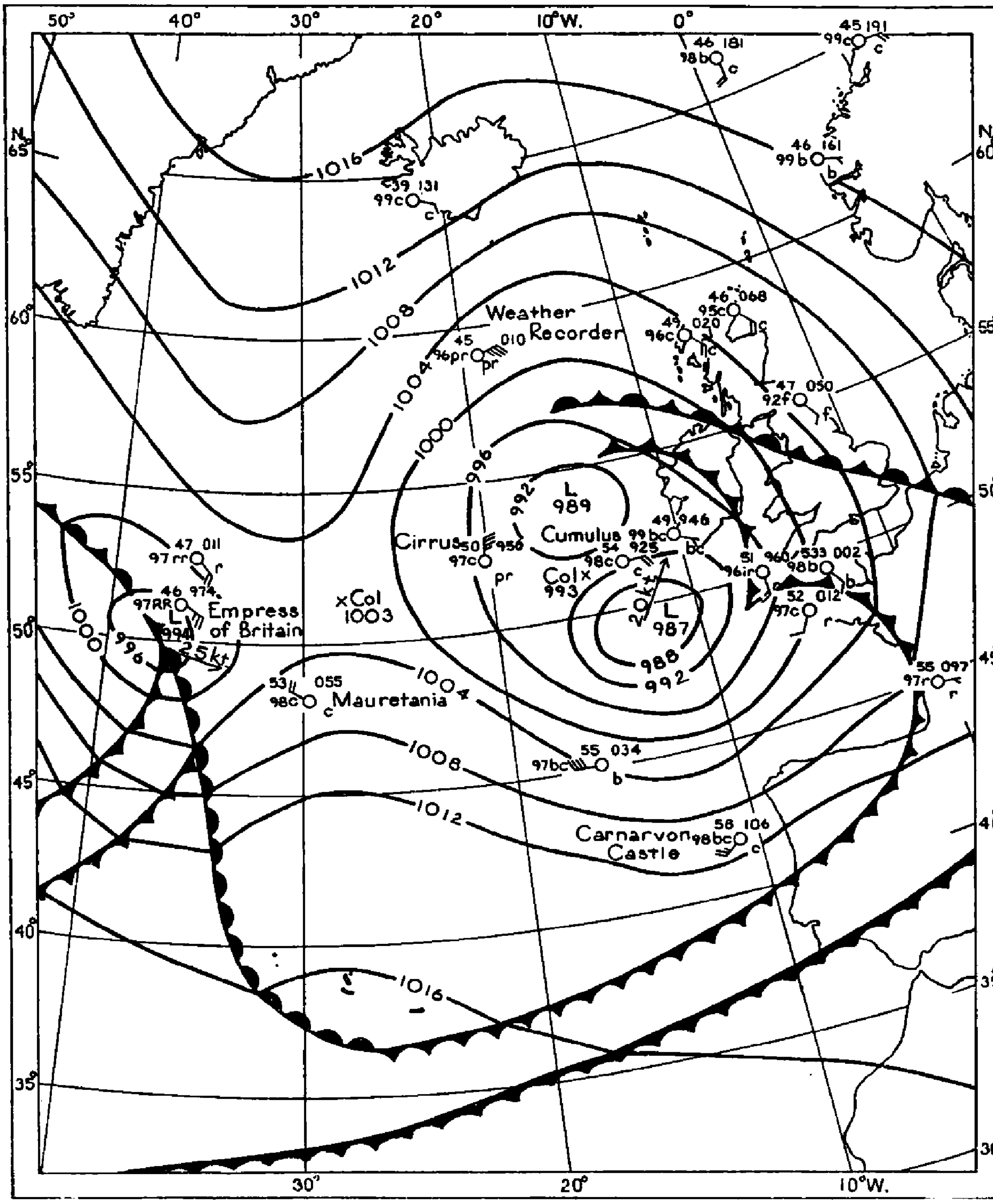


Fig. 4. The 0600 G.M.T. chart for 11th May, 1957, as drawn in the Marine Division.

area. Some useful information on the plotting and drawing up of charts is provided in M.O. 509, *International Meteorological Code—Decode for the Use of Shipping* (Fourth Edition), pages 36 and 37. The mariner would be well advised to have a copy beside him when constructing his weather map.

In conclusion, it should be remembered that our knowledge of weather behaviour over the oceans is derived almost entirely from the reports of selected ships. It is fitting, therefore, that those who supply this information should derive the greatest benefit from it, and this is very much facilitated if accurate weather charts are drawn up aboard ship and used to supplement the weather forecast. P. R.

