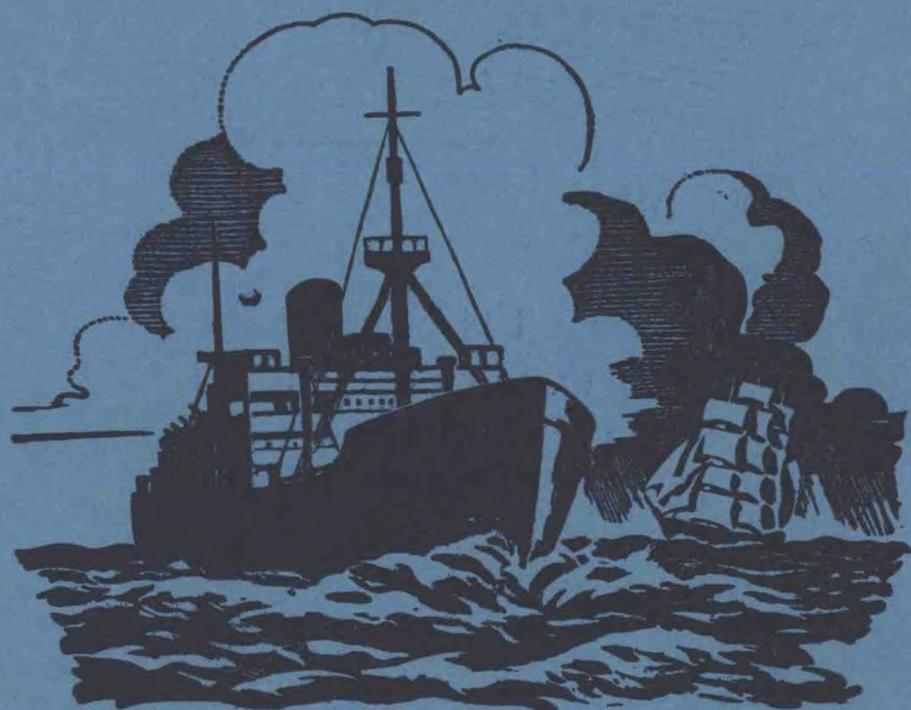


M.O. 589

# The Marine Observer

*A quarterly journal of Maritime  
Meteorology*



Volume XXV      No. 170

October, 1955

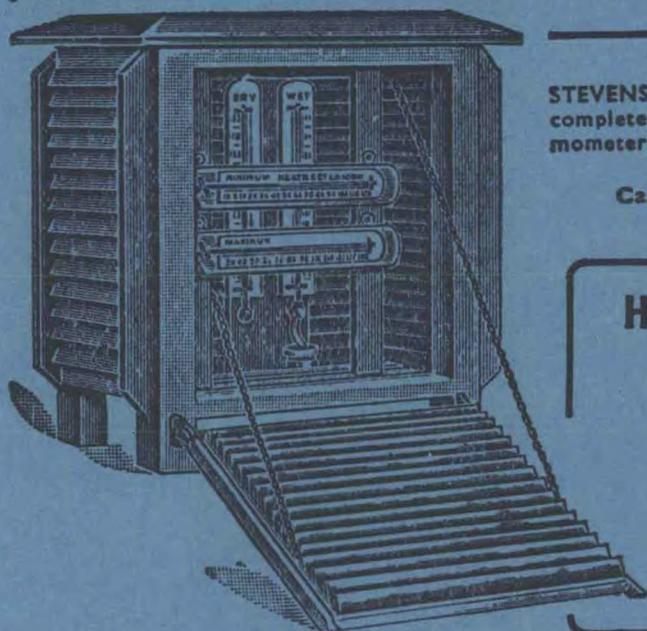
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A Quarterly Journal of Marine Meteorology  
prepared by the Marine Division of the  
Meteorological Office

Vol. XXV

1955

1855 · Meteorological Office Centenary · 1955



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*Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer,"  
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## Editorial

The history of the Meteorological Office is inevitably closely related to the history of international meteorology. After all it was the first International Meteorological Conference—held at Brussels in 1853—which encouraged the British Government to establish the Meteorological Office as a department of the Board of Trade in 1855. The Brussels Conference, although attended by all the maritime countries, was basically informal in nature; it owed its existence to the enthusiasm of one man, Maury—and it was entirely devoted to problems of maritime meteorology.

It is interesting to record that there were no professional meteorologists at that Conference—all those taking part, with the exception of M. Quetelet, the Director of the Royal Observatory at Brussels, were professional seamen or engineers. In fact there were practically no professional meteorologists in those days, although many men of science were studying the subject and making observations at universities and observatories.

The first “official” International Meteorological Conference was held at Leipzig in 1872. The invitation to this Conference said:

“If there be any branch of science in which work on a uniform system can be especially useful and advantageous, that branch is the inquiry into the laws of weather, which, from its very nature, can only be prosecuted with a hope of success by means of very extensive observations embracing large areas, in fact, we might almost say, extending over the whole surface of the globe. Owing to the enormous amount of material with which the meteorologist has to deal, the necessity for improved facilities for summarising facts is daily more and more felt, and these can only be afforded by increased uniformity in the methods of observation and publication. It may furthermore be safely assumed that a personal interchange of ideas among meteorologists will give an entirely fresh impulse to many branches of meteorology. It is only by means of an International Congress that speedy and certain methods of exchange of meteorological publications can be arranged—a step most urgently demanded, owing to the very nature of the science.”

Already official meteorological services had been established in several countries, and the Leipzig Conference, which was attended by a number of professional meteorologists in the persons of the directors of various Services, in effect saw the beginning of the International Meteorological Organisation, although it was officially not known by that name till 1878. But ever since 1872 there has been in existence a permanent International Meteorological Committee or similar body. By this time the realisation had become general that the organised study of meteorology was important not only for shipping but for various other human activities, while all concerned appreciated that it was impossible for meteorology as a science to make any progress without international co-operation. This is fairly obvious when one considers that the atmosphere envelops our whole globe, is common to ocean and land and takes no notice of frontiers.

The second conference on maritime meteorology was held at London in 1874, for the general purpose of reviewing the results of the 1853 Brussels Conference.

The International Meteorological Organisation held numerous conferences between 1872 and 1951, when it held its last conference in Paris and was superseded by the World Meteorological Organisation. The only difference between the two organisations is that the W.M.O. is a specialised agency of the United Nations and thus has full governmental status, whereas the I.M.O. was operated semi-officially by the directors of the various meteorological services themselves with the assistance of a permanent Secretariat, with governmental support. The Secretariat was first located at de Bilt (Holland); it moved to Lausanne in 1938 and to its present headquarters at Geneva in 1951.

It is pleasing to record that under the new Organisation, the control of policy continues to be in the hands of the directors of the meteorological services of

member countries, assisted, as necessary, by their various technicians and legal and political advisers when necessary.

The World Meteorological Organisation held its first Congress in Paris immediately after the dissolution of the International Meteorological Organisation in 1951. Appropriately enough it held its second Congress in 1955, the centenary year of the British Meteorological Office and 102 years after the first International Conference at Brussels. This second Congress opened at the Palais de Nations in Geneva in April, 1955, under the Presidency of Dr. Reichelderfer, Chief of the United States Weather Bureau. It was attended by 170 delegates, nearly all of whom were meteorologists, representing 83 States. (At the International Conference in Leipzig in 1872, 52 persons were present and only six of these were styled as meteorologists.) The Conference lasted from 14th April till 13th May and during that time Geneva enjoyed continuous fine weather, Mont Blanc, about 45 miles away, being visible nearly every day, which is certainly unusual: one hesitates to suggest that the presence of so many meteorologists at the same time in the same town had anything to do with it!

The task of the Conference was to review the activities of the Organisation during the first four years of its life and to plan for the next four years. The Presidents of the various Technical Commissions reported personally to Congress about the activities of their Commissions. Thus the President of the Commission for Maritime Meteorology, in making his report, stressed that the number of voluntary observing ships in the world totalled 2,400, which was nearly the same as it had been in 1952. He pointed out that certain countries continued to play a very active part in the selected ship scheme, but he appealed to each of the maritime countries to take a share in this work. He said that the future activities of his Commission would be primarily devoted to such questions as the improvement of the ocean network of voluntary observing ships and the development of a comprehensive scheme to encourage all maritime countries to play their part in the selected ship organisation; the encouragement of voluntary observers at sea and improving the accuracy of observations aboard ship; ways and means of making the best use of available maritime climatological information; the general application of meteorology to the safety of life at sea and to the efficient carriage of goods aboard ship. The President of the Climatological Commission urged the preparation of a world climatological atlas, and stressed the very important part that the Organisation could play in providing climatological information for the benefit of the Food and Agriculture Organisation.

An important task carried out at the Conference was the final preparation and adoption of detailed Technical Regulations for the Organisation, for which the bulk of the work involved had been done by the Technical Commissions. These include considerable detail for the guidance of maritime countries concerning the operation of the selected ship scheme and place upon those countries the responsibility of planning their recruitment programme of selected ships in such a way as to provide a reasonable and rational network of observations in all oceans.

One of the most interesting subjects which the Conference discussed was the meteorological work of the International Geophysical Year which is due to take place in 1957-58. Broadly, the intention is that in order to "increase our knowledge of the phenomena which can be observed in low latitudes and in the upper layers of all latitudes", a concerted international effort will be made to "investigate the large-scale physical dynamic and thermodynamic processes of the general circulation of the atmosphere on a world-wide basis". As certain observations at sea will form an important part of these investigations, a special article on the Geophysical Year will appear in a later number of *The Marine Observer*.

The Conference also passed various resolutions designed to provide meteorological advice and information for the general benefit of mankind, in co-operation with other specialised agencies of the United Nations.

Among the subjects discussed at the Leipzig Conference in 1873 was "the

possible use of the metric system internationally for meteorological purposes". It is pertinent to record that this same controversial question is still unsolved and was again discussed at the W.M.O. Conference at Geneva in 1955.

In discussing the future activities of Technical Commissions the Conference decided that, although an overlap in their various functions was inevitable, it was undesirable to make any drastic changes in their composition for the present. Thus the meteorology of the oceans and the meteorological interests of shipping will continue to be dealt with on an international level by the Commission for Maritime Meteorology, many of whose members are themselves seamen. It seems right and proper that this should be so in view of the important part that the oceans and the ships that sail upon them play in the realm of international meteorology; its whole history is connected with the sea.

The atmosphere of this Conference was extremely cordial. Meteorology is so international in its general outlook that most of the prominent meteorologists of the various countries know each other personally and intimately. Those attending this Conference thus felt that they were among friends, although very strong differences of opinion naturally came out in debate.

At the conclusion of the Conference M. A. Viaut, Director of the French Meteorological Service, was elected President of the Organisation in succession to Dr. Reichelderfer. Mr. D. A. Davies, hitherto Director of the East African Meteorological Service, was appointed Secretary-General in succession to Dr. Swoboda who is retiring after 17 years' service in the cause of international meteorology.

This second Congress of the W.M.O. not only accomplished a lot of practical good in paving the way to useful co-operative work being done in the future, but it provides a lesson to the world as to how international fellowship can be achieved and maintained. As the President said at the opening meeting: "The World Meteorological Organisation is doing whatever is possible to advance the application of the science for the benefit of mankind—in agriculture, on which the world depends for food—in transportation by land, sea and air which facilitates world commerce . . . and in many other fields—medical, social, scientific, economic and labour—all essential in modern life and all more or less directly influenced by weather and climate."

MARINE SUPERINTENDENT.

### SPECIAL LONG-SERVICE AWARDS

Every year since 1948 the Director of the Meteorological Office has made an award to the four voluntary marine observers whose long and meritorious work at sea on behalf of the Meteorological Office is considered as deserving special recognition. The basic qualification for this award is a minimum of 15 years as a voluntary marine observer, i.e. 15 years in which meteorological records have been received from the observer. Considerable care is taken to check an officer's record both as regards actual years of observing and the quality of his individual logbooks, to ensure that the award is made fairly, and a mathematical formula which gives credit for number of years observing and number of records classed excellent, very good or good in relation to the number of records received, effectually places the officers in an "order of merit".

This year the Director is pleased to make the special awards to the following shipmasters:

CAPTAIN A. B. FASTING, R.D., Capt. R.N.R. (retired), of the Cunard Line, whose first meteorological log was received here in 1924 when he was in the Booth Line. In 17 years he has sent us 102 records of which 40 have been classed excellent.

CAPTAIN H. D. HORWOOD, R.D., Cmdr. R.N.R. (retired), of the New Zealand Shipping Co. A voluntary observer since 1923. In 15 years he has sent in 29 returns, 19 of which have been classed excellent.

CAPTAIN S. W. KEAY, O.B.E., of the Canadian Pacific Steamship Co. Since his first logbook was received in 1923 he has been a voluntary observer for 16 years and has sent in 72 returns, 28 of which have been classed excellent.

CAPTAIN J. TRAYNER, of the Union Castle Mail Steamship Co. A voluntary observer since 1921; during 15 years work he has sent us 31 returns, 15 of which have been classed excellent.

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

## Old Time Marine Observers' Log

Among the old logbooks still preserved in the Marine Division of the Meteorological Office is one from the wooden full-rigged ship *Lightning*, 1,468 tons, Captain James Clarke, on a voyage from Liverpool to Melbourne in 1859. (The *Lightning* was one of the famous clippers of the Black Ball Line.) Throughout the passage barometer and thermometer readings were recorded every two hours. Clouds, wind direction and force and weather were also entered at frequent intervals as well as the usual notes of sea and swell, "shooting stars", fishes and birds. The ship made fairly good time down to the South Atlantic but then had light variable winds until she reached the Roaring Forties. The first albatross was sighted in latitude 33°S. The longitude of the Cape of Good Hope was passed on 1st December in latitude 45° 20'S when 55 days out.

The *Lightning* ran her Easting down in about latitude 45°-48°S. On 6th December, 1859, when in 54°S, 47°E, an entry in the log read "Iceberg in sight at 2 a.m. bearing south distant about 6 miles", and a small watercolour drawing of a bird was done in the remarks column. Later on there is another watercolour sketch of the Aurora Australis. The Crozet Islands were sighted on 7th December and the ship arrived off Cape Otway on 24th December, 1859, having made the passage from Liverpool in 79 days; not an exceptionally fast passage but quite good (60 days was the record). The meteorological logbook had been well kept with very full observation entries neatly written but containing few remarks.

Another old logbook in the Division is one that was written up some years before the Meteorological Office was founded. This is the log of H.M.S. *Erebus*, Captain James Clarke Ross, who, in company with H.M.S. *Terror*, Captain Crozier, commanded the expedition via New Zealand to the Antarctic in 1841-42. Part of this logbook covered their second penetration of the Ross Sea. (In the previous season the Ross Sea and the Great Ice Barrier had been discovered.)

The two ships sailed from the River Derwent, Van Diemens Land (now Tasmania) on 7th July, 1841. The log entry for that day was:

5.20. Shortened in cable. Pilot came on board. 6.40. Weighed and made sail under topsails.

7.0. Hove-to. His Excellency Sir John Franklin came on board. Filled, running out of the River Derwent.

8.0. *Terror* in company. 9.40. Set to Topg't sails. H.E. Sir John Franklin left the ship. Saluted him with cheers. Discharged the pilot. 10.15. Bore up. Set staysails and larboard studsails. Noon. *Terror* WNW 1 $\frac{3}{4}$  miles.

(Sir John Franklin was at that time Lieutenant-Governor of Van Diemens Land; a few years later he and Captain Crozier, with the entire ship's company of these same ships *Erebus* and *Terror* were lost at the other end of the world in attempting the North-West Passage.)

The ships proceeded to New Zealand and sailed from there on 23rd November, 1841, bound for the Antarctic. Typical log entries were:

Saturday, 18th December, 1841. Latitude 62° 50'S, longitude 147° 25'W. 4.15 a.m.

Entered the loose pack. Sailing through loose ice. Dense fog. Temperature  $34^{\circ}$ . Sunday, 19th December. 11.30 a.m. Shortened sail and hove-to. Captain went on a piece of ice to make observations. 2.30 p.m. Captain returned.

Monday, 20th December. 1.30 p.m. Captain Crozier (of H.M.S. *Terror*) came on board. 7.30 p.m. Down cutter. Hove-to. Captain Crozier left the ship. Sailing through openings in the ice. Wind E's, force 1.

Friday, 24th December. 6.30 p.m. Employed in warping and boring through the ice. Down cutter and sent her ahead to tow. 7.45. Up cutter.

Saturday, 25th December. Latitude  $66^{\circ}$ s, longitude  $156^{\circ} 14'$ w.

Entries continue to show much the same conditions working through the pack. 30th December, ice close in all directions, but on 1st January, 1842, in latitude  $66^{\circ} 36'$ s, longitude  $156^{\circ} 31'$ w, after the ships had been about two weeks in pack-ice, the following entry was made:

10.30. Issued warm clothing gratis to ship's company consisting of:

1 Box-cloth Jacket and Trousers, 1 Red Shirt, 2 Comforters, 1 pair of Boot Hose, and 1 Welsh Wig\* per man.

Thursday, 20th January. Wind NNW, force 10. Heavy swell from WNW. (The ships were still in close pack and the *Erebus* received severe damage to her rudder. They had been driven to the N'ward and had made practically no progress since 1st January.)

Wednesday, 27th January. Still in pack ice. Latitude  $67^{\circ} 28'$ s, longitude  $156^{\circ} 28'$ w. (Further south than Cook in this longitude.)

Wednesday, 2nd February. Cleared the ice and gained open water. 2 p.m. Latitude  $67^{\circ} 57'$ s, longitude  $160^{\circ} 03'$ w.

Wednesday, 23rd February. Farthest s on this voyage.  $78^{\circ} 10'$ s in longitude  $161^{\circ} 27'$ w. (Eastern end of the Great Ross Ice Barrier.)

The ships then withdrew to the N'ward and proceeded to the Falkland Islands, arriving on 6th April, 1842.

# THE MARINE OBSERVERS' LOG



## October, November, December

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

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

Responsibility for each observation rests with the contributor.

### LOCUSTS

#### North Atlantic Ocean

A number of ships have reported observations of locusts on the shipping tracks off the west coast of Africa and farther northward, between a position 30 miles s of Dakar and about lat.  $38^{\circ}$ N, on dates between 15th and 26th October, 1954,

\* A Welsh wig was the name given to a furry cap mainly worn by sailors in the seventeenth and eighteenth centuries.

and 3rd and 11th November, 1954. The ships are S.S. *Arundel Castle* (Captain D. D. Mackenzie), S.S. *City of Paris* (Captain T. H. Speakman), S.S. *Garvelpark* (Captain A. McF. Allan), M.V. *Gloucester* (Captain J. E. Bury), M.V. *Hartington* (Captain J. F. Champion), M.V. *Paraguay* (Captain W. S. Thomas), S.S. *Rembrandt* (Captain W. E. Kyne), M.V. *Roxburgh Castle* (Captain W. C. J. Swift), S.S. *Thaumastus* (Captain F. W. Barnes) and S.S. *Umtata* (Captain G. S. Wood).