REFERENCES

[1] HAY, R. F. M. Weather charts plotted at sea. *Mar. Obs.*, London, **26**, 1956, pp. 33–36.
[2] The preparation of weather charts aboard ship, Parts 1 and 2. *Marconi Mariner*, **3**, Nos. 46 and 47, 1955.

Presentation of Barographs

On 11th December, 1957, Dr. J. M. Stagg, Director of Services, Meteorological Office, acting on behalf of the Director-General, presented inscribed barographs to the masters of four British Selected Ships in recognition of the excellent voluntary meteorological work which they had done at sea during a long period of years. The presentation was made at the Annual Luncheon of the Merseyside and District members of the Honourable Company of Master Mariners. Liverpool was selected as the place for this presentation in view of the fact that three of the recipients were serving in ships sailing out of that port. As stated in the October 1957 number of *The Marine Observer*, the recipients of these awards were:

Commodore J. P. Dobson, D.S.C., R.D., R.N.R., and Captain J. Soame of the Canadian Pacific Steamship Company—in command of the *Empress of Britain* and *Beaverlake* respectively.

Captain W. B. Tanner, R.D., R.N.R., of the Cunard Line, in command of the *Arabia*.

Captain D. H. Chadwick of the New Zealand Shipping Company, who is in command of the *Haparangi*.

Unfortunately Captain Tanner was unable to be present as his ship was delayed somewhat due to heavy weather; Captain E. J. R. Pollitt, Marine Superintendent of the Cunard Line, accepted the barograph on his behalf.

It seemed very fitting that, thanks to the courtesy of the Honourable Company of Master Mariners, the presentation could be made at this maritime function. Lt.-Cdr. Alan Brown presided, the guest of honour was the Lord Mayor of Liverpool and Sir Frederick Bowhill, Master of the Honourable Company, was also among those present.

In making the presentation, Dr. Stagg pointed out that of the 3,000 voluntary observing ships of all nations, about 650 were under the red ensign. He emphasised that despite the existence of Ocean Weather Ships in the North Atlantic and North Pacific, the Meteorological Office depended very much on reports sent in by voluntary observers to fill in the blanks that lie between these ships. To stress the value of accurate meteorological reports from merchant ships, he quoted a case of a vessel whose report materially altered a forecast which was recently being prepared at Dunstable (vide *The Marine Observer*, October 1957, page 230). He mentioned that in the 10 years that this scheme of " special " awards had been in existence, barographs had been awarded to 40 captains representing 15 British shipping companies. He thanked the captains concerned for their admirable work and stressed that their work was symbolical of that carried out by a large number of officers in various ships; it was the inspiration and encouragement of ships' masters which helped to maintain the high standard of observations. C. E. N. F.

MALAYAN "EXCELLENCE AWARD"

The photograph (opposite page 89) shows the Honourable Mr. Francis Thomas, Minister for Communications and Works, presenting the first " Excellence Award " made by the Singapore Government to the master of a Malayan Selected Ship. The recipient is Captain H. W. Richardson, of M.V. *Kimanis* (Straits Steamship Co. Ltd.), and the award was made on 27th November, 1957. *Kimanis* has been making regular reports to the Malayan Meteorological Service since January 1954.

Mr. R. Mather, Director of the Service, says: " The Malayan Meteorological Service has recruited 17 Selected Ships based in Singapore and plans to recruit more in 1958.

"All ships using Singapore are visited by a liaison officer from this Service, and it is gratifying to report that an average of 1,200 ships' reports per month are now being received from ships which call here."

THE REPORTING OF VISIBILITY

Though we at Harrow are not in a position to decide on the accuracy of any observation from a ship at sea, and would avoid making unwarranted criticisms, we cannot fail to notice occasional discrepancies between observations of different elements at the same synoptic hour. We can sometimes, from our experience, hazard a reasonable guess as to which of these entries gives the true information, but in most cases we feel that it is more prudent to discard both of them for climatological purposes. We are always reluctant to do this, but for many years it has been our principle not to use a doubtful observation.

One of the most prevalent inconsistencies, though by no means universal, in ships' meteorological logbooks, has been found between the code figure for visibility (VV) and its neighbour, present weather (ww) in Group 4. For instance, a recent logbook gives a VV of 96 (visibility 2–5 miles) against a ww of 43 (fog, becoming thinner in last hour with visibility less than half a mile).