*Note.* These observations were sent in full to the Anti-Locust Research Centre and the Director, Dr. Uvarov, after expressing his thanks, stated in his reply: "These data are most valuable, as they help in our analysis of the synoptic conditions which brought a few locusts during mid-October to the Scilly Islands and Southern Ireland."

## LEPIDOPTERA

### South Atlantic Ocean

S.S. *Malmesbury*. Captain S. W. Howell. Newport (Mon.) to Buenos Aires. Observer, Mr. K. Walker, 2nd Officer.

12th December, 1954, 0830 G.M.T. Butterflies were observed being blown along the vessel's track ( $207^{\circ}\text{T}$ ). The vessel was 33 miles from the nearest land which was abeam, and 155 miles from the nearest land (Abrolhos, Brazil) in the track of the wind. The butterflies were few and very scattered, but one was caught and slightly damaged. The specimen is enclosed. Wind N, force 5-6.

Position of ship:  $19^{\circ} 44'\text{S}$ ,  $39^{\circ} 10'\text{W}$ .

*Note.* Dr. C. B. Williams of the Department of Entomology at the Rothamsted Experimental Station has identified this as a moth and writes:

"The specimen that you have sent is scientifically known as *Otosema odorata*, and is a well-known wanderer, both at sea and from the South American coast and northwards across the Caribbean Sea into North America, where it attracts attention by its large size.

"It has on occasions even reached as far north as Canada. Another example is the capture of one in the Atlantic Ocean on the 13th December, 1938, by S.S. *Alcantara* in latitude  $21^{\circ} 26'\text{N}$ , longitude  $23^{\circ} 21'\text{W}$ , which is 200 miles N of Cape Verde and 2,000 miles from South America which is its home. A still earlier capture was some time previous to 1893, when one was caught on a steamer 800 miles ESE from Rio de Janeiro.

"These captures are all of great interest to us, and before the war we circularised most of the ships on the British Register and were getting in most valuable information; we have not succeeded in getting our organisation going again since the war, but we greatly value records of this type, particularly when specimens are included."

## STEAM FROM THE SEA

### New Zealand waters

M.V. *Hertford*. Captain E. A. Burton. Auckland to Wellington (coasting). Observer, Mr. C. M. Hill, 3rd Officer.

27th October, 1954, 0850 N.Z.S.T. While passing White Island at distance 29 miles and bearing  $320^{\circ}\text{T}$ , steam or what appeared to be steam was seen issuing from the sea. The vessel passed about  $\frac{1}{4}$  mile away from the point and unfortunately it was not seen until it was just abaft the starboard beam. It was first observed through binoculars and thought to be whales blowing, but it was soon realised that it was continuous and too vapour-like to be whales. It was also noticed at this time that there was a line of demarcation in a NE-SW direction which passed through the point from which the steam was being emitted. The sea on the N side of the line was noticeably more choppy than that to the S of it, which was almost flat calm. Sounding gave no bottom at 600 fathoms (using Marconi "seagraph").

Position of ship:  $37^{\circ} 12\frac{1}{2}'\text{S}$ ,  $177^{\circ} 39\frac{1}{4}'\text{E}$ .

*Note.* This observation has been forwarded to the Hydrographer of the Navy. White Island is a volcano which during its frequent periods of activity emits large volumes of steam and vapour, as stated in the New Zealand Pilot. There is nothing, however, in the Pilot to say that steam has previously been observed rising from the sea in the vicinity.

## PHOSPHORESCENCE

### North Atlantic Ocean

M.V. *Port Lincoln*. Captain E. W. Dingle, M.B.E. Liverpool to Curaçao. Observers, Mr. P. Richards-Jones, 3rd Officer, and Mr. P. R. Ardley, 4th Officer.

2nd October, 1954, 0200 G.M.T. The vessel passed through an area of phosphorescence stretching from horizon to horizon and estimated to be about 30 miles across. The bow-wave showed a vivid light blue. The sky was overcast and there was no moon; the sea was slight, each ripple broke and looked not unlike "white horses" with a much stronger wind force. There was a strong white glow over the entire surface of the sea, which made the wind force difficult to judge. Thunderstorms were apparent in the vicinity, with frequent and vivid lightning and heavy rain at times. Wind SE'ly, force 5-6, gusting to 7.

Position of ship:  $27^{\circ} 27'N$ ,  $46^{\circ} 53'W$ .

M.V. *Hudson Deep*. Captain F. Platt. Swansea to Santo Domingo. Observer, Mr. R. Barron, 3rd Officer.

25th October, 1954, from sunset throughout the night, unusually brilliant phosphorescence was observed. A ship's masthead light was only detectable at midnight (ship's time) by its persistently steady light. At 2320 the entire surface of the sea was aglow with a milky-green appearance, exceptionally bright along the tops of the swell; the ship's side was illuminated by it and had a dazzling effect on the eyes. This lasted until 2326, when it slowly faded until the bow wave and wave crests were phosphorescent as before. The night was otherwise very dark and clear.

Position of ship:  $28^{\circ} 12'N$ ,  $49^{\circ} 06'W$ .

*Note by Captain.* The foregoing report is under-emphasised if anything. The luminosity was remarkable in 32 years at sea. A large majority of the ship's company gazed at frequent intervals alternately at the unusual phenomenon and at the bridge.

### Gulf of Guinea

M.V. *Dominion Monarch*. Captain B. Forbes Moffatt. Cape Town to Las Palmas. Observer, Mr. G. H. Perry, 3rd Officer.

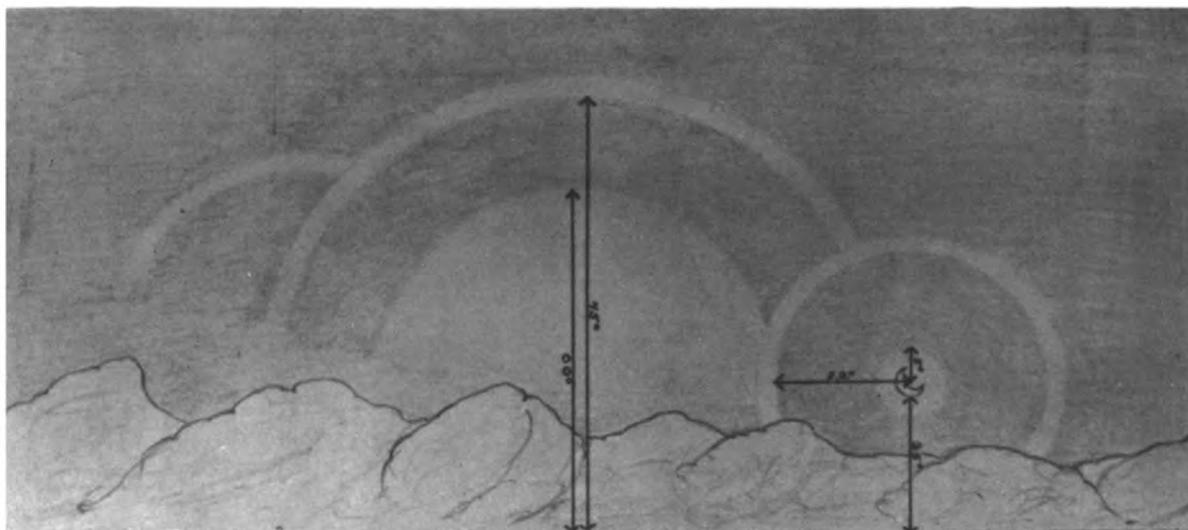
6th October, 1954, 0000 G.M.T. Many shining balls of phosphorescence, of various sizes, were observed to pass down on either side of the vessel, and at one time the sea was a mass of bright specks. It is difficult to state the sizes of the balls, but about  $1\frac{1}{2}$  ft diameter is a fair estimate, and within the larger balls the phosphorescence appeared to be continually on the move.

Position of ship:  $3^{\circ} 48'S$ ,  $6^{\circ} 30'W$ .

M.V. *Richmond Castle*. Captain J. D. B. Fisher. Southampton to Cape Town. Observers, Mr. C. E. Bragg, 2nd Officer, and Mr. C. D. Rea, 3rd Officer.

3rd December, 1954, 0120 G.M.T. The vessel ran through two wide bands of phosphorescence extending from horizon to horizon in a direction  $150^{\circ}$ - $330^{\circ}$ . The bands, about 60 ft wide and about 300 ft apart, were made up of large circular patches of phosphorescent matter, some as much as 18 in. in diameter; those on or near the surface gave off a vivid green light. The wind direction was  $150^{\circ}$ , force 3, so that the bands were lying to the wind, although their position was in a usually strong part of the South Equatorial Current, setting W. Having run through these banks the vessel returned to clear water having no trace of phosphorescence whatsoever. The bands were in sight for approximately 30 min, and were thus a minimum length of 9 miles. Temperatures: air  $76^{\circ}F$ , sea  $77^{\circ}$ , wet  $72^{\circ}$ .

Position of ship:  $4^{\circ} 20'S$ ,  $5^{\circ} 25'W$ .



Lunar halo phenomenon sketched by Mr. R. M. Henshaw aboard M.V. *Port Hobart*, 30th December, 1954 (see page 215).

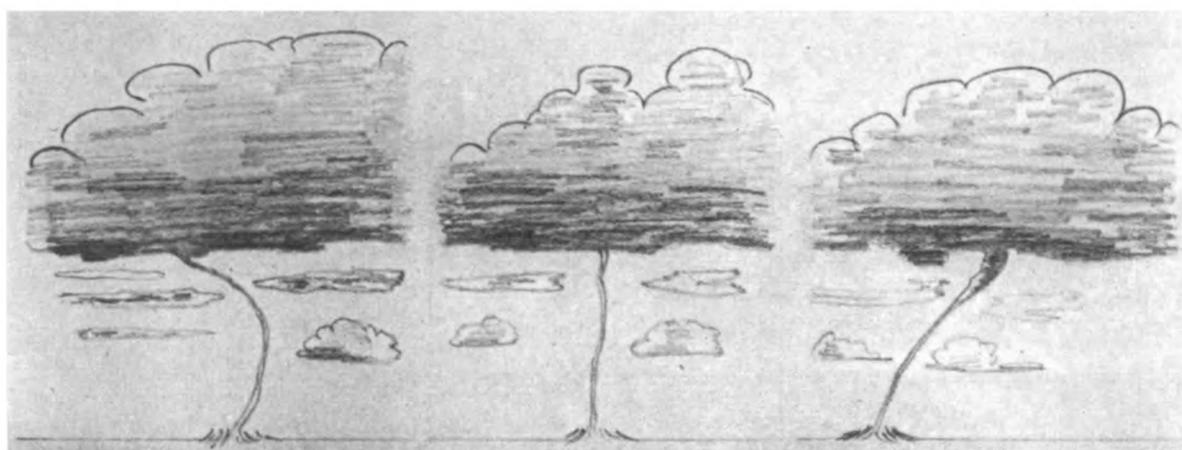


Fig. 1

Fig. 2

Fig. 3

Successive stages of a waterspout observed from S.S. *Trochiscus* on 20th November, 1954 (see page 211).

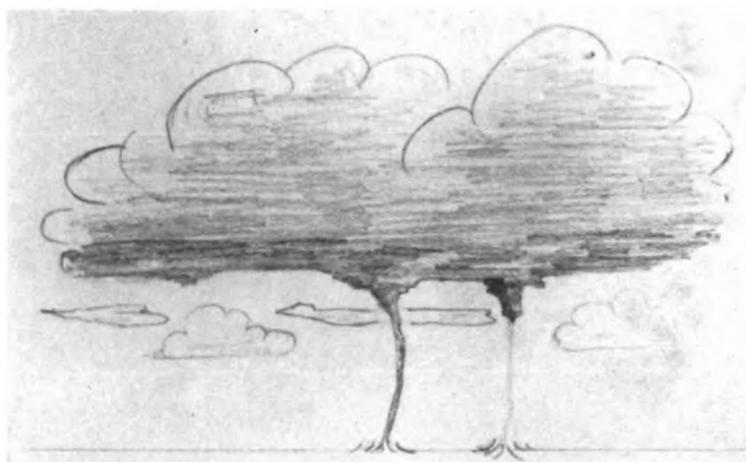


Fig. 4

Two more waterspouts observed from S.S. *Trochiscus*.



Crepuscular rays observed from M.V. *Enton* on 4th November, 1954, at 11°N, 76°W (see page 215)



Releasing a pilot balloon from *Hin Sang* (see page 235)

### Arabian Sea

S.S. *Trochiscus*. Captain C. McK. Young. Aden to Mena-al-Ahmadi. Observers, Mr. F. H. Walton, Chief Officer, Mr. W. E. Reed, 3rd Officer.

15th December, 1954, 1600 G.M.T. Whilst taking the sea temperature by the canvas bucket considerable phosphorescence was observed when drawing water from overboard, also when immersing the thermometer. On emptying the bucket small granular particles were found, varying in size but averaging the size of a pin-head. The particles were found to have a blue-black core with a transparent film surrounding it, and to be quite solid. They emitted a bluish-white light which lasted for about 35 min after the bucket was emptied on to the deck. At the time of observation the sea did not appear phosphorescent except when disturbed. Air temp.  $76^{\circ}\text{F}$ , sea temp.  $77.2^{\circ}$ .

Position of ship:  $19^{\circ} 34' \text{N}$ ,  $58^{\circ} 31' \text{E}$ .

### Indian Ocean

S.S. *Empire Trooper*. Captain R. H. A. Bond, O.B.E. Beira to Colombo. Observers, Mr. W. K. Fullagar, 2nd Officer, Mr. C. S. Robinson, 3rd Officer.

21st October, 1954, 1745 G.M.T. Following a heavy rain squall, numerous patches of greenish-white phosphorescence were observed all over the visible sea surface. The patches gave the impression of rising from the depths and "blossoming" when they reached the surface, after which they faded rapidly. This phenomenon continued ever less frequently until 1910 when another prolonged heavy rain squall struck the ship. Within a few minutes the patches were occurring as frequently as ever, only to become less frequent again when the rain had ceased. The phenomenon ceased altogether by 2130 and no further rain squalls occurred that night. Wind w, force 6 (7 in squalls). Rough sea.

Position of ship:  $5^{\circ} 30' \text{N}$ ,  $78^{\circ} 20' \text{E}$ .

S.S. *Empire Halladale*. Captain Roland Blake. Rodriguez to Singapore. Observer, Mr. M. J. K. B. Mactavish, 3rd Officer.

23rd December, 1954, 1830–1900 G.M.T. The vessel passed through a large area of phosphorescence which stretched as far as eye could see. The patches varied in size about 1 to 2 square feet, and were continually changing position, giving the effect of an area of working lights. The night was cloudy and dark, wind indeterminate and sea calm.

Position of ship:  $04^{\circ} 40' \text{N}$ ,  $98^{\circ} 28' \text{E}$ .

### South Pacific Ocean

S.S. *Devon*. Captain R. G. Hollingdale. Lyttleton to Buenos Aires. Observers, the Master and Mr. T. E. Partridge, 3rd Officer.

25th November, 1954. Throughout the ensuing night the glow of phosphorescence was clearly distinguishable at the breaking of wave crests at the bow wave and wake. Quite apart from this small patches of very intense luminosity were also frequently observed. Closer examination with binoculars revealed that all the patches were uniformly oblong in shape, about 12 to 18 in. long and 2 to 4 in. wide, and the outline hard and distinct. Each patch appeared to move independently of the motion of the wave crests. The patches occurred roughly in groups of three to six at varying intervals of time. Unlike the glow left by the breaking of a crest they did not fade and disappear but were clearly visible from approximately 300 yd ahead to the same distance astern.

Further examination on the following night, using a powerful searchlight, revealed that this phosphorescence surrounded white objects of the above dimensions that gave the impression of being substantially alive. Rough sea and moderate NW'ly swell.

Position of ship:  $46^{\circ} 30' \text{S}$ ,  $169^{\circ} 30' \text{W}$ .

M.V. *Enton*. Captain R. F. Hellings. Panama to Nouméa. Observer, Mr. P. M. Johnson, 2nd Officer.

30th December, 1954, 1000 G.M.T. Flashes of phosphorescence, apparently 3 to 4 ft under water and lasting about  $\frac{1}{2}$  sec, were observed in patches about 40 ft from the ship's side and abeam of the vessel's half-length. They were not very brilliant and could only be seen in the undisturbed water around the bow wave. The patches were roughly oval in shape, about 5 ft across, and all appeared at about the same distance from the ship. Sky overcast. Air temp.  $77^{\circ}\text{F}$ , sea  $78^{\circ}$ . Sea slight.

Position of ship:  $17^{\circ} 2'S$ ,  $132^{\circ} 25'W$ .

### Java Sea

S.S. *Fengning*. Captain J. W. Evans. Semarang to Macassar. Observer, Mr. H. Nightingale, 2nd Officer.

23rd October, 1954, 1700 G.M.T. Numerous closely-spaced patches of phosphorescence, about 3 ft in diameter, were observed extending all round the ship to a distance of at least  $\frac{1}{4}$  mile. Each patch appeared to flash regularly at  $\frac{1}{2}$ -sec intervals.

After 30 min the patches slowly increased in brilliance and bands of light were seen continuously during the subsequent 15 min, appearing as straight lines except for one short period when they seemed to radiate from a position approximately two points abaft the port beam, although no definite centre could be seen. For most of the time the bands appeared to come from no definite direction, but were continually changing, staying in one direction for only short periods, and never coming from more than one point at a time. In the observer's opinion the bands consisted of closely packed illuminated areas; they had the same frequency as the flashing of the separate patches, which remained visible throughout. The observer considers that the apparent motion was caused by the illumination of alternate bands. The bands ceased at 1745 and the patches slowly grew less bright and numerous until at 1800 only an occasional dim flash was seen close to the ship.

During the period of the observation the ship passed through numerous streaks of spawn, which were densest at the time of greatest brilliance of the patches and the appearance of the bands. No phosphorescence was seen in the bow wave apart from an occasional "spark". Further streaks of spawn were seen later, after phosphorescence had ended. Air temp.  $81^{\circ}\text{F}$ , sea temp.  $83\frac{1}{2}^{\circ}$ . Wind s, force 2. Sea slight, swell nil.

Position of ship at 1700:  $06^{\circ} 11'S$ ,  $111^{\circ} 54'E$ .

*Note.* The above observation was forwarded to us by the Director, Royal Observatory, Hong Kong. As he points out, the observation is of interest because it coincides, as regards the impression that alternate bands were lighting up, with the observation of S.S. *Canton* in the October, 1954, number of this journal, page 206.

## WATERSPOUT

### Mediterranean Sea

S.S. *Empire Fowey*. Captain W. T. C. Lethbridge. Port Said to Southampton. Observer, Mr. P. J. Clarke, 3rd Officer.

13th October, 1954, 1040 G.M.T. Two waterspouts commenced to form from a Cb cloud bearing  $230^{\circ}\text{T}$ , about 7 miles distant. The smaller failed to form completely and quickly disappeared. The larger appeared to form slowly and descended from the cloud (base approximately 1,000 ft) at an angle of  $45^{\circ}$  for about half its length before descending vertically. The funnel on nearing the sea caused it to become considerably agitated, although spray did not rise above 40 ft at any time.

The waterspout passed  $\frac{1}{2}$  mile to the southward, when the water descending in the funnel and rising in the core (which was very well defined) could be clearly

seen. The spout lasted for 20 min before cantering over at an angle of more than  $60^\circ$ , when it broke and quickly disappeared. Cloud  $5/8$  Cb with Fs, Ac and Sc. Weather, frequent rain showers.

Position of ship:  $37^\circ 00'N, 04^\circ 30'E$ .

S.S. *Trochiscus*. Captain C. McK. Young. Port Said to Rotterdam. Observers, Mr. J. Mayo, 2nd Officer, and Mr. W. E. Reed, 3rd Officer.

20th November, 1954, 1058 to 1108 G.M.T. A single waterspout was observed bearing NNE. It was clear and well defined, extending from a heavy black Cb with base 1,700 ft. Where it touched the surface the sea was extremely agitated. The spout appeared to move from an inclined position (Fig. 1, opposite page 208) to the upright (Fig. 2), and before disappearing was inclined in the opposite direction (Fig. 3). At 1130 two waterspouts were observed extending from the same large Cb to NNE. The spout to the westward was clear and well defined and caused considerable agitation of the water at point of contact with the sea (Fig. 4). The second, although thicker at the top, was less well defined and caused less agitation at the sea surface. It was only visible with the aid of binoculars, distance about 10 miles.

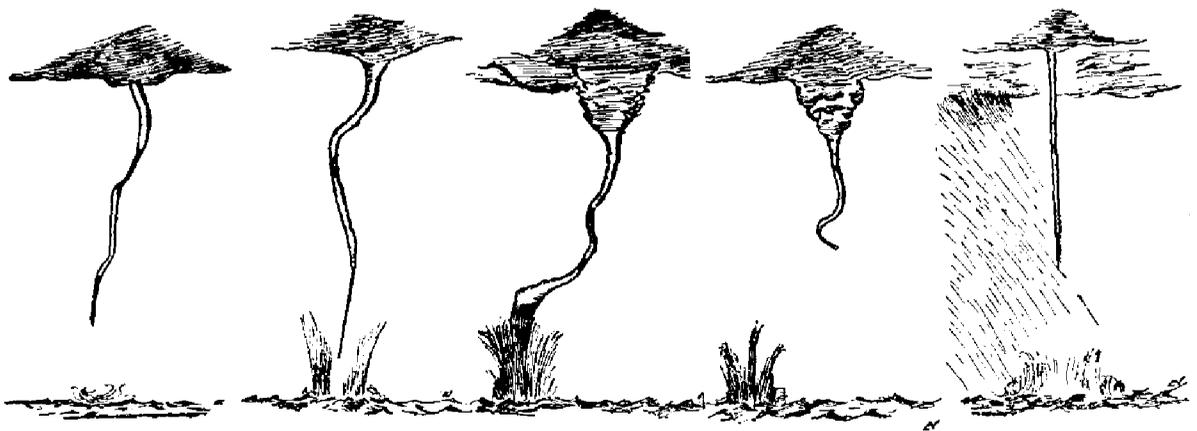
It was generally agreed by the observers on board that these waterspouts were much longer and smaller in diameter, and came from clouds having greater altitude than any previously seen.

Position of ship at 1100:  $37^\circ 18'N, 07^\circ 35'E$ .

#### North Atlantic Ocean

M.V. *English Star*. Captain L. Vernon, M.B.E. Curaçao to London. Observers, the Master, Mr. E. Neave, 2nd Officer, and Mr. D. Newlin, 3rd Officer.

17th October, 1954. At about 1910 G.M.T. a violent thunderstorm began, the accompanying wind caused a certain amount of spindrift, three patches of which began a rapid anti-clockwise spiral movement and advanced in an ENE direction at between 20 and 25 kt. One of these was observed to grow in momentum and be joined by a thin sleeve-like strip of cloud from the base of a passing Ns at an estimated height of 500 ft. After formation the waterspout appeared to curve towards the E, maintaining a rapid forward motion. At 1920 it broke at the base and the sleeve-like strip withdrew upwards, whilst the water at the bottom con-



tinued to spin for a few moments before the whole effect was lost in rain. The approximate angle of elevation of the top of the spout was  $25^\circ$ .

Wind wsw, force 5, increasing to 6-7 in the squall. Air temp.  $66^\circ F$ , sea temp.  $75^\circ$ . A very close view of the commencement of the spout was had when it was within 200 yards of the port side of the vessel and crossed the bow.

Position of ship:  $33^\circ 25'N, 39^\circ 22'W$ .

## HURRICANE North Atlantic Ocean

M.V. *Delphic*. Captain C. L. Carroll, D.S.C. Curaçao to Hamburg. Observer, Mr. D. A. Rogers, 3rd Officer.

2nd October, 1954. The first notification of a tropical storm was received at 1400 G.M.T. It was then estimated to be 200 miles WNW from the ship, where wind was w's, force 3, 2/8 towering Cu and wisps of Ci. Reports during the next 24 hours indicated that the storm was moving NW at 15 kt. By 1400 on 3rd wind was SSE, force 6, and the sea more confused with a moderate swell from NW: 7/8 towering Cu and some Cs. During the following 48 hours the storm recurved to NE and accelerated. At 1400 on 5th wind was SSE, force 5, barometer steady after falling for the previous six hours. Cloud 7/8 Cu and Ac, the sky showing chaotic cloud masses with showers of short duration. The centre of the storm was now estimated to be 230 miles SW of the ship, i.e. almost astern, and moving to NE at 20 kt.

During the night the barometer began to fall fairly rapidly. At 0600 on 6th wind was steady SSE, force 8, 9 in gusts, with a heavy sea and increasing swell; 8/8 low Fs. During the next three hours the barometer continued to fall and by 0900 conditions were very bad. Wind s'e, force 11, 12 in gusts, and sea very high, crests continually breaking and large masses of foam were blown along the surface. Visibility was very poor indeed with rain and spray continually across the ship which was now rolling heavily. The centre of the storm was now believed to be about 60 miles to NW. At 1000 what appeared to be a trough passed over the ship; it had a rapidly varying wind direction and there was an increase in the now general confusion of the sea, which was covered with spray and presented a milky appearance. After this trough passed the barometer began to rise and conditions to improve quickly. During the storm the ship maintained course and speed and no attempt was made to heave-to. By 1200 on 7th wind was S, force 2, 4/8 Sc and a heavy swell from NW.

During the storm it was observed at times that a wave of considerable size equivalent to that produced in a force 5 wind in normal conditions, travelled between the crests of the swells along the line of the troughs, at right angles to the wind. This was assumed to be "valley effect" between the crests. A small patch of blue sky was seen at 1030.

Position of ship at 1400 on 3rd: 29° 30'N, 51° 42'W; 1400 on 5th: 37° 48'N, 39° 48'W.

*Note.* This observation was forwarded to the Director of the United States Weather Bureau who stated that it would be of direct help to his annual report *North Atlantic Hurricanes and Tropical Disturbances*.

## LIGHTNING Caribbean Sea

M.V. *Sussex*. Captain E. H. Hopkins. Curaçao to Colon. Observers, the Master and Mr. J. Newsham, 3rd Officer.

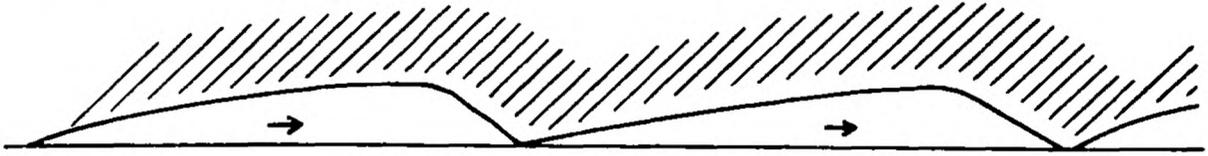
10th October, 1954, 0240 G.M.T. Vessel crossed the track of hurricane "Hazel" 40 hours after passage of the storm centre. From about 2300 on 9th heavy Cb had been massing and lightning, diffused by the clouds, was seen. Radar revealed the storm to have a depth of 12 miles, and was moving in a N'ly direction against a moderate E'N breeze. Lightning intensified as the storm was approached and both fork and sheet lightning were seen followed by thunderclaps. At 0225 light rain commenced which intensified at 0240 and ceased at 0315. The vessel was thought to be at the centre of the storm at 0240, when very loud thunderclaps and lightning apparently coming from all quarters were incessant. The lightning was very painful to the eyes and lit up the entire horizon and gave it a violet tinge. The storm was more severe than any previously experienced by the observing officers; it was later learnt that this storm had interfered with power and lighting installations on the islands of Aruba and Curaçao.

Position of ship at 0240: 12° 33'N, 70° 39'W.

## ABNORMAL REFRACTION

### Arabian Sea

S.S. *Perim*. Captain L. Porter. Adelaide to Aden. Observer, Mr. G. S. Forbes, Cadet.



8th October, 1954, 1800 S.M.T. (1445 G.M.T.). Just after the sun had disappeared below the horizon bright patches of light were seen to travel round the horizon in a clockwise direction as shown in the sketch. Each wedge was seen to sink into the horizon and start again.

Position of ship:  $12^{\circ} 06' N$ ,  $60^{\circ} 38' E$ .

*Note.* This is a very remarkable observation, depending on some unusual form of abnormal refraction.

### Mediterranean Sea

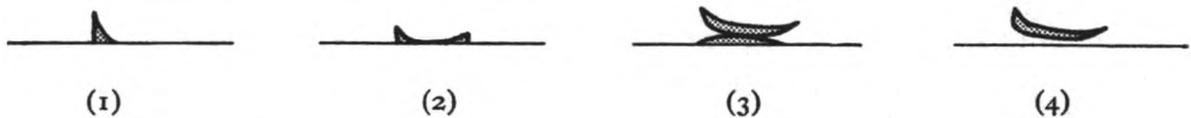
M.V. *Cambridge*. Captain P. P. O. Harrison. Liverpool to Suez. Observer, Mr. R. Pook, 4th Officer.

18th October, 1954. Behind a layer of Cu rising to an altitude of  $5^{\circ}$  a red sun rose bearing  $102^{\circ}$ . When the sun was about three-quarters over the horizon a second sun appeared on the edge of the true sun and just touching it. The size was about one-third of that of the true sun, its relative position to the true sun being at 10 o'clock and its colour a shade paler than the red sun. Its outer edge was rather blurred. This phenomenon lasted about 15 sec. Before the sun rose it was noticed that a few of the clouds to the westward had a definite red colouring. Cloud  $3/8$  Cu. Visibility very good.

Position of ship:  $33^{\circ} 48' N$ ,  $24^{\circ} 06' E$ .

### Strait of Gibraltar

M.V. *British Marquis*. Captain J. V. Robinson. Swansea to Ceuta. Observer, Mr. G. F. T. Smith, 2nd Officer.



20th November, 1954. The moon on rising at 0212 G.M.T. was visible first as a loom, then by its appearance as sketch 1. Until apparently clear of the horizon, as in sketches 2 to 4, the inverted refracted image (sketch 3) appeared to set as the true moon rose clear of the horizon. Bearing of moon at first observation,  $095^{\circ}$ .

Position of ship:  $36^{\circ} 18' N$ ,  $02^{\circ} 03' W$ .

### Gulf of Suez

S.S. *Benvannoch*. Captain J. C. Allan. Suez to Aden. Observer, Mr. A. Syme, 2nd Officer.

29th December, 1954, 1200 G.M.T. Shadwan Island was observed from 83 miles; the three main peaks of Shadwan (731 ft, 826 ft, 979 ft) were clearly visible. When the island was 70 miles distant details of the country were easily identified. The mountains on each side of the Gulf, particularly those on the Sinai side, were seen

in great detail, with colours ranging from deep blues and greens to bright yellows, pale pinks and brilliant reds. At the same time other vessels were observed apparently sailing above the horizon with reflected images beneath and masts in the sea. Cloud 6/8 Cu, about 6,000 ft. Temperatures: dry 61°F, wet 53°.

Position of ship: 28° 36'N, 33° 00'E (Ras Gharib Lighthouse, bearing 159°T, distant 15½ miles).

## RAINBOWS

### West Pacific Ocean

S.S. *New Australia*. Captain Sir David Aitchison, K.C.V.O. Pusan to Brisbane. Observer, Mr. P. K. Murchison, 3rd Officer.

11th November, 1954, 1045 G.M.T. Primary and secondary lunar rainbows were observed with full spectrum colours in each.

Position of ship: 20° 50'N, 133° 50'E.

### North Pacific Ocean

S.S. *Orcades*. Captain S. S. Burnnand, O.B.E. Honolulu to Vancouver. Observer, Mr. J. L. Chapman, 3rd Officer.

29th December, 1954, 2130 G.M.T. An intense rain squall passed over the ship. There was an exceptionally broad rainbow apparently straddling the ship and a narrower one above it. As the squall passed beyond the ship the shape of the rainbow changed so that the colours seemed to be growing out of the sea. The bow changed shape frequently, at times like fountains, at others like a flowering shrub. The colours were not clearly separated, the main effect being green-blue when rain was close at hand, and a reddish-orange as the squall moved away.

Position of ship: 24° 12'N, 155° 20'W.

## HALO

### Atlantic Ocean

S.S. *Clan Macrae*. Captain W. R. Woodriffe. Cape Town to Liverpool. Observer, Mr. I. H. Scott, 4th Officer.

29th October, 1954, noon. A solar halo was observed with a radius of 14½°, measured to the inner edge of the halo. The width of the halo was 1°. The halo was complete although the lower portion was not so distinct as the upper. The inner edge of the halo was of a purple hue, changing to light yellow on the outer edge. Altitude of sun, 67°.

Position of ship: 7° 02'N, 14° 03'W.

*Note.* In the January, 1955, number of this journal, page 36, we published an observation by S.S. *Baron Maclay* of a lunar halo of radius 15° and in the July, 1955, number, page 152, an observation by S.S. *Marabank* of another lunar halo of the same radius. The observation of S.S. *Clan Macrae* is therefore very interesting as it provides additional confirmation of the formation of a halo of about the same radius, which is not in the list of recognised halo phenomena. Halos of abnormal radii are reported from time to time, but may be faint and difficult to measure, also if observed on land there may be no means of measurement available. Such halos are not admitted to the list of accredited phenomena until they have been observed, with accurate measurements, on at least several occasions. The large number of observations of measured halo radii we are now receiving from the sea is adding considerably to our knowledge of halos and of their degree of frequency or rarity.

### South Pacific Ocean

S.S. *Wairuna*. Captain G. H. Kime. Observers, Mr. L. Davis, 2nd Officer, and Mr. R. Cox, 3rd Officer.

16th October, 1954, 0000 S.M.T. A lunar halo was observed and was found to have a radius of 20° 10', measured by sextant from the centre of the moon to the

inner edge of the halo. The moon's altitude was  $28^\circ$ . The sky was covered with light Cs, through which stars were visible. A patch of lenticular Ac lay within the halo and the lower part of the halo was obscured by patches of Cu. The halo had been visible since 2315 on 15th October and after midnight became more distinct and was still visible at 0400, when all cloud except Cs had disappeared.

Position of ship at 0000:  $26^\circ 30'S$ ,  $169^\circ 57'W$ .

### Western Mediterranean Sea

S.S. *Philomel*. Captain H. Selmer. Algiers to London. Observers, Mr. G. T. May, Chief Officer, and Mr. B. J. Pratt, 2nd Officer.

17th November, 1954, 0300 G.M.T. An arc of a lunar halo was observed, which on measurement at 0350, when it became complete, proved to be of  $19^\circ$  radius. At 0300 the cloud was Cs with a fair amount of Cu, the latter preventing the remainder of the halo being observed at the beginning. At 0400 the halo was very bright indeed, but at 0430 had disappeared, the part of the sky concerned having presumably been covered by As.

Position of ship:  $36^\circ 47'N$ ,  $01^\circ 20'E$ .

*Note.* The halo seen by S.S. *Wairuna* may be considered to be that known as the  $19^\circ$  halo, the observed radii of which have been from  $18\frac{1}{2}^\circ$  to  $20^\circ$ . The  $19^\circ$  halo is one of those which the observations received from the sea of recent years are showing to be not of such rare occurrence as was formerly supposed.

### Pacific Ocean

M.V. *Port Hobart*. Captain J. A. Fairbairn. Balboa to Auckland. Observer, Mr. R. M. Henshaw, 3rd Officer.

30th December, 1954, 0515 G.M.T. With the moon bearing  $261^\circ$  the main halo was quite distinct when first observed at 0512. The lower parts of the other two arcs, which were easily distinguishable, though not as bright as the halo, faded into the night sky at an altitude of approximately  $30^\circ$ . The inner circle of light was concentric with the larger arc and was of the same brilliance at the top, but faded at the bottom. After 25 min the arcs and circle of light were seen to be dissolving and the halo to be fading: the halo disappeared altogether about 15 min before the moon set at 0634. Towering Cu along the horizon, and a thin veil of As through which stars could be clearly seen over the whole sky. (See opposite page 208.)

Position of ship:  $21^\circ 58'S$ ,  $133^\circ 52'W$ .

*Note.* This is a very interesting observation, which apart from the halo of  $22^\circ$  cannot be explained in terms of known halo phenomena. The disc of light is a very unusual feature.

## CREPUSCULAR RAYS

### Caribbean Sea

M.V. *Enton*. Captain R. F. Hellings. Panama to Curaçao. Observers, Mr. P. M. Johnson, 2nd Officer, and Mr. D. Brodie, 3rd Officer.