If fog is present at the time of observation and there is no precipitation, i.e. drizzle, rain, snow or sleet, the code figure for ww must always be between 40 and 49 and the code figure for visibility (VV) will be 90, 91, 92 or 93 according to the thickness of the fog. On the other hand, visibility can be reduced to less than 1,100 yards by weather phenomena other than fog such, for example, as snow, rain, drizzle, or a very heavy shower. In these cases the use of code figures for ww describing these phenomena, e.g. 59, 75, 90 or 99, would make it perfectly clear to the recipient of the report why visibility figures 90–93 had been used. In a coastal region, the visibility might be reduced to the scale 90—93 by a dust or sandstorm. Such occurrences at sea are rare, though last October a selected ship 140 miles off shore reported that the bush fires then raging in New South Wales had shortened her visibility to between 2 and 3 miles.

VV code figures 90 to 93 must *not* be used when visibility is 1,100 yards or more.

Book Reviews

Hurricanes: Their Nature and History (9th, revised edition), by Ivan Ray Tannehill. $8\frac{1}{2}$ in. × 6 in. pp. x + 308. *Illus.* University Press, Princeton; Oxford University Press, London, 1956. 36s.

This is the ninth edition of a book which was first published in 1938 and has since become widely known among meteorologists as the standard work on the subject. It deserves to be better known amongst seamen.

Tropical revolving storms are known by different names in different parts of the world and it is only in the North Atlantic that they are called hurricanes. As its title implies, therefore, the book is particularly concerned with storms of the West Indies, the United States and adjacent waters of the Atlantic Ocean, the Gulf of Mexico and the Caribbean Sea. No one could be more competent to handle such a subject than the author, who was for many years Chief of the Division of Synoptic Reports and Forecasts in the U.S. Weather Bureau, and for 20 years was specially concerned with hurricane warning work.

The book sets down in simple language all the essential facts and theories regarding the tropical storm. Chapters dealing with tropical storms in general, and associated winds, storm waves, rainfall and precursory signs provide the reader with any information he may wish to have about the nature of these phenomena in all parts of the world. Later on in the book he may obtain from the historical section an account of, or at least a reference to, the occurrence of every hurricane known to have visited the North Atlantic. There is in this part of the book a chronological list of tropical storms which have visited this area from 1494 to 1900, with very brief details where known. Hurricanes of the twentieth century are treated in greater detail and the 76 pages of Chapter XIV give a chronological narrative of all hurricanes which have been detected between 1901 and 1944, together with a half-page map of their tracks for each year. These narratives and maps are brought up to the year 1955 in an appendix which also treats of the progress which has been made in tracking these storms since the previous edition was published.

The work of the U.S. hurricane warning service is dealt with at some length in various parts of the book, from 1870 when the first storm warning was issued for the Great Lakes, until the present day when information is gathered by radar, air reconnaissance, radio-sonde and automatic unattended weather stations established on lonely islands in the Caribbean Sea.

On this subject, it seems a pity that so little is made of the part played by ships. Writing of the early days of this service on page 8, the author refers to the first radio weather message from a ship at sea in 1905, and the first report of a hurricane received by wireless from a ship at sea on 26th August, 1909. When the reader turns to the latter pages of the history, however, he is left with the impression that nowadays observations from ships play a very minor part in the tracking of hurricanes. That this is not so is shown by the numerous meteorological logbooks which come into the Marine Division containing three-hourly observations made by British ships at the request of various U.S. meteorological centres. The pages of *The Marine Observer* have frequently recorded the thanks of the Chief of the U.S. Weather Bureau for the observations of voluntary observing ships at these times. In Volume XXIII, page 213, are recorded the names of no fewer than 12 British ships whose observations had assisted in the tracking of hurricane "Charlie" (25th–30th September, 1952).

Although, as has been stated above, the book lays special emphasis on the tropical storms of the North Atlantic, those of other regions of the world are not neglected. In the early history of research into the origin and behaviour of these other storms, however, it seems strange to find no mention of the work of Ralph Abercromby, a gentleman of independent means, who, in the nineteenth century, voluntarily devoted several years to this particular study in the Indian Ocean and the Far East.

The map on page 4 which indicates the principal world regions of tropical storms gives the impression that the West Indian region is the one most visited by them. Tables later on in the book, however, show that those of the western North Pacific and China Sea are far more frequent. The reviewer, who first learned to respect these violent manifestations of nature as a young man of 17 in the South Pacific Ocean, would suggest that many storms in wider areas go undetected because of the scarcity of shipping. Any map purporting to show the world-wide distribution of tropical revolving storms is more likely, therefore, to be in fact a map showing the distribution of vessels which have been unlucky enough to encounter them.