4th November, 1954, 1745 S.T. Five minutes after the sun had set a spectacular display of crepuscular rays was observed which lasted for 20 min until 1805. Most of the rays, especially those in the centre, were very sharply defined. The rays themselves were a pale pink and the sky between a vivid blue. The thickness of each ray varied, and the sky lower down towards the horizon was deepening to lilac though the rays remained the same pale pink. A few small Cu were present, with some Ci.

Position of ship:  $11^\circ N$ ,  $76^\circ W$ .

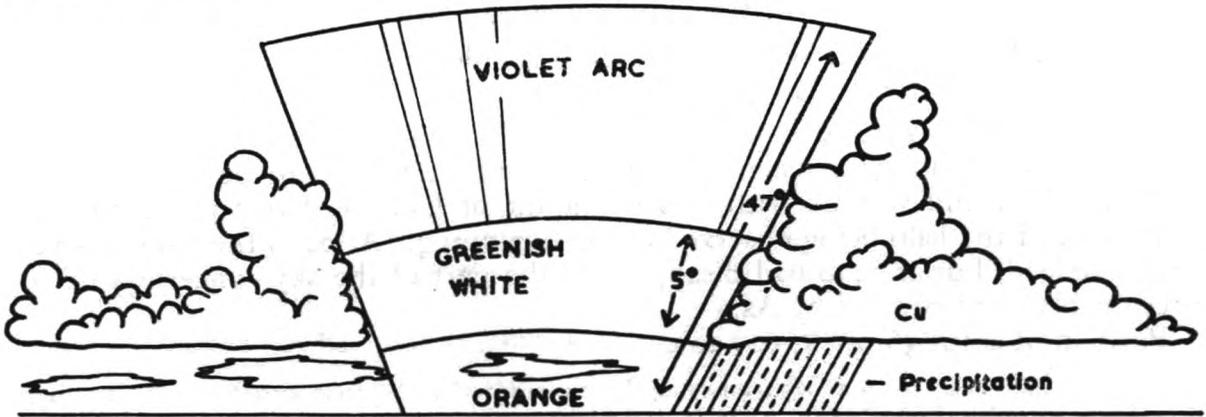
*Note.* We do not recollect seeing a photograph (see opposite page 209) of crepuscular rays before and would like to congratulate the photographer on the excellence of this one.

## SUNSET RAYS

### Indian Ocean

M.V. *Timaru Star*. Captain H. W. McNeil. Melbourne to Aden. Observers, the Master and Mr. N. Johnson, 4th Officer.

31st December, 1954, 1400 G.M.T. Shortly after sunset a very noticeable set of violet rays were seen, which reached an altitude of  $47^\circ$  and extended over a considerable arc.



Immediately above the horizon the sky was bright orange, obscured in parts by Sc and Cu. Above this was an arc of approximately  $5^\circ$  of greenish-white, topped by the violet rays, which became most noticeable 15 min after sunset; they retained maximum brilliance for a further 10 min and then commenced to fade. Within another 10 min the rays were invisible. Wind calm. Sky throughout very brightly coloured.

Position of ship:  $5^\circ 00'S$ ,  $66^\circ 10'E$ .

*Note.* This is perhaps a phenomenon allied to that variety of the green flash at sunset in which the sky above the point of sunset is coloured green, or green rays are observed to shoot up from this point, several instances of which have been published in this journal. In certain atmospheric conditions the green coloration may be extended to a violet one, just as the green flash proper (the coloration of a segment of the sun) is sometimes seen as a purple or violet flash, when rays of this colour passing through the lower atmosphere are not completely absorbed before they reach the observer.

## GREEN FLASH

### Red Sea

M.V. *Cambridge*. Captain P. P. O. Harrison. Suez to Aden. Observer, the Master.

23rd October, 1954. At sunset there was a jade green flash of  $2\frac{1}{2}$  sec (timed). It commenced by an apparent split of the remaining portion of the sun, both portions showing green; then there was one steady "flash". Immediately after, and about  $2^\circ$  above the spot where the sun had set a ball of pale green, perhaps half the diameter of the sun, pulsated for at least 5 sec.

Position of ship:  $12^\circ 28'N$ ,  $44^\circ 10'E$ .

## LUNAR GREEN FLASH

### Japanese waters

S.S. *Wairuna*. Captain G. H. Kime. Observer, Mr. R. Cox, 3rd Officer.

2nd November, 1954, 2147 S.M.T. At moonset, the green flash and a dull green colouring of the sky were observed for about  $1\frac{1}{2}$  sec with the aid of binoculars. The green flash lasted for only a fraction of this time.

Position of ship:  $31^\circ 49'N$ ,  $134^\circ 23'W$ .

*Note.* The above observation was forwarded to us by the Controller, Canadian Meteorological Division. It is very interesting, as such observations are very rare and no other one

has been received in the post-war period. The main reason why the green flash is seldom seen at the setting or rising of the moon is that the total light of the moon is so much less than that of the sun. In this connection it is interesting to note that the moon's age at the time of the above observation was 6.3 days, so that it had not reached the first quarter phase and was therefore giving much less light than the full moon does. Another reason for the rarity of the observation is probably that the phenomenon is not often looked for when the moon sets or rises.

## RED FLASH BEFORE SUNSET

### Indian Ocean

M.V. *Cambridge*. Captain P. P. O. Harrison. Liverpool to Fremantle. Observers, the Master and Mr. S. Lambrick, Chief Officer.

28th October, 1954, 1740 S.M.T. Near sunset the sun appeared from behind a Sc cloud which had a sharply-defined base at an altitude of 16'. As it emerged there was an instantaneous red flash. At 1743½ the sun set with a pale blue flash lasting 1 sec.

Position of ship: 0° 19'N, 68° 16'E.

*Note.* A similar observation, made by M.V. *Coptic*, was published in the July, 1953, number of this journal, page 144. In the note on that observation it was stated that it was the only one of its kind that we had received up to that time. The conditions of refraction that give a green (or blue or violet) rim to the upper edge of the sun's disc also give a red rim to the lower part of the disc. This can only be seen when the sun emerges from the hard-edged base of a cloud situated near the horizon.

## AURORA

### North Atlantic Ocean

S.S. *Beaverlodge*. Captain L. H. Johnston. Le Havre to Montreal. Observer, Mr. D. K. Walker, 4th Officer.

17th to 18th October, 1954. A fine display of Aurora Borealis was observed during most of the hours of darkness commencing with an arc at bearing 340°T and travelling across the northern sky to an altitude approximately 8°. The rapid changes of the phenomenon made it impossible for accurate bearings and altitudes to be taken. At times rays changed into bands covering the whole sky with pulsating patches. There was an active display of rays and curtains throughout, with a formation of a corona sometimes lasting half an hour which roved across the sky changing very rapidly to other forms in the northern sky. Weather conditions extremely good.

Position of ship: 0000 to 0500 G.M.T., approaching Belle Isle Strait.

S.S. *Scythia*. Captain J. D. Armstrong, D.S.C., R.D., R.N.R. Quebec to Southampton. Observer, Mr. D. J. Swinnerton, 3rd Officer.

30th October, 1954, 0440 to 0640 G.M.T. A display of aurora reached its maximum activity about 0600. During most of the time there was a basic arc extending over 140° from horizon to horizon. At 0600 the arc extended from 050° to 270° with its apex bearing 340°, the altitude of the lower edge at the apex being 12°. Shooting upwards from the arc were pulsating patches, two of which at bearing 320° and 040° reached altitude 40°. Bands covering about 80° of azimuth were in evidence, particularly around 0600, their vertical movement frequently reaching the zenith. White was the only colour displayed. Activity subsided at 0630, and at 0640 only a glow remained which lasted till dawn.

Position of ship at 0600: 52° 24'N, 50° 48'W.

S.S. *Rialto*. Captain H. Grunnill. Newcastle to Montreal. Observers, Mr. W. Walker, 2nd Officer, and Mr. D. J. Pengelly, 3rd Officer.

2nd November, 1954. Aurora commenced at 2000 G.M.T. as a glow to NNW, altitude 10°, altering little in appearance until 2355 when isolated rays were seen

to NW. These rays became more intense and greater in length until gradually a shooting arc, azimuth  $260^{\circ}$ – $080^{\circ}$ , altitude  $90^{\circ}$  and width  $3^{\circ}$ , was formed; the colours included in this arc were red, mauve and a dull green. The phenomenon lasted for 3 min after which bright tufts like moonlit Ci appeared, which constantly changed in shape and size until 0015 when a brilliant half-corona took shape with the centre bearing N and diameter  $20^{\circ}$ . This lasted for 6 min after which shooting rays (like searchlights) took place, gradually fading in length until 0040 when the aurora took on a dawn-like glow again, covering  $6/8$  of the sky, although an occasional shooting ray was seen from N. At 0240 the aurora reappeared as a dawn-like glow to NW, and at 0300 a bright aurora like the moon penetrating cloud was seen in NW, altitude  $40^{\circ}$ ; this gradually disappeared to the E, after which small bright tufts, like patches of Cu, appeared to NW and there spread out to give a dawn-like appearance, which disappeared at 0330. At 0331 bright streaks like mares' tails appeared to W, altitude  $10^{\circ}$ ; these passed overhead and faded to E at 0345.

Position of ship during display:  $58^{\circ} 08'N$ ,  $28^{\circ} 46'W$ , to  $58^{\circ} 00'N$ ,  $30^{\circ} 13'W$ .

3rd November. From 2200 to 0310 aurora was visible as a glow from N–W, with occasional rays; at 0310 it appeared brightly in W, altitude  $5^{\circ}$ , and stretched to NE, altitude  $20^{\circ}$ , with highest point at  $350^{\circ}$ , altitude  $30^{\circ}$ . Stars could be seen above, below and faintly through the aurora, which spread and gave a dawn-like appearance to NW. At 0340 the aurora disappeared in W but became bright in NE, with streaks from  $5^{\circ}$  to  $15^{\circ}$  altitude; they spread to N and gradually faded at 0350. The aurora reappeared at 0400 as a combination of that seen between 0310 and 0350, but the brightest parts and streaks were seen in NNE and the arc running to W; they faded at 0410.

Position of ship:  $57^{\circ} 17'N$ ,  $36^{\circ} 41'W$ , to  $56^{\circ} 54'N$ ,  $39^{\circ} 00'W$ .

6th November. Until 0500 there was at times a faint glow to N, and at that time the aurora appeared like a white rainbow from W–N, each end just above the horizon and zenith in NW, altitude  $25^{\circ}$ . It was uniform in width and brilliance, and remained unchanged until 0545 when it gradually faded and disappeared. From 0700 to 0730 small cirrus-like streaks appeared to NW, then faded out.

Position of ship:  $52^{\circ} 48'N$ ,  $51^{\circ} 18'W$ .

### Bass Strait

M.V. *Port Townsville*. Captain E. W. R. Young. Launceston to Hobart. Observer, Mr. J. R. King, 2nd Officer.

23rd October, 1954, 1010 G.M.T. Aurora Australis was observed along the north coast of Tasmania for 8 min. It extended from  $160^{\circ}$ – $220^{\circ}T$  and reached an altitude of about  $20^{\circ}$ . The aurora was changing continuously in appearance but mainly resembled vertical shafts of light about  $5^{\circ}$  wide, gradually merging into one wide glow. One-eighth detached Cu, about 4,000 ft.

### METEOR

#### West African waters

S.S. *Clan Macaulay*. Captain J. H. S. Petherbridge. Birkenhead to Dakar. Observer, Mr. R. S. Schooling, 2nd Officer.

3rd November, 1954, 0330 G.M.T. A bright glow was observed at bearing  $170^{\circ}$ , altitude  $30^{\circ}$ . The brightness increased in intensity and the object had a trail of a quite considerable length. At approximately bearing  $140^{\circ}$  and altitude  $10^{\circ}$ , the brightness increased suddenly as though an explosion had occurred, which lighted up the sea surface, and five or six small balls of light were seen one behind the other in the trail. A few seconds after this the meteor seemed to falter in velocity, fade and disappear. The complete phenomenon lasted about 10 to 15 sec. Visibility excellent.

Position of ship:  $21^{\circ} 7'N$ ,  $17^{\circ} 52'W$ .

### Eastern Mediterranean Sea

S.S. *Somerset*. Captain W. J. T. Stevens. Port Said to London. Observer, Mr. R. L. B. Holdsworth, 3rd Officer.

14th October, 1954, 2029 G.M.T. A meteor was observed falling on a wavy track from above Altair, altitude about  $30^\circ$ , bearing  $250^\circ$ , to below Fomalhaut, altitude about  $10^\circ$ , bearing  $210^\circ$ .

Position of ship at 2400:  $31^\circ 54'N$ ,  $31^\circ 12'E$ .

### Gulf of Aden

M.V. *Glenartney*. Captain D. K. Dunlop. Colombo to Aden. Observer, Mr. A. W. Spivey, 3rd Officer.

2nd October, 1954, 1710 G.M.T. A meteor was observed of pale orange colour moving from Jupiter (bearing  $219^\circ$ , altitude  $42^\circ$ ) towards the moon (bearing  $240^\circ$ , altitude  $9^\circ$ ). It had a bright white trail  $20^\circ$  long, and descended about  $25^\circ$ , when it broke up  $5^\circ$  above the moon into a detached head and trail, the head into about six pieces. Duration of flight 4 to 5 sec.

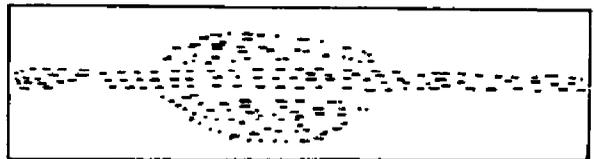
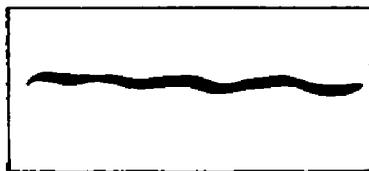
Position of ship:  $11^\circ 54'N$ ,  $51^\circ 56'E$ .

## RADAR PHENOMENON

### Sulu Sea

M.V. *Calchas*. Captain Digby Jones. Hong Kong to Manila. Observers, the Master, Mr. E. Farmer, 2nd Officer, and Mr. M. J. Jones, 3rd Officer.

30th November, 1954, 0130 G.M.T. An image was seen on the radar right ahead about 5 miles. This consisted at first of an ordinary line with indentations similar to a picture of a low coast line. The ship was in radar contact with Baguan Island, and it was realised that this could not possibly be the coastline to the E of Sandakan, which should have been 33 miles ahead of the ship. The image ran in a slight curve from approximately E-W. The ship reduced speed to about 8 kt and approached to within about  $2\frac{1}{2}$  miles of the object on the radar. The image had by now become clearer with fewer indentations but with a mass of specks all around it. Its appearance was now very similar to a mass of iron filings with a line of iron filings running through it. It was not light enough to see anything so we waited until daylight. In the meantime the ship steered N and S, turning round every half hour. Each time the ship approached on a s'ly course the same image was seen on the screen. The image varied from about 3 to 5 miles in width.



When daylight came nothing was seen so we steamed towards the image on the screen. When we came within a mile it was much clearer, and we could see just ahead of the ship a strong tide rip. This consisted of a tidal line around which, in our vicinity, was a circular patch of tide rips. We compared the image on the radar with the tide rip and it was without doubt the tide rip which had caused the image on the screen. During this time the sea was smooth, with only light airs. Sky about  $5/8$  covered, but night dark.

Position of ship at 0130:  $6^\circ 12'N$ ,  $118^\circ 38'E$ .

*Note.* In the April, 1954, number of this journal, page 81, an observation by S.S. *Rialto* of unidentified radar echoes was published. It was suggested that the echoes were produced by a current rip. In a later observation made by the same ship, on 11th April, 1954, in the

North Atlantic Ocean, radar echoes were associated with a visible current rip. The observation of M.V. *Calchas* confirms these previous ones.

## UNIDENTIFIED PHENOMENA

### Eastern Pacific Ocean

S.S. *Walvis Bay*. Captain A. Donald. San Pedro to Panama. Observer, Mr. J. A. R. Lewis, 3rd Officer.

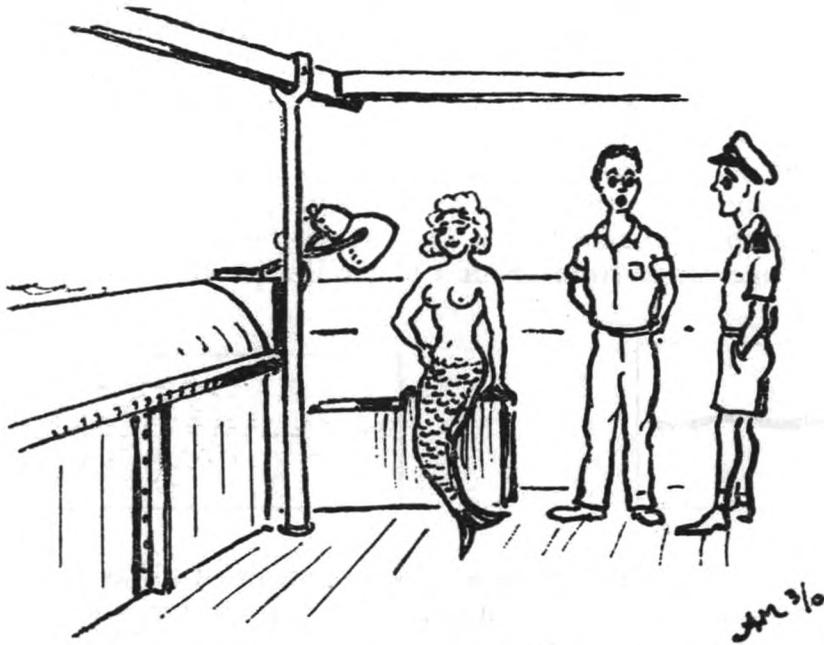
31st October, 1954, 0350 G.M.T. A very bright light green with white edge, similar to a flare, was observed; it was approximately  $50^{\circ}$  above the horizon and appeared to be about 20 miles from the vessel in a NE'ly direction. The light lasted for about 1 sec, then dropped swiftly about  $10^{\circ}$  and left a white trail like smoke which disappeared about 2 sec later. There was frequent lightning at this time.

Position of ship:  $16^{\circ} 43' N$ ,  $100^{\circ} 48' W$ .

3rd November, 1954, 0240 G.M.T. A similar light was observed about  $40^{\circ}$  above the horizon in a S'ly direction. In this instance the light appeared to rise very slightly and then dropped swiftly, leaving the white trail as on the previous occasion. The light and trail were visible for about the same period of time as before. There was also frequent lightning at this time.