Altogether this is a book which is well worthy of a place on the shelves of any shipmaster, particularly among those who trade in the western North Atlantic and the Caribbean Sea. Only its price will put it out of the reach of many. L. B. P.

Cloud Study: A Pictorial Guide, by F. H. Ludlam and R. S. Scorer. 9½ in. × 6¼ in. pp. 80. *Illus.* John Murray, Ltd., London, 1957. 12s. 6d.

This excellently produced book has been prepared under the auspices of the Royal Meteorological Society, whose President has written the Foreword. The volume contains a 12-page introduction and 74 annotated cloud photographs, six of them in colour, selected mostly from the collections of the Society.

In the introduction the authors state that their main purpose is to relate the visible forms of cloud to the processes which have fashioned them. It is this which gives the book its undoubted value. They describe briefly how water behaves in the atmosphere, how it is that supercooled droplets can exist in the upper part of the atmosphere, and how ice crystals, once formed, can grow and multiply. They explain why the edge of a droplet cloud is well defined while that of an ice cloud is often diffuse. Three basic forms of cloud are defined according to their mode of formation: streak clouds, sheet clouds and heap clouds. Various processes of cloud formation are described with examples of each and some indication of their relative importance. Here cloud includes fog, Arctic sea smoke, aircraft condensation trails and the funnel clouds of tornadoes and waterspouts. Various processes which modify clouds are then considered, including the release of convection in unstable layers, small-scale convection produced by radiation, and distortion and arrangement of clouds by the wind. Finally, processes leading to the dissipation of clouds are dealt with.

Each of the photographs which follow is accompanied by explanatory notes written by the authors. These are easy to follow and yet consistent with the latest theories and knowledge about the formation of clouds. It is certain that the book will be of considerable help to any cloud observer, whether on land or at sea, because it will enable him to understand more clearly what he sees. It is good value at 12s. 6d.

H. C. S.

"*Challenger*": *The Life of a Survey Ship*, by George Stephen Ritchie (Capt., R.N.). 8¾ in. × 5⅝ in. pp. xxi + 249. *Illus.* Hollis & Carter, London, 1957. 30s.

There are few sea areas of the world which haven't at least one chart on which a reference is made to H.M.S. *Challenger*. In many cases the reference is to a survey or a sounding made aboard the first *Challenger* which was built in 1856 and became famous as a result of her world oceanographic voyage which lasted from 1872 to 1876. But, as the author shows us in this book, a tremendous amount of hydrographic survey work was also made in the second *Challenger*, which was the heroine of this book and whose name will also have a permanent memorial on many Admiralty charts. Thus there are few seamen who haven't heard of the *Challenger* and it is fitting therefore that this book should be reviewed here.

The author is himself a Captain in the Royal Navy, and a hydrographic surveyor, and he was in command of the ship from 1950 to 1951. The acknowledgments on the first page show the enormous number of people he consulted and the great care and trouble he took to get his facts right before putting them down on paper. The resulting book is an extremely instructive and "human" narrative concerning the life of the second *Challenger*—and what an interesting and useful life it was. The *Challenger*, which was a single screw steamship of about 1,200 tons displacement and about 200 feet in length, was built as a surveying ship and was launched at Chatham Dockyard in June 1931, being completed in the autumn of that year; she went to the ship-breakers in December 1953. In this book the author takes us right through her career. He has the happy knack of describing the scientific and technical work aboard the ship without making it sound dull, and at the same time introduces a number of entertaining anecdotes about personalities in her ship's company. After her completion, *Challenger* was affected by an economy drive during the great financial slump and was thus laid up until the end of the year—hardly an auspicious start to her career. After a few months oceanographical work in the eastern Atlantic in the early part of 1932, she was busy on hydrographic surveying off the Labrador coast and in the West Indies until the spring of 1938. Afterwards she was sent to survey Masira on the Arabian coast, Ras Tanura in the Persian Gulf, and Muhammed Qol in Northern Sudan. Later she returned to England for a refit. During the early part of the Second World War she was employed marking out the voyage channels in the North Sea for the "East coast" convoys, after which she surveyed various harbours on the north coast of Scotland, followed by a lengthy and rather uncomfortable period of survey work in Iceland. After surveying the approaches to Londonderry, by way of a contrast she was sent out to West Africa, where she did some very useful work in the Gambia River area. After a refit in England in May 1942 she was sent out to join the flag of the Commander-in-Chief, Eastern Fleet, where she did a major survey of Port Kilindi and Port Ritz on the East African coast, followed by a survey of the Palk Straits