Position of ship:  $11^{\circ} 09' N$ ,  $90^{\circ} 33' W$ .

*Note.* These phenomena were observed at night, but in the absence of any information as to the state of the sky it is not possible to identify them with certainty. They appear most likely to have been bright meteors, on the assumption that the part of the sky in which they were seen was free from cloud. As there is no mention of thunder, the lightning observed was probably sheet lightning. If on the other hand the sky was overcast, with a thunderstorm in progress, there is a possibility that ball lightning occurred. This is considered unlikely, as ball lightning is not usually so brilliant, nor does it appear to move as swiftly as is described



Is there any Beaufort notation for this phenomenon?

(This sketch was sent to the Marine Division by Mr. A. McGrath, 3rd Officer of M.V. *Ajana*.)

### MERCHANT NAVY AGENT, TYNE

Captain P. R. Legg has been appointed as Meteorological Office Merchant Navy agent for the Tyne area in succession to Captain West, whose death occurred in April, 1955. The address and telephone number remain the same.

# Krakatau, 1883

By E. W. BARLOW, B.SC.

(Marine Division, Meteorological Office)

In this centenary year of the Meteorological Office it is thought that some account of the great volcanic eruption in August, 1883, of Krakatau, a small island in Sunda Strait, would be of interest to our readers, since in addition to the great loss of life and widespread devastation that ensued, the eruption produced the most outstanding atmospheric disturbance not only of the last 100 years but of all historical time.

The only previous eruption of Krakatau of which there is any historical record began in May, 1680, and continued as a series of moderate eruptions until November, 1681, by which time the rich tropical forests covering the island were completely destroyed. On 20th May, 1883, the eruption began again with a sudden outburst followed by a temporary decline in violence. Subsequently the eruptions continued with increasing severity throughout the summer months until the afternoon of 26th August when they took on a paroxysmal character, culminating in four terrific explosions at intervals from 5.30 a.m. to 10.52 a.m. on 27th August. These, particularly the third, just after 10 a.m., were of a violence unparalleled in historical times in any part of the world. Minor eruptions followed until 2.30 a.m. on 28th August, when activity ceased. In an article in *Weather*, May, 1955, Mr. B. J. Mason, Lecturer in Meteorology at Imperial College, London, estimates that the force of the final Krakatau explosions was probably about 1,000 times as great as that of a hydrogen bomb.

During the crisis of the eruption the towns and villages along both the Java and Sumatra sides of Sunda Strait were enveloped in terrible darkness which lasted for many hours. While so obscured they were overwhelmed by a succession of great sea waves which inundated the entire coastline for varying distances up to 5 miles inland, resulting in the death of 36,380 persons, of whom 37 were Europeans. The towns of Anyer, Charingin and Merak, in Java, and Telukbetung, in Sumatra, were completely destroyed, together with about 300 villages. Ships were stranded and in some cases carried into valleys inland. Sunda Strait was almost impassable for weeks afterwards, the sea being covered with enormous masses of floating pumice, which were so thick in many places that no vessel could force a passage through them. Some lighthouses were swept away and all landmarks obscured by a vast deposit of volcanic dust. For months after the eruption one of the principal channels was greatly obstructed by two new islands which had arisen therein.

The effects of the culminating eruptions were world-wide. A succession of air waves spread outwards over the whole globe and the sea waves travelled for thousands of miles. The sound of the eruptions was heard over an area covering one-thirteenth of the earth's surface. Part of the material from Krakatau was projected into the upper air and thence travelled all round the globe, its presence being detected in rain and being made evident by the magnificent sunsets and afterglows, coloured suns and moons and other optical phenomena, which persisted for varying periods up to nearly three years after the eruption.

In January, 1884, the Council of the Royal Society appointed a Committee to collect all the data available about this remarkable occurrence and to report on all its scientific aspects. The report was issued in 1888 in the form of a volume of nearly 500 pages, and it is from this source that a large part of the information contained in this article, including the illustration, has been derived. Information from the logs of 172 ships is contained in the report; much of this relates to observations made in various parts of the world after the eruption.

Before the eruption Krakatau was an island about 5 miles long and about 3 miles across in its central and southern part. The highest of its volcanic peaks was Rakata, 2,623 ft. As a result of the eruptions of 1883 two-thirds of the island was

blown away, leaving little but the southern part, and of this the northern half of the cone of Rakata had disappeared, exposing a complete section of the volcano to the summit. It is estimated that  $1\frac{1}{8}$  cubic miles of material was ejected; most of this, apart from the dust sent into the upper air, fell into Sunda Strait, completely altering the previously charted depths, especially to the northward of Krakatau. Two new islands were formed, Steers and Calmeyer Islands. The figure shows approximately the changes in the form and extent of Krakatau and the neighbouring islands, before and after the eruption. The survey of the islands before the eruption was, however, somewhat imperfect and the representation in the drawing of the islands after the eruption must not be taken to represent present-day conditions accurately. Steers and Calmeyer Islands were the highest part of a great underwater bank formed by the eruption. After a few months the islands were reduced to sandbanks and are now reefs, Steers reef having a least depth of  $1\frac{1}{4}$  fathoms and Calmeyer reef a least depth of  $3\frac{1}{4}$  fathoms. Verlaten Island, also an active volcano, is nearly three times the area it was previous to the eruption.



Map of Krakatau (old spelling, Krakatoa) ( $6^{\circ} 09'S$ ,  $105^{\circ} 27'E$ ) and the surrounding islands, from the chart prepared immediately after the eruption. Later charts show the islands of Steer and Calmeyer reduced to sandbanks. The shaded areas show the form of the islands according to the old chart. Much of the discrepancy between the southern limit of Krakatau in the two maps is due to the imperfection of the old survey. Dotted lines show sandbanks and lines of breakers. This map is taken from the *Report of the Krakatoa Committee of the Royal Society*, published 1888.

Minor eruptions continue in the region and the Eastern Archipelago Pilot, Volume IV, states that the area between Krakatau and Sebesi Island, 10 miles to the northward, must be considered as unsafe for vessels. In 1928 a new islet, Anau Krakatau, appeared midway between Verlaten and Lang Islands; it disappeared the following year, but was reformed and increased and still exists.

Vegetation did not return to Krakatau until five years after the great eruption.

The great eruptions of Papandayang in Java in 1772, of Laki, near Skaftájökull in Iceland, in 1783 and of Tomboro in Soembawa in 1815, all ejected much larger quantities of material than did Krakatau in 1883. The special feature of Krakatau was the excessive violence of the culminating explosions, which have no parallel in the records of volcanic activity. This was due to the intrusion of the sea into the

heart of the volcano after the island had been sufficiently blown away in the preliminary eruptions. The access of great quantities of cold water at first moderated the volcanic action, but gave rise in the end to greatly increased explosions.

An account of the experiences of several ships in the vicinity at the time of the eruption is given below.

The Dutch barque *Marie*, engaged in the salt trade, was anchored off Telukbetung, Sumatra. By putting out a third anchor she was enabled to ride safely and to avoid being stranded by the gigantic sea waves which swept on to the land. The vessel was at times in imminent danger and four persons were drowned.

The greatest opportunities for observation seem to have been those afforded to Captain Watson of the British ship *Charles Bal*, when on her voyage to Hong Kong. This vessel passed Princes Island, at the southern entrance to Sunda Strait, at 9 a.m. on Sunday, 26th August. At noon she was on the south-west side of Krakatau and at 4.15 p.m. she reached a point about 10 miles nearly due south of the volcano. The island was then covered in dense black cloud; material was being ejected from the north-east point with great velocity and sounds like discharges of artillery occurred at about every second, together with a crackling noise. The whole increased towards 5 p.m. and the darkness becoming too great to permit of safe navigation, sail was shortened and through the whole night the vessel was kept beating about on the east of the volcano and within a dozen miles from it. From 5 to 6 p.m. a rain of large pieces of pumice, quite warm, fell on the ship. During the night sheets of fire appeared to ascend between the volcano and the sky, while on the south-west side there seemed to be a continual roll of balls of white fire. These appearances were doubtless caused by the discharge of white-hot fragments of lava as they rolled down the sides of the peak Rakata which was still standing. The air at this distance, though the wind was strong, was described by Captain Watson as being hot and choking, sulphurous with a smell as of burning cinders. Masses like iron cinders fell on the ship and the lead from the bottom of 30 fathoms came up quite warm. From midnight till 4 a.m. explosions continually took place, the sky one second intense blackness, the next a blaze of fire. At 6 a.m. on 27th August the Java shore was sighted and the vessel was enabled to continue her voyage.

The vessels passing through the Strait as well as the observers on land all reported a very marked, though gradual, increase in the violence of the eruptions during the three days which preceded 26th August. On that day about 1 p.m. the detonations caused by the explosive action attained such a violence as to be heard at Batavia and Buitenzorg, about 100 English miles away. At 2 p.m. Captain Thompson of the *Medea*, then sailing at a point 76 miles east-north-east of Krakatau, saw a black mass rising up like smoke in the clouds to an altitude estimated as being not less than 17 miles. If this estimate be correct, some idea of the violence of the outburst can be formed from the fact that during the eruption of Vesuvius in 1872 the column of steam and dust was propelled to the height of from only 4 to 5 miles. At 5 p.m. the sounds produced by the explosions had become so tremendous that they were heard all over the island of Java and at many other equally distant localities. At Batavia they were so violent during the night that few people in the district were able to sleep; the noise is described as being like the discharge of artillery close at hand.

Captain Wooldridge of the ship *Sir Robert Sale*, north-eastward of Krakatau at sunset on the evening of 26th, describes the sky as presenting a most terrible appearance, the dense mass of clouds being covered with a murky tinge, with fierce flashes of lightning. At 7 p.m., when the dense vapour and dust clouds rendered it intensely dark, the whole sky was lighted from time to time by electrical discharges, and at one time the cloud above the mountain presented the appearance of an immense pine tree, with stem and branches formed by volcanic lightning. The air was loaded with excessively fine ashes and there was a strong sulphurous smell.

Several ships in the Strait during the great eruption experienced terrible weather, heavy squalls from different directions, confused sea, lightning and a rain of mud,

ashes and pumice. None of these ships mentioned any particularly large waves, nor was any damage done to them by the sea. One vessel at anchor 6 miles from St. Nicholas Point observed a rapid current of 10 kt (estimated) running towards the volcano some time after the great explosion.

Mr. P. G. Parkhurst, M.B.E., formerly Librarian, Ministry of Transport, has kindly sent the following extracts from the log of the Batavian S.S. *Gouverneur-Generaal Loudon*. Geographical names mentioned have been altered to their modern spelling and some slight shortening made.

“ Sunday, 26th August. Left Anyer at 2.45 p.m. with 111 passengers. Discovered that Krakatau was casting forth enormous columns of smoke. From 6 o'clock we had rain of ashes and small bits of stone. There was a stiff breeze from NW. Reached roadstead of Telukbetung at 7.30 p.m.

“ Monday, 27th August. At midnight as no boat had come off sent first mate in gig to find out reason. He returned at 1 a.m. and stated that it had been impossible to land on account of the heavy current and surf; also that harbour pierhead stood partly under water. The weather began to get stormy and accompanied by a current which swept around (a sort of whirlpool).

“ When day broke we discovered that the *Berouw*\* was stranded inshore. However, owing to the violent winds and currents we did not dare to send a boat to her assistance. At 7 p.m. we saw some very high seas approaching up the roadstead. These poured on to the shore and flowed inland, so that we presumed that the inhabitants who dwelt near the shore must be drowned. The lighthouse was altogether carried away and the *Berouw* then lay high upon the shore among the coconut trees (as far as ascertained since every soul on board was killed; the steamer now lies two miles inland).† No more was seen of the revenue cutter or native boats. Since it was dangerous to stay where we were we proceeded towards Anyer under steam to give information. At 10 a.m. we were obliged to come to anchor in 15 fathoms because the ash-rain kept continually growing thicker and pumice stone also began to be rained, of which some pieces were several inches thick. The air grew steadily darker and at 10.30 p.m. we were in total darkness, as on a very dark night. The wind increased to the force of a hurricane. Awnings and curtains from forward right up to the mainmast and three boat covers were carried away in a moment. The passengers were sent below. Lightning struck the mainmast conductor six or seven times. The rain of pumice changed to a violent mud rain and this was so heavy that in the space of 10 minutes the mud lay half a foot deep. At noon the wind dropped but the darkness and mud rain continued. The darkness remained until 4 a.m. the next morning. During the night the mud rain covering masts, rigging and decks was phosphorescent and on the rigging presented the appearance of St. Elmo's Fire.

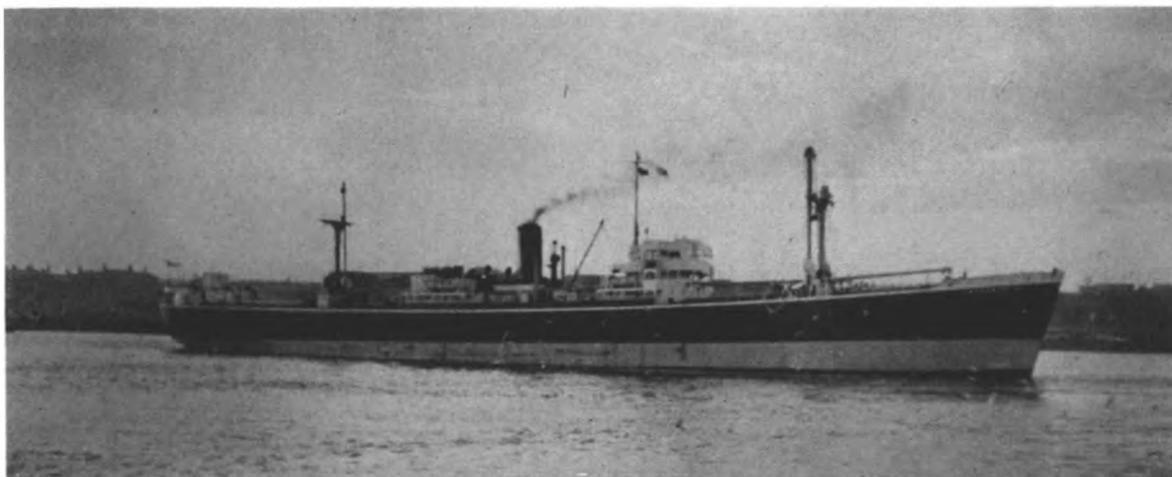
“ Tuesday, 28th August. Got under steam at 6.30 a.m. Found much ash and driftwood and what appeared to be solid land had formed between the islands. Steamed slowly through Legundi Strait and came into a layer of floating pumice 7 or 8 ft thick.

“ Wednesday, 29th August. As we steamed past Krakatau we noticed that half of the island had disappeared and what is left had been broken into fragments with open spaces between them. As we neared the coast of Java we observed that everything here had been laid desolate. We also perceived that the lighthouse on Java's Fourth Point was washed away—nothing remaining except a stump some feet high. At four o'clock reached Anyer roadstead, and although there was nothing to be seen of the place itself the captain went ashore to learn what information was to be obtained.”

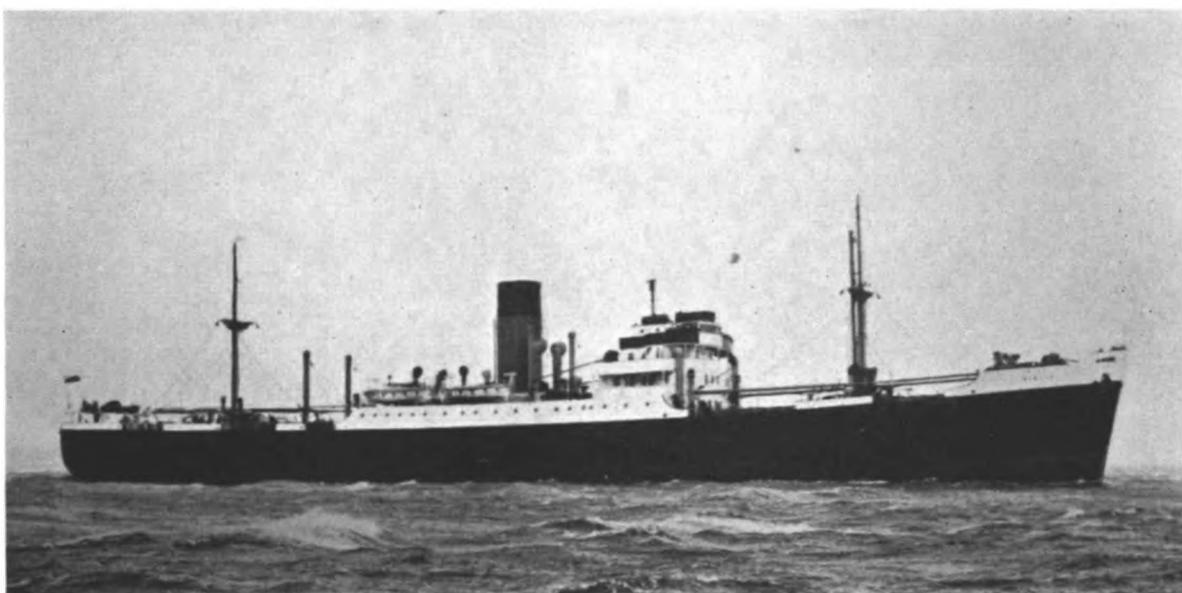
The extracts given below are from two British ships, both far from Krakatau, the logbooks of which are in the Marine Division.

\* This Government steamer, with a revenue cutter and native boats, had also been at anchor.