(Ceylon), the Seychelles and the Torres Strait, followed by similar work in Borneo and Sarawak. During much of this period new charts were actually printed aboard the ship; quite a considerable feat bearing in mind the cramped conditions aboard. After a refit at home in 1946 she did a further extensive survey in the Persian Gulf, followed by some work in the harbours of Cyprus. After a further refit in 1949, she followed the example of her predecessor by setting off on a world cruise " aimed at taking a very considerable number of soundings in the oceans as well as carrying out searches for a number of shoals reported in such areas, particularly in the latter years of the war when thousands of ships were running their echo-sounding machines ". On this occasion she took with her a small party of scientists from Cambridge to explore the structure of the ocean bed itself. Her world cruise lasted 2½ years. After calling at Bermuda, where she got involved in a hurricane, she once again visited the West Indies, passed through the Panama Canal, visited San Diego (California), did some survey work in British Columbia as far north as Port Simpson, and then moved across the Pacific to Pearl Harbour and thence to Japan, New Guinea, New Zealand, Fiji, the Ellice Islands, and thence back to northern Japan and finally home via Colombo, Aden, Port Said and Cyprus. Much investigation was made into the structure of the sea bed by the seismic refraction methods involving the use of small depth charges and buoyed hydrophones. During the voyage a record sounding of about 5,900 fathoms was obtained in the Marianas Trench in the Western Pacific.

The author shows us that a surveyor's life in the Royal Navy is by no means all " shipborne "—in fact he is liable to spend a considerable amount of his time living under canvas ashore, often in primitive and uncomfortable conditions. And we are also given a glimpse of the generally arduous nature of a hydrographic surveyor's work; after hours of sounding in open boats or tramping around ashore on triangulation duties, he has to spend the evening transferring his work neatly to a chart. There are no " union " hours on this job. But one see there are many consolations, and for those who are interested in nature it seems that the life must always be interesting, and the hydrographic surveyor can always feel that the work he is doing is for the benefit of all seamen of all nations. The author draws a cosy picture of " the peace that comes upon the commander of a deep sea expedition, as the land slowly sinks below the horizon astern and he heads for the limitless ocean, is profound . . . there is time to think, time to stop at a moment's notice to study some passing phenomenon and to remain there a day if need be to investigate the matter ". Captain Ritchie's book is in the nature of a tribute to the hydrographic service and after reading it one does have, thanks to the graphic and interesting style of the author, an overall word picture of life in such a ship.

In addition to hydrographic survey work and oceanography, it seems inevitable that meteorology should play an important part in the work of a surveyor and that it should find its place in this book. The nature of his job is such that the weather naturally affects all his activities—including his physical comfort as well as the efficiency and extent of his operations—to an even greater extent than most other mariners. The photographs are numerous and well produced. The book might have been improved if it had contained a general map showing the geographical extent of the *Challenger's* activities. Generally, it makes very enjoyable reading.

C. E. N. F.

Personalities

RETIREMENT.—CAPTAIN W. T. FITZGERALD, R.D., R.N.R., retired in October 1957, after 47 years at sea.

William Thomas FitzGerald served his apprenticeship with the White Star Line, joining their full-rigged ship *Mersey* in Liverpool in July 1910. This ship carried 50–60 cadets who worked the ship entirely. Captain FitzGerald tells us that about

150 cadets passed through the *Mersey;* maybe 20 spent their lives at sea, and he is probably the last of these. He made four voyages in her and passed for Second Mate in May 1914.

In October 1914 he joined the R.N.R. and during the First World War he commanded drifters in the Dover Patrol and was also in Admiralty yachts. His whole qualifying time for Mate and Master was served in the Royal Navy and he passed for Master in March 1919.

After the war he rejoined the White Star Line and successfully survived the many vicissitudes of that Company, the slump and the merger with the Cunard Line.

During the Second World War, Captain FitzGerald served as Commodore of East Coast convoys and then, in command of the *Engadine,* he was promoted to Captain R.N.R. in 1943.

After the Second World War he returned to the Cunard Line and was promoted to his first command, the *Vardulia,* in 1949. He subsequently commanded eight Cunard Line ships, all of them being voluntary observing ships, and also made a few voyages as staff captain both of the *Queen Mary* and the *Queen Elizabeth.* His last command was the *Britannic.*

Captain FitzGerald's association with the Meteorological Office goes back to 1927 when he was in the *Majestic.* Since then he has sent us 82 returns, 60 of which have been classed Excellent. He received Excellent Awards in 1927, 1929 and 1953, and in 1951 was awarded a barograph for long and zealous voluntary service on behalf of this Office.

We wish him health and happiness in his retirement. J. R. R.

RETIREMENT.—After more than 43 years at sea, CAPTAIN A. LYALL retired when he brought the *Salamanca* into Liverpool last December.

Captain Lyall made his first trip to sea in the Allan Line's *Grampian* in 1914. Shortly after obtaining his Master's Certificate he joined the Pacific Steam Navigation Company in 1924 as 4th Officer of the *Oropesa.* He was appointed to his first command, the *Talca,* in 1947. He subsequently commanded *Samanco, Losada, Salaverry* and *Salamanca.*

During the 1914–18 war, Captain Lyall served in the R.N.V.R. in H.M.S. *Emperor of India* and later in H.M. rescue tugs. In the Second World War he served in the troopships *Reina del Pacifico* and *Orduna.*

Captain Lyall's connection with the Meteorological Office dates back to 1938, when serving in *Oropesa.* During this period, he has in 10 years sent us 15 logbooks, three of which have been classed Excellent. Captain Lyall received an Excellent Award in 1949, when in command of *Samanco.*

We wish him health and happiness in his retirement. J. R. R.

OBITUARY.—We regret to record the death of CAPTAIN F. W. MOULD, aged 53 years, which took place suddenly on board M.V. *Ajana* on 29th October, 1957, two days after leaving Port Said on the homeward passage. Our sincere sympathy at his untimely passing is extended to his family and his many friends.

Captain Mould commenced his career at sea in 1919 when he was apprenticed to the Albyn Line, Ltd. He completed his indentures and served as a Junior Officer in the same company. In 1928 he obtained his Master's certificate and in March 1929 entered the service of Messrs. Trinder, Anderson & Company, Limited as Second Officer. He was promoted to his first command, M.V. *Kaikoura,* in 1941 and saw service throughout the Second World War in this vessel in the North Atlantic and Mediterranean areas. He was appointed Master of the new *Ajana* in 1950 and remained in her until the date of his death.

Captain Mould's association with the Meteorological Office commenced in 1949 when he commanded M.V. *Ashburton.* Since that date 22 meteorological logbooks have been received from him, six of which have been classed as Excellent. He received an Excellent Award in 1953. F. G. C. J.

OBITUARY.—It is with deep regret that we record the death of CAPTAIN ARTHUR LLEWELYN WEBB, O.B.E., which took place on board the *New York City* at sea on 27th November, 1957.

Captain Webb was born on 30th November, 1896, and served his time in the Strath Steamship Company of Cardiff, commencing in 1914. After completing his apprenticeship he continued to serve in that company as Junior Officer and entered the service of the Bristol City Line as 3rd Officer in 1922. In June 1935 he was promoted to Chief Officer and in May 1936 took over his first command—a former *New York City*.

During the Second World War he served as Vice-Commodore of ocean convoys on many occasions and was torpedoed in the North Atlantic in January 1942. Towards the end of the war he took part in the military landings in the south of France and was awarded the O.B.E. in 1944 in recognition of services to his country.

He continued in command of ships of the Bristol City Line until the date of his death and, as Senior Master, he was appointed to command the new *New York City* in 1956.

Captain Webb's association with the Meteorological Office commenced in 1951 when he commanded the *Bristol City*. Since that date 12 meteorological logbooks have been received from ships under his command, seven of which have been classed as Excellent, his last logbook reaching an especially high standard.

Our sincere condolences are extended to his family and his many friends.

F. G. C. J.

Notices to Marine Observers

M.O.509, INTERNATIONAL METEOROLOGICAL CODE, DECODE FOR USE OF SHIPPING (4th EDITION)

Our voluntary observers will probably have received by now the new edition of this code book, and we hope that the slightly changed layout will be found to be an improvement. Previously, the explanation of the international analysis code, I.A.C. (Fleet), F.M. 46A, used in the Atlantic Weather Bulletin appeared in a different section of the book from the general explanation of the Atlantic Weather Bulletin, but it was pointed out to us that this was inconvenient from the mariner's point of view. We have accordingly placed these two sections together in the new edition. We are always glad to receive suggestions as to how we may improve our publications in details such as this.

The issue of an amendment list with this new edition is regretted.

REPRINT OF THE SELECTED SHIP'S METEOROLOGICAL LOGBOOK

Many selected ships will have recently received a new reprint of the meteorological logbook and will have noted that the column which for many years has called for entries regarding the present weather in Beaufort notation is now to be used for a simple running record of aurorae, instructions for which are given in the earlier pages.