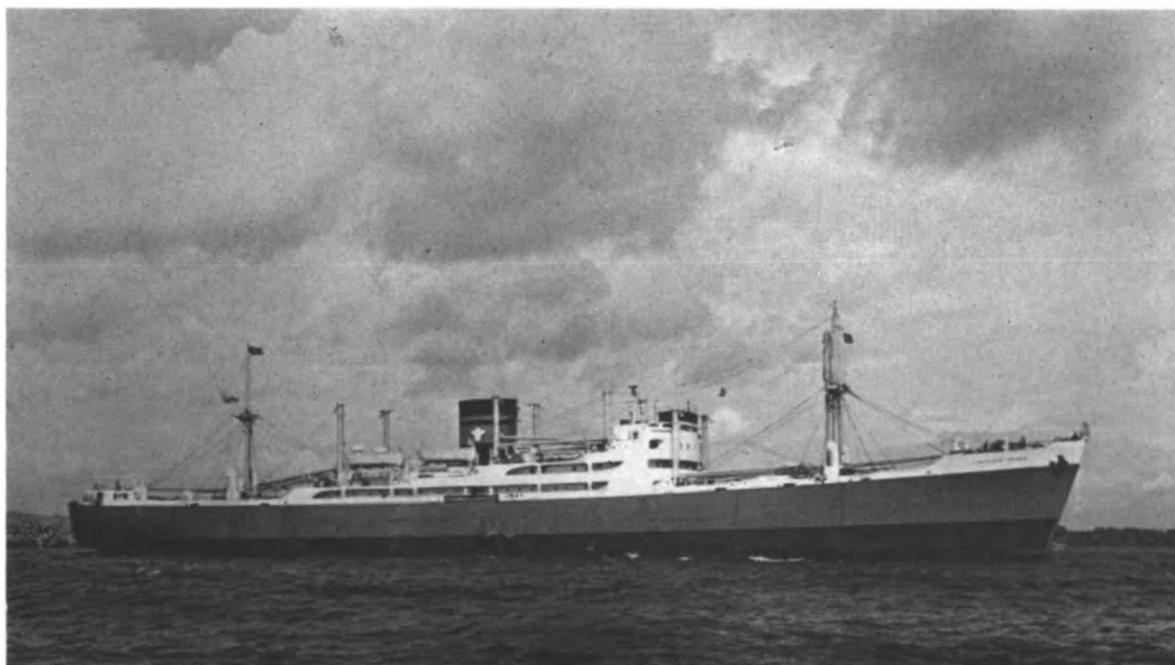
† Actually 1.8 miles, and 30 ft above sea level.



S.S. *Warkworth* (Messrs. R. S. Dalglish, Ltd.) Captain N. Thompson.



S.S. *Rialto* (Ellerman's Wilson Line) Captain H. Greenhill.



M.V. *Cingalese Prince* (Prince Line) Captain B. R. Simons, M.B.E.

The above three ships gained the highest markings for their meteorological logbooks in the year ended March 31st, 1955. The books have been displayed this year at various of the Meteorological Office's Centenary exhibitions.



Commander C. H. WILLIAMS, R.D., R.N.R., Port Meteorological Officer at London, aboard a selected ship instructing a Turkish meteorologist in the use of the ship's portable hygrometer. (see retirement notice on page 243)

Ship *Simla*, Captain M. Nicholson, Bombay to London (Log 5671), about 1,000 miles from Krakatau. "26th August, 1883. Latitude  $4^{\circ} 20'S$ , longitude  $87^{\circ} 53'E$ , noon. In the morning passed a quantity of pumice-stone floating on the water. Picked up about three dozen pieces from the size of an egg down to small pebble-stones worn smooth.

"27th August,  $5^{\circ} 35'S$ ,  $88^{\circ} 16'E$ . Passing quantities of pumice-stone floating on the water.

"28th August,  $6^{\circ} 12'S$ ,  $88^{\circ} 17'E$ . 2 p.m. Sky very hazy. A fine white powder falling on board in a constant shower like snow, the whole ship is covered with it. It looks like pumice-stone ground into flour. I swept up about  $\frac{1}{4}$  lb. of it off the skylight, part of which I shall send to Captain Toynbee\* with some of the pumice-stone. 5 p.m. Sky still very hazy and dust falling.

"29th August,  $6^{\circ} 26'S$ ,  $87^{\circ} 52'E$ . A very large quantity of dust fell on board during the night; had quite a job to wash it off. 4 p.m. Very hazy still and dust falling quite thick. Passed quantities of pumice-stone; collected a quantity. 5 p.m. Sun completely obscured  $15^{\circ}$  above the horizon owing to the haze." ( Similar remarks were made for 30th August.)

H.M. surveying vessel *Magpie*, Captain The Honourable F. C. P. Vereker, R.N., surveying in North-east Borneo (Log 5676), 1,227 miles from Krakatau. "27th August, 1883. Latitude  $5^{\circ} 52'N$ , longitude  $118^{\circ} 22'E$ . Explosions like the firing of heavy guns were distinctly heard during the day."

The rain of ashes and dust fell over all southern Sumatra and northward to Singapore. It extended eastward to Djarkarta (Batavia) and south-westward to the Cocos Islands. The winds and ocean currents gradually carried the floating pumice across the Indian Ocean, where it was mainly reported between the Equator and latitude  $20^{\circ}S$ . Pumice arrived on the coast of Natal on 27th and 28th September, 1884, and at Diego Garcia (Chagos Archipelago) on 1st October, 1884.

The air waves from Krakatau were recorded in the barograph traces of places all over the world, from 27th August to 1st September inclusive. At many stations no less than seven waves were observed at intervals; the first wave on arrival at the point antipodal to Krakatau returned to Krakatau, from whence it went out again, four times out and three times back, after which it was too feeble to be recorded.

The sound of the eruptions was heard over a large elliptical area, the larger part of which extended westward and southward from Krakatau. It extended, however, northward and eastward sufficiently far to include Ceylon, the Malay Peninsula and Siam, all the islands of the East Indies, much of the Philippines and the western part of New Guinea. South-eastward the area included a large part of Australia, extending to South Australia. The most distant place at which the sound was heard was the island of Rodriguez, 2,968 miles away, where it was compared to the distant roar of heavy guns. At a number of distant places, such as Diego Garcia, 2,267 miles, Manila, 1,804 miles, and Port Blair, Andaman Islands, 1,500 miles, the sounds were thought to denote a ship in distress and action was taken accordingly.

In the immediate vicinity of the volcano the sea wave engendered by the greatest explosion, on the morning of 27th August, was believed to have been at least 50 ft high. Where obstructed, it greatly increased in height and was observed at several places on the shore of Sunda Strait to reach heights of from 72 to 120 ft. At Telukbetung, Sumatra, the water rose to the square of the Resident's house, 118 ft above normal high-water level.

The various eruptions produced sea waves, which appear to have been of two different kinds, long waves with periods of over an hour, and shorter, higher waves at much quicker but irregular intervals. To the north and east, in the Java Sea, the long wave could only be traced for 450 miles, but to the west it travelled over great distances, reaching Cape Horn, 7,520 miles, in  $30\frac{1}{2}$  hours, with a maximum height

\* Then Marine Superintendent, Meteorological Office.

of 7 in. as measured on the tide gauge at Orange Bay; it also reached Cape Horn by the somewhat longer eastern route, in a shorter time,  $23\frac{1}{2}$  hours. The wave was recorded at Table Bay, 5,100 miles, in  $14\frac{1}{2}$  hours, with a height of 10 in., and it was believed to have reached places in the western part of the English Channel, about 11,000 miles, in times ranging from  $30\frac{1}{2}$  to  $32\frac{1}{2}$  hours with heights up to 4 in. The shorter waves reached Ceylon and perhaps Mauritius.

The estimates of the height to which fine dust and water vapour were ejected into the upper air vary; it was perhaps as much as 30 miles. The dust was carried westward round the world by the easterly wind above the Equatorial region and, as judged by the spread of the optical phenomena, encircled the globe by 9th September. It spread into higher latitudes in the anti-trade winds of the upper air, and by the end of November had extended to south of latitude  $40^{\circ}$ s in the southern hemisphere, all round the world. In the northern hemisphere its extent was more variable at that time and was further north in the eastern part of the North Atlantic, where it reached the southern coast of Iceland, in about latitude  $63^{\circ}$ N.

The phenomena produced by the dust in the upper air were very striking and probably of longer duration than similar phenomena produced by previous great eruptions. Some of them began to be seen from the date of the beginning of the eruptions in May, 1883.

The sky-haze was very marked in tropical regions, the normal blue of the sky being dimmed with a smoky or yellowish or reddish appearance, visible all day. A number of observers report it as not being uniform but having a rippled or striated structure. It was dense enough to cause the sun to disappear completely when within a few degrees of the horizon. The sky often had a livid or leaden appearance and at night the stars were dimmed, with the fainter ones invisible. In higher latitudes the haze was generally thinner, resembling thin cirrostratus, and was often only visible near the sun. The exact duration of the haze cannot be determined, but it appears to have become gradually thinner until it was almost imperceptible towards the end of 1885, over two years after the main eruption.

Coloured suns and moons were of very frequent occurrence in the tropics for some months, but were only occasionally seen in higher latitudes. In the tropics this phenomenon often lasted for hours, sometimes all day. The variety of the colour of the sun was remarkable, shades of red and copper, shades of green, sometimes very brilliant, pale or azure blue, or a neutral colour, silvery or leaden. Often the colour would change with the sun's altitude. The colour of the moon was less varied, mainly green but sometimes blue. These appearances lasted till the early months of 1884.

The following extract is from a logbook (5705) in the Marine Division. The ship *Belfast* of Liverpool, Captain B. J. Balderston, on voyage from Calcutta to Liverpool, was about 1,800 miles from Krakatau at the time.

"9th September, 1883. Latitude  $16^{\circ} 56'N$ , longitude  $87^{\circ} 17'E$ , noon. Light-brown clouds in the vicinity of the sun on this day. For two hours before sunset the sun was in colour pale blue and it was no more difficult to look at than it would have been to look at a full moon—to which it bore much resemblance.

"10th September,  $18^{\circ} 0'N$ ,  $85^{\circ} 40'E$ , noon. Light-brown clouds as yesterday, green sea water. From 4 p.m. until nearly sunset the sun was pale blue in colour. For the last 10 minutes before it set it changed slowly from pale blue to an olive green and disappeared from sight when about  $2^{\circ}$  above the horizon. The above sun shining through an open round port in the ship's side on to a large piece of white paper caused a distinctly blue reflection."

The unusually vivid and often abnormal colouring of sky and cloud at sunrise and sunset was very spectacular. With this were associated brilliant afterglows of various colours, with an extension of the normal duration of twilight. The afterglow covered a large area of the western sky after sunset, occasionally extending to the zenith. At times it appeared as a silvery glare, of remarkable lustre. These glows were world-wide; even by the end of September, 1883, they had been seen

in places as far apart in latitude as southern England and Cape Horn. They were not always visible or equally brilliant. The sunsets of November, 1883, in the British Isles were especially magnificent. In the spring of 1884 they rapidly declined in duration and brilliancy, but reappeared again, much reduced in brilliancy, in the latter parts of 1884 and 1885; after the end of 1885 they were not seen again.

Another effect of the Krakatau dust was seen in the darkness of the totally eclipsed moon on 4th October, 1884, and 30th March, 1885. A similar darkness had been seen after earlier large volcanic eruptions.

The dust brought into being a meteorological phenomenon which had not been previously recorded; a giant form of corona, which appeared as a dull red-brown ring. The size of this corona varied with the sun's altitude; when the sun was low the diameter of the brightest part of the ring was greatest,  $38^{\circ}$ . It is known as Bishop's ring, as the first detailed observation of it was made by Mr. Bishop at Honolulu on 5th September, 1883. This was the most long-lived of all the phenomena, continuing till June, 1886, showing that some dust remained in the atmosphere for nearly three years after the eruption. Bishop's ring was seen again after the eruptions of 1902 in St. Vincent and Martinique.

In the article previously referred to, Mr. Mason estimates that the presence of the Krakatau dust reduced the amount of solar radiation received at the earth's surface by 10 per cent, and he states that this had no noticeable effect on the average surface temperature or rainfall of the globe during the time that it remained in suspension in the upper air. This fact, together with the great violence of the Krakatau eruptions, deserves consideration in connection with the question of whether atomic or hydrogen bombs can have any influence on weather, apart from very localised or transitory effects.

## Deterioration of Motor-cars during Shipment Overseas

By E. A. SHIPLEY, B.SC.

Extracts from a paper which was read to the North-East Coast Institution of Engineers and Shipbuilders at Newcastle upon Tyne on 25th February, 1955.

### Introduction

Condensation of moisture (i.e. cargo or ship's sweat) and relatively high humidities, associated with perhaps rapidly changing temperatures of up to  $90^{\circ}\text{F}$ , are conditions which can be encountered during a voyage to Australia of five or six weeks duration, and it is these conditions that are known to produce deterioration in motor-cars carried in the ship as cargo.

Metal parts or sub-assemblies can be seriously affected by the highly humid conditions likely to occur during shipment. It has been necessary to provide these mainly ferrous items with some form of temporary protection.

For example, during the war and for some years following, it was customary to protect the cylinder bores of engine units by spraying internally with a solution of lanoline in white spirit or solvent naphtha. Such treatment was soon proved to be unsuitable by reports arriving from Australia and India indicating that severe rusting had brought about the complete seizure of the engine during the outward voyage. Laboratory experiments proved that the use of this type of rust preventative was not suitable for protection under shipping conditions and alternative methods had to be sought. Extensive investigations, which involved the testing of complete engine units in a humidity cabinet, proved that an oil-based or non-solvent-containing preservative was desirable in this particular case, and protective compounds of this nature have since been adopted as standard practice.

*Editor's Note.* These extracts from Mr. Shipley's paper are published here, not only because motor-cars are such an important export from the United Kingdom nowadays, but also because much of the material in this paper is of such general meteorological interest to ships' officers. They are published by kind permission of the North-East Coast Institution of Engineers and Shipbuilders.

Between 1949 and 1951 many motor-cars arriving in far-off countries, mainly Australasia, were found to be affected by mould growth on the upholstery and blistering of the exterior paint finish. Such deterioration was perhaps somewhat surprising since many of the vessels had been built during the post-war period and were equipped with more advanced types of hold-conditioning apparatus than their pre-war counterparts, in whose day it has been said such trouble was rarely encountered, although admittedly a smaller volume of cars was exported.

Before describing the work that has been carried out to overcome these troubles, it may be as well briefly to outline the nature of the problem: damage of upholstery materials by "mildew" and of paint finishes by blistering.

"Mildew" is the attack of textile materials by moulds or micro-fungi and leads to the well-known musty smell and discoloration of the materials; extreme attack can cause decay or rotting shown by a loss of strength; mere discoloration of fabrics often means rejection and replacement at considerable cost. If the surrounding atmosphere at any time becomes warm and humid mould spores rapidly germinate and may form flourishing colonies which may ruin or at least produce unsightly marks on materials on which they are growing. Such an atmosphere is quite frequently produced in the hold of a vessel which has to pass through the tropics from an initially temperate zone.

Unfortunately these warm, damp and possibly stagnant atmospheres can also have a disastrous effect on automobile paint finishes; even the best paint films are permeable to water vapour and if, due to very high atmospheric humidity or even condensation on the surface, penetration does occur it may set up forces sufficient to weaken the adhesion between the various coats or the adhesion of the whole paint structure to the underlying metal. As a result blisters may form.

Deterioration of motor-cars in the above manner is a serious matter, and the cost of rectification has in the past amounted to large annual sums, for in numerous cases deterioration has been so severe that vehicles have had to be cleaned down to the bare metal, completely resprayed and the interior trim completely removed and cleaned or even replaced.

With these facts in mind the investigations about to be described were embarked upon.

### **Early work**

The initial experiments carried out at the end of 1949 concerned a number of completely built cars packed in standard wooden boxes. Two methods of treatment were used:

- (1) Enclosure of the vehicle by means of a thin plastic film (polythene) which was completely sealed to prevent ingress of moisture and which contained a desiccant, silica gel, to absorb the enclosed moisture. This treatment was designed to protect both interior and exterior of the vehicles.
- (2) Partial cocooning of the paintwork by means of special plastic materials, similar to those used for the protection of warships and aeroplanes stored by the Ministry. In the tests this treatment was used only to protect the paintwork, not to seal off the vehicle completely as in the case of the polythene film.

The results of this work indicated that enclosure in a plastic film was a completely successful method of protection, but unfortunately was so expensive in both cost of materials (approximately 30s. per car for plastic sheeting alone) and labour that it was considered quite impracticable for large-scale packing.

Cocooning of the paintwork was also a failure as the plastic solutions applied at that time seriously affected the automobile paint finishes, whether cellulose or synthetic.

### **More extensive investigations**

It was soon realised that further work had to be carried out in order to find less expensive methods of protection. Investigation included the following:

- (1) Determination of conditions prevailing in the holds of vessels during long-period voyages.
- (2) Survey of vehicles delivered to Australia through a specific period of time, with an assessment of the cost of rectification of damage.

#### CONDITIONS DURING SHIPMENT

It was obvious that notwithstanding the fact that quite a few ships were equipped with modern air-conditioning apparatus, very adverse conditions were developing inside holds during the voyage, and in order to throw light on the matter it was considered essential to determine the actual conditions prevailing inside individual cars. As no commercial apparatus was available, an instrument had to be specially developed to record temperatures and humidities at intervals throughout the complete voyage, from the packing shop in the factory to the point of unpacking at the final destination of the car. The essential features of this instrument are as follows:

A dial thermometer, reading from 20°F to 220°F, and a hair hygrometer, reading from 20 per cent to 100 per cent relative humidity, are situated at one end of an air-tight and light-tight container; the dials are photographed at hourly intervals on 35 mm. film by a specially designed camera located at the other end of the container. The number of recordings which can be made by means of this apparatus is limited only by the length of cine-film carried by the camera; in our experiments 2,400 recordings were possible, i.e. records for a total period of over three months can be made. Only cased cars have been used for these tests, since more severe mould growth is obtained in packed cars than in those sent as "deck cargo". Since the instrument was built it has only been possible to obtain records on five separate voyages, but these have given some indication of the conditions which are likely to be encountered.

In addition to the readings provided by the instrument it is necessary to obtain the temperatures and dew points of the deck atmosphere and general hold atmosphere, and for this purpose the assistance of the officers aboard each ship carrying the instrument had to be enlisted; every assistance was given by shipping companies and their officers throughout the tests.

Table 1 summarises data relating to the five voyages; the location of the experimental pack, the construction of the hold and type of ventilation, the route taken by each vessel and the out-turn report on each vehicle being given.

**Table 1—Data Relative to voyages with Recording Hygrometer**

Shipment	Location	Type of Hold	Type of Ventilation	Route	Period	Out-turn Condition of Car
A	No. 3 Lower hold	Insulated	Mechanical	Cape	Feb.-April	Mouldy
B	No. 2 " "	Insulated	"	Panama	Nov.-Jan.	Mouldy
C	No. 2 " "	Not Insulated	Natural	Panama	June-Aug.	No mould
D	No. 4 " "	Insulated	"	Suez	Oct.-Dec.	No mould
E	No. 1 " "	Not Insulated	"	Cape	Feb.-April	No mould

The records obtained to date have been plotted on the series of graphs two of which are shown in Figs. 1 and 2 (voyages A and C); these show the temperature and relative humidity as supplied by the recorder (i.e. conditions inside the car), together with dew point of the deck atmosphere and temperature in the lower hold as measured by the ships' officers—in certain cases these temperatures were measured by means of thermometers permanently installed inside the hold and in other instances the readings were taken by a member of the crew actually descending into the lower hold. These records have provided the following information:

- (1) Relative humidities of 80 per cent or more are regularly attained and maintained inside packed cars during the voyage to Australia.
- (2) Associated with these relative humidities, temperatures of 75°F or more are frequently reached.

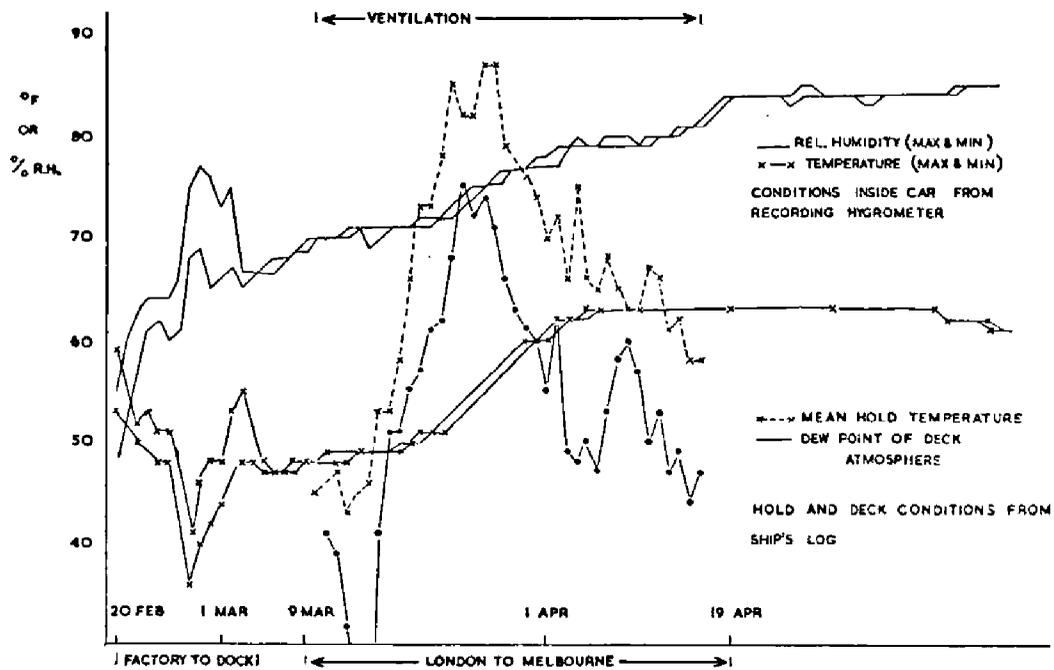


Fig. 1. Voyage A.

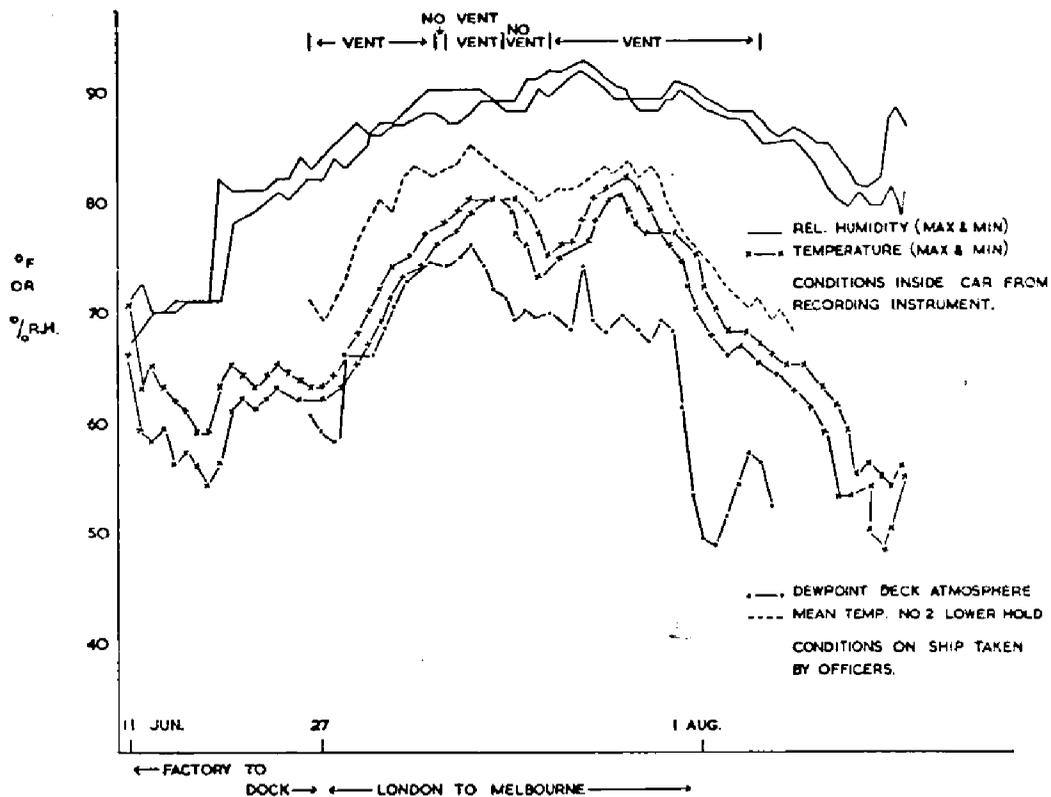


Fig. 2. Voyage C.

- (3) Such combinations of temperature and relative humidity do not necessarily produce mould growth—the reason for this is not fully understood, although it seems that stagnation, at least to some degree, and the presence of moisture droplets (i.e. condensation) on the affected surfaces are essential features of mould propagation. Compare voyages A and C: in voyage A, temperature and relative humidity are relatively low but condensation, due to ventilating while the atmospheric dew point was above the hold\*

\* Cargo temperature.

Note. In Fig. 1 the dew point is represented by the same symbol as in Fig. 2 (i.e. a line separated by dots).

temperature, was probable—mould growth was present here; in voyage C, temperature and relative humidity were much higher but condensation was improbable—no mould was present in this case. A comparison of voyages A and E would also appear to support the condensation theory. These voyages occurred at identical periods of the year, February to April, and the relative humidity of the atmosphere inside each car took an almost identical course, i.e. from 65 per cent a steady rise to 83 to 85 per cent at journey's end. But there comparison ends, for vessel A had an insulated hold and vessel E an un-insulated hold; thus, due to insulation the car temperature in the first instance rose steadily throughout the voyage but in the second case with no insulation the car temperature fluctuated almost simultaneously with external conditions. Now, as stated previously, due to ventilation on voyage A condensation was probable since the dew point of the atmosphere was well above the surface temperature of the car; on voyage E condensation was unlikely or certainly less likely since the atmospheric dew point only at times reached the surface temperature of the car. Therein possibly lies the answer to the development of mould on the trim of the car in ship A while the trim of the car in ship E arrived in perfect condition.

These voyages also suggest that insulated holds are less suitable than non-insulated holds, for the transportation of general cargo such as cars, since a longer time is required to raise the cargo temperature.

- (4) With cargoes of packed cars, temperatures recorded in hold spaces rarely agree with the true temperatures of the vehicles, and since the errors are on the high side, the risk of "cargo sweat" is greater than would be anticipated from the ship's records. Thus in voyage A, from records taken from the ship's instruments there was every justification for ventilation each day of the trip, but as shown by the recording hygrometer, had the ventilating air impinged on the vehicle surfaces during the period 17th March to 31st March, severe "cargo sweat" would have occurred. Unfortunately we do not know what the degree of ventilation was, but it is significant that there was mould growth on the interior trim on arrival in Australia. In voyage B, however, the hold temperature as measured by the ship's instruments coincided almost exactly with the car temperature given by the recorder and the ships' officers did not permit ventilation for almost the whole voyage as the deck dew point was above the hold temperature. Such a procedure is, I believe, considered correct practice but nevertheless is not always satisfactory for the vehicle in this experiment arrived with mould on the interior trim! Surely, then, something better in the way of hold conditioning is necessary. Also, should not a closer watch be kept on the hold dew point as well as hold temperature?

One solution, perhaps, lies with the use of air-drying equipment with which, in this case, it may have been possible to have reduced the moisture content of the hold atmosphere to below danger point, but all vessels do not have such equipment—this one did not; she did, however, have mechanical ventilation and it may be that this could have been put to better use—after all, rapid ventilation with warm air is one way of raising the hold temperature.

#### FIELD TESTS INVESTIGATING MOULD INHIBITORS, TYPES OF CASE CONSTRUCTION, ETC.

During the period 1951-52 the volume of car exports was such that the larger car manufacturers chartered vessels individually, and thus arose the opportunity for a series of experimental shipments in which cased cars could be specially treated to determine a means whereby mould growth could be reduced, or even eliminated. It was fortuitous that these shipments occurred between October, 1951, and

February, 1952, since it is with cars shipped during these winter months that the greatest trouble due to mould growth and paint blistering is experienced.

Special packs of cars were devised to provide the following information:

- (1) The effect of deliberately produced high humidity inside the car cases: 14 gallons of water were introduced into each case in specially designed trays—these cases were fully lined with Sizalkraft paper to keep in the moisture.
- (2) The effect of treatment of the case timber with mould inhibitors: separate car cases were thoroughly brushed with one of three chemicals, namely, a solution of phenyl mercuric acetate, a solution of lauryl pentachlorophenol and creosote, the timber being allowed to dry thoroughly before the cases were assembled.
- (3) The effect of vapour phase and contact inhibitors inside the vehicles: the chemicals used were thymol and furfural, in the vapour phase, and lauryl pentachlorophenol applied to the trim surfaces in a suitable solvent, as a contact inhibitor.
- (4) The effect of two types of case construction, i.e. crated (ventilated) or close boarded.
- (5) The effect of completely sealing the cases: in some cases sealing was on the inside surface of the timber and in others the whole case was enclosed.

In order to obtain as much information as possible the moisture content of the timber of each case was measured at the time of packing; also the temperature and relative humidity in the packing department. Arrangements were made with the shipping company and stevedores concerned to stow the cases of each consignment in the same section of each vessel wherever possible, i.e. in No. 2 lower hold. It should be mentioned here that the cargo of these vessels comprised mainly cars and that the holds were completely filled. During each voyage records were kept by the ship's officers of the temperature and the humidity conditions prevailing in the ship's holds and on deck.

On arrival in Australia the cars were unpacked and examined in detail for mould growth, the effects of the various treatments being clearly indicated. These are summarised in Table 2.

#### FACTORS INFLUENCING MOULD GROWTH

Several interesting features may be derived from the figures shown in Table 2.

- (1) It can be seen that treatment of the case timber has no significant effect on the prevention of mould growth inside the cars; this is important since it was thought at one time that mould spores present on this timber were a source of infection.
- (2) Assuming that the interior spray of lauryl pentachlorophenol had absolutely no effect, then the contents of packs D, E, F and G, i.e. close-boarded, ventilated, sealed (inside case) and sealed (outside case), were the same, and if the fortunes of packs D, E and F are tabulated the results show the degree of isolation of the contents from conditions outside the cases. Thus it is seen that very little benefit is gained by the use of a crated, i.e. ventilated, case as distinct from a close-boarded case. It would, of course, be advantageous to have a completely skeletonised case, but this is impracticable when timber is used in its construction.
- (3) That the moisture inherent in the timber may have quite an influence on the degree of mould produced is clearly shown by a comparison of packs F and G; in F the timber moisture was locked in whereas in G it was locked out. Nevertheless it is also obvious that ventilation of the hold must also play an important part in removing the moisture exhaled by the timber during rises of temperature, and it would appear therefore that plain mechanical ventilation properly used would be of considerable benefit in the conditioning of a hold atmosphere.

Table 2—Summary of Results of Field Tests

Treatment of Pack		Index of Mould Attack. Max. = 100					
Car	Case	Ship 1	Ship 2	Ship 3	Ship 4	Ship 5	Total
A1 Lauryl Pentachlorphenol	Added moisture	36	14	35	52	100	237
2 Not treated	Added moisture	42	22	39	81	100	284
B1 Not treated	Organic Mercurial	36	36	68	26	100	266
2 Not treated	Lauryl Pentachlorphenol	0	36	55	0	100	191
3 Not treated	Creosote	40	29	48	55	100	272
C1 Thymol	Not treated	10	0	32	6	100	148
2 Not treated	Thymol	36	36	58	50	100	280
3 Furfural	Not treated	0	0	0	0	0	0
D1 Lauryl Pentachlorphenol	Close boarded	0	0	42	6	100	148
2 Not treated	Close boarded	0	0	42	0	60	102
E1 Lauryl Pentachlorphenol	Ventilated	0	0	6	26	100	132
2 Not treated	Ventilated	0	0	23	0	60	83
F1 Lauryl Pentachlorphenol	Sealed inside	—	—	23	19	100	142
2 Not treated	Sealed inside	—	—	6	39	100	145
G1 Not treated	Sealed outside	54	0	42	65	100	261
2 Not treated	Sealed outside	54	36	42	38	100	270

Two important results were obtained from the above field test:

- (a) That lauryl pentachlorphenol, when used as an interior spray, was ineffective as a mould inhibitor.
- (b) The chemical "furfural", a vapour phase inhibitor, completely prevented mould growth in all the tests, and this treatment has been used successfully for the last 15 months.

#### SURVEY OF DAMAGE DUE TO MILDEW AND BLISTERING

In order to give some idea of the extent of damage caused by mildew and paint blistering, a survey was made between June, 1951, and March, 1952, of the out-turn condition of all cased and uncased vehicles sent to Australia during that period. This was not only to provide an indication of the cost of rectification, but also to act as a guide on how to make a further attack on the problem.

The survey covered 130 different shipments comprising a total of 8,843 cars, 6,863 of which were sent in the boxed condition, the remainder being uncrated 'tween-deck cargo.

From the results obtained graphs were compiled showing the percentage of cars mildewed and blistered, plotted against the month of sailing, and these indicate fairly clearly that boxed vehicles despatched from this country to Australia between November and February inclusive are far more liable to damage by mould attack or paint blistering than at any other period of the year: between 40-60 per cent of the cars were affected by mould and 10-20 per cent damaged by blistering. During the whole of this particular survey period 30 per cent of the boxed cars showed mould attack and 12 per cent of cars showed paint blistering. Outside this period the vehicles were relatively free from mould, usually less than 10 per cent of the cars affected, and between sailing dates April and June inclusive paint blistering was almost negligible.

The results on the unpacked cars, which are, of course, stowed in the 'tween-decks of vessels, and consequently are far more likely to be free from stagnation than those stowed in the lower holds, showed that breakdown occurred to a much less extent than with the packed vehicles, mould attack occurring very consistently, irrespective of sailing dates (about 10 per cent of the cars being affected), and paint blistering was more erratic and not related to the sailing date in any way. It should

also be noted that although a considerable reduction in mildew attack is effected by sending cars in the unpacked condition, there is essentially no reduction in the extent of blistering in this manner. This fact would appear to give support to the theory that stagnation plays an important part in mould growth; in the 'tween-decks such ventilation that would produce gross condensation on the vehicle surfaces would also produce fairly rapid changes of atmosphere (since the cars are not boxed), and although paint blisters may be produced by the condensation, mould growth on the internal trim may be less than might be expected because of the better ventilation.

Records were also made of the routes taken by the ships to Australia and the type of ventilation employed by these vessels, but results of this investigation indicate that no particular route appears to offer any definite advantage from the point of view of mould deterioration or blistering. Approximately 80 per cent of the ships studied employed natural ventilation, but the evidence that was available from the ships which used forced ventilation did not point to any advantage being gained by its availability. Naturally of course we do not know that full and proper use was made of the facilities available, and also other factors such as the properties of other cargo stowed with the cars could not be fully determined.

#### LABORATORY TESTS

In addition to the field tests previously described, considerable work was carried out in the laboratory relating to deterioration of the paint work. Severe condensation was promoted on test panels during the early stages of the heating cycle by supporting them on fairly thick wooden blocks, which tended to keep the painted surfaces cool while the surrounding atmosphere became warm and completely saturated with moisture. This effect is analogous to the ventilation of a hold carrying a comparatively cool cargo with a relatively warm atmosphere whose dew point is above the temperature of the cargo.

The type of blistering which is commonly brought about by adverse hold conditions is that known as "water blistering". Examination of films which have failed in this manner indicates that the blisters have occurred in the finishing colour coats, the underlying primer surfacer or filler coats remaining intact. Considerable work has been carried out to find the most suitable primer surfacers or fillers having the maximum resistance to moisture absorption and low pigment solubility.

Numerous experiments were also undertaken to find possible means of preventing vapour from reaching the painted surfaces, e.g. coating these surfaces with protective waxes. Work of this nature is still being carried out, although it seems doubtful whether any protective coating will be found which does not have an injurious effect on the underlying paint film.

#### Conclusions

From the foregoing it will be seen that a great deal of work has been done to overcome the problems of deterioration associated with the shipment of vehicles. Corrosion of metal components and assemblies is now virtually non-existent due to the use of effective corrosion preventives and inhibitors. Mould attack of interior trim can be brought under control by the use of a suitable vapour phase inhibitor, but the damage of paintwork by blistering, a serious and costly business, cannot be entirely eliminated by efforts on the part of the car manufacturers or paint-maker. It is therefore obvious that more adequate knowledge and control of conditions prevailing inside the holds of vessels during long-period voyages will be necessary before these problems can be completely solved. It has been shown that temperatures provided by ships' instruments located in holds do not always give a true indication of the temperatures of the actual cargo and, as is well known, an error of 5° in the recorded temperature can easily mean the difference between a satisfactory and disastrous out-turn.

It is also felt that there is need for the greater use of mechanical ventilation,

possibly together with air-drying equipment, although it may be that mechanical ventilation alone, if properly used in conjunction with accurate records of hold cargo temperatures and dew points of air entering and leaving the holds, could go a long way towards the elimination of those conditions which give us so much trouble.

## **Pilot Balloon Ascents carried out by Voluntary Observers in a Hong Kong Selected Ship**

By Cdr. W. P. GOODFELLOW, D.S.C., V.R.D.

(Cdr. Goodfellow is Marine Liaison Officer for ships co-operating with the Royal Observatory, Hong Kong)

The South China Sea is a particularly interesting region from the meteorological point of view, for in winter the NE monsoon of the China coast frequently converges with the trade winds of the North Pacific in this area, while in summer it is the meeting-place of the trades and the SW monsoon from the Indian Ocean. Moreover tropical cyclones are liable to form over these waters in the summer and autumn months. Upper-air information from this region is thus of great importance for forecasting purposes. Unfortunately the only information of this kind available from the central part of the South China Sea consisted of occasional reports from aircraft in flight, and the possibility of filling this gap by pilot balloon observations from a ship trading in this area was therefore considered.