On the ground of economy, however, we have felt it prudent to continue to issue copies of the older printing until supplies are exhausted, and some selected ships will not therefore receive the new printing for some time. These ships are now asked not to make any further entries of weather in Beaufort notation, because the climatological purposes for which these were required have now been fulfilled. Instead, they are asked to use that column for observations of aurorae in accordance with the following instructions which are given as they appear in the new logbook. The logbook for supplementary ships is also being reprinted, and the change from entries of Beaufort notation to those of aurorae is equally applicable to them. It will be appreciated that aurorae may be seen not only in the higher latitudes but occasionally in equatorial regions.

Entries in column 46* are especially required for continued investigation of aurora in all parts of the world. For this purpose it is as important to note the definite absence of aurora as it is to record its presence and it is requested that an entry be made in column 46* against each observation hour, whether in daylight hours or not. The entry should consist of one of the following four symbols, X, O, ? or L.

X means that daylight, twilight, bright moonlight, cloud, fog, or some other hindrance to observation, makes a decision about presence or absence of aurora impossible.

O means that the sky is sufficiently dark and clear to allow observation and that aurora is not present.

? means that aurora is suspected but observing conditions do not allow a firm decision to be made.

L means that auroral light is clearly present.

When an X or ? is reported, one or more of the following letters should also be given, in order to explain the observing conditions: D = daylight or bright twilight, M = bright moonlight, C = cloud and F = mist or fog. For a daylight observation hour, no entry other than XD is necessary. At night, the three-letter combinations XMC, XMF or XCF are sometimes appropriate.

Entries in column 46* are intended to indicate the presence or absence of aurora. If aurora is present, indicated by the entry of L in this column, it is desirable that the auroral forms observed should be noted, also the times of their occurrence or change and other details, as described in *The Marine Observer's Handbook*. These may be entered in the Remarks column if there is space to do so without omitting the other entries normally made in this column, but in general, especially if there is much interesting detail to record, the auroral description should be entered on the Additional Remarks pages. Sketches or photographs would be of value; the time to which they refer is an important detail.

B.B.C. GALE WARNINGS

As the result of a B.B.C. request, a new system of broadcasting gale warnings has been agreed. As from 1st March, 1958, gale warnings are broadcast on the Light Programme at the first programme juncture. If the first broadcast of any warning does not occur at half-past the hour, it will be broadcast again at the first programme juncture that does fall at half-past an hour. Where a news summary is scheduled at half-past the hour, the gale warning will be given immediately after it.

The announcement that we made in the last number of *The Marine Observer* concerning the broadcasting of gale warnings on the Home Service also, in the case when both services are broadcasting the same programme, still holds good.

RADAR PROPAGATION REPORTS

For some six years past the blank meteorological logbooks issued to observing ships have contained a form for recording radar propagation. These forms, when completed, were sent by us to the Naval Weather Service. The general purpose of the reports and the ultimate aim in collecting them was last outlined on pages 40 and 41 of *The Marine Observer* for January 1957.

The Director of the Naval Weather Service has recently informed us that he now has sufficient reports for his purpose and hopes shortly to start on their analysis. The use of the radar propagation report in meteorological logbooks should therefore now be discontinued and the forms will be omitted from future printings of the logbooks.

The Director of the Naval Weather Service has asked us to express his appreciation to the masters and officers of observing ships who compiled these reports, from which he has gained much interesting and useful information.

It is recognized that many, perhaps all, ships fitted with radar were already keeping radar logs in one form or another and will continue to do so. The fact

* Column 24 in the supplementary ships' meteorological logbook.

that so many ships kept this extra record for us and the Naval Weather Service is a measure of the regard which ships' officers have for scientific progress.

It is hoped that observing officers will continue to record narratives of interesting or unusual radar performances in the Additional Remarks pages of their meteorological logbooks, particularly when these are associated with abnormal meteorological conditions or the incidence of bio-luminescence. We shall continue to publish the more interesting of these observations in *The Marine Observer.*

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.

DRAWINGS BY MARINE OBSERVERS

In the meteorological logbooks which we receive there are many excellent diagrams and sketches, a number of which are published in *The Marine Observer* each quarter. Unfortunately, owing to the nature of the paper and ink used, these are not always suitable for publication and have to be redrawn, and however carefully this is done some of the individual character of the drawing is lost. It is suggested, therefore, that marine observers should draw their diagrams in Indian ink on plain white paper where possible and attach them to the Additional Remarks section of the logbooks. In this way we might be able to reproduce the sketches without alteration. Some pencil drawings can also be reproduced as they stand. Though, due to the prohibitive cost, we are not able to print in colour, we still hope to continue receiving the interesting coloured sketches that observing officers send us from time to time.

INSPECTION OF INSTRUMENTS

Principal observing officers are requested to see that when the ship arrives in a home port all Meteorological Office instruments, books, atlases, stationery, etc., are readily available for muster by a Port Meteorological Officer or Agent. If the observing officer himself is unlikely to be aboard or free to attend the muster it would greatly help if he would leave a note as to the whereabouts of the various items (including the spare thermometer and remains of any broken instruments).

ERRATUM

The Marine Observer, October 1957, page 206. Under SEA COLORATION, line 9: *For* 37·5°F. *read* 57·5°F.

Meteorological Office (Marine Division) Atlases

The following are published by the Marine Division of the Meteorological Office and may be purchased from the bookshops of Her Majesty's Stationery Office at any of the addresses on the title page. Copies are available for reference by shipmasters and shipowners in the offices of Port Meteorological Officers.

Meteorological Atlases

Monthly Meteorological Charts of the Atlantic Ocean. M.O.483, 1948. (60°S–70°N, 80°W–40°E) *Reprinting*

Monthly Meteorological Charts of the Western Pacific. M.O.484, 1956. (60°S–60°N, 100°E–155°W) (16¾″ × 23¾″) 105*s.* (post 2*s.* 9*d.*)

Monthly Meteorological Charts of the Eastern Pacific. M.O.518, 1956. (60°S–60°N, 160°W–60°W) (17½″ × 24½″) 147*s.* (post 3*s.* 3*d.*)

Monthly Meteorological Charts of the Indian Ocean. M.O.519, 1952. (50°S–30°N, 20°W–120°W) (16½″ × 22½″) *Reprinting*

The above four atlases contain monthly charts of wind, barometric pressure, air and sea temperature, and all meteorological elements including some typical tracks of tropical revolving storms.

Monthly Sea Surface Temperatures and Surface Current Circulation of the Japan Sea and Adjacent Waters. M.O.M.447, 1944. (20°N–47°N, 110°E–150°E) (20″ × 17″) 7*s.* 6*d.* (post 9*d.*)

Monthly Sea Surface Temperatures of Australian and New Zealand Waters. M.O. 516, 1949. (50°S–10°S, 100°E–180°) (19¾″ × 12¼″) 10*s.* (post 7*d.*)

Monthly Sea Surface Temperature of the North Atlantic. M.O.527, 1949. (30°N–68°N, 80°W–15°E) (19¾″ × 12¼″) 10*s.* (post 7*d.*)

Monthly Meteorological Charts and Sea Surface Current Chart of the Greenland and Barents Seas. M.O.575. (60°N–80°N, 30°W–120°E) *In the press*

This atlas contains a generalised surface current chart for the area and monthly charts of wind, barometric pressure, air and sea temperature, and all meteorological elements.

Current Atlases

Currents of the Indian Ocean. M.O.392, 1939. (50°S–30°N, 20°E–140°E) (30″ × 20″) 10*s.* (post 7*d.*)

South Pacific Ocean Currents. M.O. 435, 1938. (60°S–0°, 140°E–70°W) (22″ × 34″) 10*s.* (post 1*s* 1*d.*)

The above two atlases contain quarterly "current arrow" and "current rose" charts.

Quarterly Surface Current Charts of the Atlantic Ocean. M.O.466, 1957. (60°S–70°N, 80°W–20°E) (22½″ × 18″) 32*s.* 6*d.* (post 1*s.* 6*d.*)

Quarterly Surface Current Charts of the Western North Pacific Ocean with monthly chartlets of the China Seas. M.O.485, 1949. (0°–60°N, 98°E–160°W) (21″ × 16″) 25*s.* (post 11*d.*)

The above two atlases contain current rose charts, predominant current charts, and vector mean current charts.

Ice Atlases

Monthly Ice Charts of the Arctic Seas. M.O.M.390a, 1944. (60°N–80°N, 80°W–110°E) (12″ × 7″) 3*s.* 6*d.* (post 5*d.*)

Polar ice, mean limits of sea ice, extreme limits of sea ice, extreme limits of bergs.

Monthly Ice Charts of Western North Atlantic. M.O.478, 1944. (37°N–53°N, 72°W–35°W) (12″ × 7½″) 4*s.* (post 6*d.*)

Mean limits of pack, extreme limits of pack, mean limits of bergs, extreme limits of bergs.

Her Majesty's Stationery Office

Printed in Great Britain under the authority of Her Majesty's Stationery Office by The Campfield Press, St. Albans, Herts.

23190. Wt. 0002. K.14. 3/58. S.P. & S. G.9.8.8. S.O. Code No. 40-38-4-58