To provide trained personnel and arrange for them to be accommodated in a merchant ship specially for the purpose of taking pilot balloon observations would normally have been beyond the resources of the Royal Observatory. In the spring of 1953, however, a temporary surplus in the observing staff enabled two of its members to be detached for duties on board a Hong Kong voluntary observing ship.

The Marine Superintendent of the Indo-China Steam Navigation Company Ltd. took an active interest in the project, and thanks to his co-operation two members of our Chinese staff were signed on the articles of the S.S. *Hin Sang* as supernumeraries and sailed for ports in British North Borneo on 4th May, 1953.

During this first voyage, which lasted 21 days, pilot balloon observations were carried out at 0000 and 1200 G.M.T. whenever weather conditions permitted, and all on board showed great interest in these unusual proceedings. Captain Edwards tells us that gasps of wonder and amazement from his Chinese crew greeted the first balloon as it sailed upwards and away to leeward in a fresh breeze, and that subsequent observations were watched by a large audience perched on every vantage point, the better to view the happenings on Monkey Island, where our computers, unused to the heaving and rolling of this seaborne observing station, performed strange contortions in their battle with the legs of the theodolite tripod, and the small elusive image of the balloon in the telescope.

It was soon found that the small 20-gram balloons, provided from stock at the Observatory, and which rise at a speed of 500 ft per minute, could rarely be followed above 10,000 ft when at sea, because above that height the balloon was too distant to be visible through the telescope of the theodolite. Winds at greater heights than this were required to justify the experiment, so while the *Hin Sang* was in Hong Kong after this voyage a supply of 100-gram balloons was obtained from naval sources, and the local railway workshops were commissioned to make the necessary filler valve and weights.

When the *Hin Sang* was due to sail again only one computer could be spared. This necessitated the ships' officers taking an active part in the work. It was the keen interest taken in the project by Captain G. W. F. Edwards and his officers that made possible this second series of observations, since an observer requires at least one assistant to record data, operate the stopwatch and watch the standard compass while he tracks the balloon with the theodolite.

The ascents carried out on this voyage proved that balloons rising at either 700

or 1,000 ft per minute are necessary if winds at greater heights than 10,000 ft are required from a 10-kt ship, but unfortunately one of the hydrogen cylinders on board developed a slight leak and only 24 observations were made before the supply of gas was exhausted.

Before the *Hin Sang* returned it was apparent that a computer would not be available to make another trip, and it was reluctantly decided to cease operations until a trained observer could again be employed on this work. This decision was made without reference to Captain Edwards and his officers, who when they heard of it were emphatic that they could take the observations themselves. This was readily agreed to, and there followed a short course of instruction for the officers at the Observatory, during which the whole operation from inflating the balloon to coding the observations for transmission by w/t was demonstrated and explained.

Briefly the operation is as follows:

A balloon is inflated with hydrogen until it will support a specified weight. The weight the balloon can support controls its rate of ascent which for practical purposes is assumed to be constant.

The balloon is released from the ship and the time of release noted. The path of the balloon, which will be with the wind in the layers of the atmosphere through which it rises, is followed by measuring its angles of elevation and azimuth with a theodolite at regular intervals (generally of 1 min). From the elevation, azimuth and height of the balloon at each time of observation, its true bearing and horizontal distance from the ship are calculated.

The ship's positions at time of release and at each time of observation are plotted and from these the relevant bearings and distances of the balloon are laid off to give its track over the surface of the earth. The height of the balloon at each time of observation being known, the direction and velocity of the wind at selected levels are measured directly from the plot.

A special pilot balloon slide rule is provided to calculate the horizontal distance of the balloon from the ship and to simplify the operation of plotting. The latter is done on an aerological plotting board. This consists of a perspex disc 36 in. in diameter graduated round the edge in degrees, and mounted over a square board ruled off with parallel vertical lines. The disc can be rotated in azimuth about a bearing pin fixed in the centre of the board. Arrowheads at the top and bottom of the board, drawn at the extremities of a vertical index line which passes through its centre, are the marks for reading wind direction and for setting azimuth or course by rotating the disc. Scales for plotting are inscribed on either side of the index line below the centre of the board, so that distances from the centre (i.e. the point of release) can be measured directly, and positions are plotted on the perspex disc over the distance read from the scale in use.

When plotting ascents made while the ship is at anchor, the ship's position throughout is the centre of the disc, and the plotting operation consists of turning the disc to bring successive azimuths over the arrowhead at the bottom of the board and marking the balloon positions on the disc at the relevant distances from the centre.

When the ship is under way plotting becomes more complicated. The ship's positions at each minute or time of observation after release have first to be marked on the disc, and from these the relevant bearings and distances of the balloon are laid off. To do this the disc is rotated as before to bring the degree graduation representing the azimuth of the balloon at the time in question over the arrowhead at the bottom of the board, but the distance is measured from the ship's position at that time, along or parallel to one of the vertical lines and towards the bottom of the board, using a separate distance scale similar to that engraved on the board.

When the complete ascent is plotted, the points marked show to scale the actual plan positions of the balloon at the times the angles were measured by the theodolite, so it is only necessary to ascertain the direction and speed of the balloon between

points to obtain the direction and velocity of the wind at the heights represented, which are the known intervals of time after release.

Wind speed is measured by another scale, graduated to read wind speed in knots from the distance travelled by the balloon in 2 min; i.e. the wind speed 1 min after release is assumed to be the mean speed of the balloon between the point of release and its position 2 min later, and that at the second minute, the mean speed travelled between the first and third minute positions, etc.

Wind direction between these positions is found by rotating the disc until the alternate plotted positions of the balloon are aligned on or parallel to the index line or one of the lines parallel to it, with the later position always nearest the bottom of the board. The direction from which the wind is blowing is then read as the degree graduation on the disc over the arrowhead at the top of the board.

It will be appreciated from the foregoing that ships' officers undertaking this work have to give up a considerable amount of their own time to it, for plotting the ascent and coding the observations in F.M.33A for transmission by w/r may well take as long as the ascent. The ascent itself may last upwards of an hour in good conditions, such as when the direction of the wind at high levels is almost opposite to that at low levels. On these occasions the balloon may be brought back through positions which lie more or less over the track followed near the surface, and make it possible to follow it to over 60,000 ft. This has in fact been done by the officers of the *Hin Sang* on several occasions.

The photograph (opposite page 209) shows the Second Officer of the *Hin Sang* standing by the theodolite and the Third Officer releasing the balloon.

Three hydrogen cylinders were usually carried and no objection to their being stowed on deck was raised by the ship's owners. Balloons were filled from a cylinder on the lee side of the bridge and the final adjustment of "free lift" was made in the wheelhouse with the weather door and windows closed. No special shelter was found to be necessary as the charthouse provided a good lee. The ship being fairly small it proved impossible to track the balloons in winds of over about force 4-5 on account of the lively movement of the vessel.

The theodolite used was of American manufacture, fitted in gimbals on a tripod stand. It operated on the sextant principle for measuring angles of elevation.

### COMMONWEALTH METEOROLOGICAL CONFERENCE

Following the Second Congress of the World Meteorological Organisation in Geneva, the Directors of the Meteorological Services of British Commonwealth countries took the opportunity to attend a Commonwealth Meteorological Conference in London during May.

The object of this Conference was to discuss various meteorological questions which affect the British Commonwealth, to have a general interchange of views and to consider ways and means of achieving greater co-ordination of effort for the benefit of the Commonwealth in general.

A Conference of Empire Meteorologists had been held in 1946 and many of the resolutions which were passed at that Conference concerned maritime meteorology. One of the tasks of the present Conference was to review those resolutions, consider the effectiveness of the action which had been taken and consider what further co-ordination could be achieved at sea.

Among the other questions discussed were: Commonwealth participation in the international Geophysical Year, the establishment of a Commonwealth Institute of Tropical Meteorology, general problems of co-ordination within the Commonwealth and artificial control of rain.

The Conference passed resolutions on the following subjects of a maritime meteorological nature: special efforts to recruit voluntary observing ships operating in unfrequented oceanic waters; encouragement of the scheme whereby ships other than selected ships send short coded "non-instrumental" messages in code form FM23; the institution of a scheme whereby meteorological services of the British

Commonwealth can recruit British selected ships under certain circumstances, provided they treat the ship as if she had been recruited by the British Meteorological Office; measures to ensure that all radio weather messages received from ships are speedily retransmitted; and a Commonwealth scheme for the issue of blank synoptic maps to all voluntary observing ships on request.

Although the results of this Conference will not be spectacular, there seems little doubt that this interchange of views between the Directors of Commonwealth Meteorological Services was useful, for there is no doubt whatever as to the beneficial part that a concerted effort by countries as widely scattered and knowing such a diversity of climate as those of the British Commonwealth can play in the cause of international meteorology.

C. E. N. F.

### EXCELLENT AWARDS FOR CANADIAN SHIPS

We have received a letter from Mr. A. Thomson, Controller of the Canadian Meteorological Division, an extract from which is as follows:

“ We have recently made the selection of officers whose work in marine observing on Canadian selected and supplementary ships during 1954 has merited the presentation of our annual ‘ Excellent Award ’.

“ The awards, which take the form of a book, are made each year to principal observing officers whose work has been above average in quality and quantity of observations. In the calendar year 1954, a total of 68 officers acted as principal observers on the 37 ships which were actively engaged at one time or another during the year. We found that 26 officers had carried out above-average work, and so qualified for an award. Of necessity, however, there were some ships on which there was no officer receiving an award. In these cases we considered the records from the ship collectively. We felt that if such a ship had provided at least the equivalent of 300 observations in a 12-month period, her officers had done good work. On this basis, seven ‘ Ship Awards ’ were made to the masters concerned for inclusion in the ship’s library.

“ This year our ‘ Excellent Award ’ consists of two books: *Life of Captain Cook*, by Hugh Carrington, and *Touching the Adventures*, edited by J. Lennox Kerr.”

#### Excellent Award Winners for 1954 in Canadian Observing Ships

C. A. Bradshaw	S.S. <i>Rincon Hills</i>
J. C. Richards	S.S. <i>Paloma Hills</i> , S.S. <i>Pinnacles</i>
J. C. Crouse	S.S. <i>Rincon Hills</i> , S.S. <i>Paloma Hills</i> , S.S. <i>Pinnacles</i>
G. H. Warren	S.S. <i>Lord Kelvin</i>
F. W. Mauger	S.S. <i>Cyrus Field</i>
E. M. Wilkie	S.S. <i>Imperial Edmonton</i>
J. C. Smith	S.S. <i>Imperial Charlottetown</i> , S.S. <i>Imperial Alberta</i>
A. H. Campbell	S.S. <i>Imperial Toronto</i> , S.S. <i>Imperial Edmonton</i>
G. F. Burgess	S.S. <i>Pinnacles</i>
M. Quinton	S.S. <i>Waikawa</i>
I. S. Murray	D.E.V. <i>Beaverbrae</i>
J. Heath	S.S. <i>Fort Avalon</i>
J. A. Hunt	S.S. <i>Imperial Alberta</i>
A. Hess	M.V. <i>Irvingbrook</i>
J. C. Matthews	S.S. <i>Imperial Alberta</i>
C. D. Maginley	S.S. <i>Fort Hamilton</i>
R. H. Cox	S.S. <i>Wairuna</i>
R. J. Lesslie	S.S. <i>Ottawa Valley</i>
R. P. Chouinard	S.S. <i>Esso Knoxville</i> , S.S. <i>Imperial Alberta</i>
S. H. Willers	M.V. <i>Canadian Leader</i>
F. Barnstead	S.S. <i>Imperial Toronto</i>
W. P. Murphy	S.S. <i>Imperial Fredericton</i> , S.S. <i>Imperial Edmonton</i>
R. Webb	S.S. <i>Waihemo</i>
A. Lamontagne	S.S. <i>Pinnacles</i>
C. Ritcey	S.S. <i>Imperial Toronto</i>
M. Kirk	S.S. <i>Waihemo</i>

### Vessels receiving " Ship Awards " for 1954

S.S. <i>d'Iberville</i>	M.V. <i>Rupertsland</i>
M.V. <i>Fort Hearne</i>	S.S. <i>Waitomo</i>
M.V. <i>Canadian Victor</i>	M.V. <i>Canadian Highlander</i>
S.S. <i>Lakonia</i>	

## ASSOCIATION OF NAVIGATION SCHOOLS

### Annual General Meeting

The Annual General Meeting of the Association of Navigation Schools was held aboard the *Wellington*, headquarters' ship of the Honourable Company of Master Mariners, in London on 13th May, 1955.

The conference was opened by Sir Frederick Bowhill, Deputy Master of the Honourable Company of Master Mariners, who welcomed the Association and its guests and stressed the important job which instructors at navigation schools had in training ships' officers to be seamen and navigators.

Mr. R. H. Senior, Deputy Chairman of the Port Line, addressed the conference on the subject of the National Dock Labour Scheme, and described the advantages and disadvantages of that scheme and some of the difficulties under which it had to operate, as well as the potential value of that scheme in the national economy.

Captain Sir Gerald Curteis, Deputy Master of the Corporation of Trinity House, gave an interesting account of the history and varied activities, past and present, of that Corporation.

Captain F. J. Wylie, Director of the Radio Advisory Service, described some of the pitfalls in connection with the practical use of radar for navigational purposes at sea. He mentioned, for example, how easily targets could be lost in sea clutter or missed altogether due to excessive use of anti-clutter suppression and also that targets could be lost in rain due to the use of excessive gain. Interpretation of the radar picture was difficult at times and needed experience, especially in narrow waters and among rainstorms and sea clutter.

A particular aspect which Captain Wylie rightly stressed was the importance of regular practice in plotting, but even here the custom of plotting in relation to the ship's head could become a pitfall because in such a case there is a tendency to lose sight of the compass bearing.

As is customary at these conferences, the Principal Examiner of Masters and Mates (Captain H. Topley) gave a resumé of the examination results during the year; as mentioned in an earlier number of *The Marine Observer*, he recently succeeded Captain Quick in this appointment. The following table shows the percentage frequency of successful candidates in each category, compared with the figures for 1953:

	1954	1953
Master .. ..	63·1	61·9
First Mate .. ..	62·2	65·5
Second Mate .. ..	54·5	55·2
Master H.T. .. ..	64·2	68·0
Mate H.T. .. ..	58·3	60·0
Average .. ..	58·3	59·1

C. E. N. F.

## Letter to the Editor

### PECULIAR STRATIFIED SHAPE OF TYPHOON WAVES

SIR,—While M.V. *Tancred* of the Barber Line was riding out the typhoon of early October, 1954, in Kobe Bay, we were able to observe a unique shape of typhoon wave which, so far as we know, has not been described. The vessel was hove-to with two anchors down facing the incoming gale (72 kt), and the waves with crests up to 10 ft and 15 ft were passing neatly along her side. From the rail we were struck by the peculiar appearance of the wave-slopes facing the wind.

On many of these there were a number of well-defined steps carved, so to say,

into the water just like the steps of a ladder, starting from the trough of the wave up to about half its height. Although the waves were moving quickly the steps remained steady, extending parallel to each other for one or two metres in length. There were at times as many as 20 of these nicely successive steps cut into the body of the wave. We tried to photograph them, but the very poor visibility and the fast motion of the waves resulted only in a blurred print.

Were these steps carved in the wave slopes by high harmonics of the period of the typhoon squalls? These higher harmonics have been registered by sensitive modern microbarographs, and they might have something to do with the quite peculiar screaming of the wind often reported by seamen during the squalls of tropical storms. Strangely enough this peculiar whistling has never been noticed in the squall line of extratropical storms.

St. Louis University,  
St. Louis 3, Missouri.

E. GHERZI, S.J.

*Note.* This interesting letter, first published in *Nature*, February, 1955, and reproduced here by permission of the editors, was forwarded to *The Marine Observer* by a member of the staff of the Imperial College of Science and Technology, London, who is carrying out a research into the formation and growth of sea waves. Additional observations of this sort will be welcome, even if they refer to waves raised by winds of quite extraordinary speed, because certain effects which may be present in lighter winds are thereby exaggerated and made more prominent.

## Book Reviews

*A Handbook of Sailing Barges.* By F. S. Cooper. 7½ in. × 5 in. pp. 112. *Illus.* Adlard Coles Ltd., 1955. 12s. 6d.

Anyone who is familiar with the London river must also know the Thames sailing barges, at one time a very numerous fleet, but now reduced to a mere handful. This little book, one of the now familiar "Ship Series", traces the history of these craft, the evolution of their hulls and rigging, up to the present century, when they attained their greatest efficiency and beauty. For her large size the Thames sailing barge is undoubtedly one of the handiest craft under sail; only two men are needed. The writer of this note has even seen a sailing barge get under way from an anchor, set all her sails one by one and tack down river, all done by one man alone. The book contains chapters on the construction of the vessels, their masts, rigging and sails, their handling and maintenance. The author has described clearly the great simplicity of all the gear which has been evolved over centuries of experience. A large number of excellent drawings in line and line and wash show the various types of barge and their rig and the details of their structure, fittings and gear.

A few years ago these vessels were very numerous in the London river; there were about 2,000 of them at the turn of the century, but they have naturally been gradually ousted by powered craft. At the beginning of the 1939-45 War there were still some 600 of them in service. It is a remarkable fact that a number of them sailed to the Clyde during the war. This was no mean achievement for such shallow-draught, flat-bottomed craft, with their rather cumbersome heavy sprit mainsail, although some of the larger ones had been accustomed to making short coastal voyages. At the end of the war only about 300 remained, and many of these had engines and so were no longer pure sailing barges. By 1950 there were only 80 left under sail alone. Since then some have been converted into yachts, and very comfortable, roomy vessels they must be. One or two have actually been built as yachts.

Some of the barges were very long-lived. One that was built in 1803 was still trading in 1930 and is reported to be still afloat as a houseboat. These old wooden barges were very stout vessels. The book gives an account of a coastal barge called the *Lady Daphne* which survived a severe gale in the Channel in December, 1928.

Bound for Fowey from Weymouth she was attempting to make Plymouth for shelter in a NE'ly gale and heavy snow squalls, when her skipper was lost overboard and her sails, with the exception of the bow-sprit jib, were blown away. Her crew were taken off after a 12-mile chase by the Lizard lifeboat. The abandoned barge sailed through Crow Sound in the Scillies and beached herself on Tresco. Three days later she was salvaged, towed to Hugh Town and finally to the mainland for refit.

At the back of the book there are appendices of rigging, etc., and an index of owners and their house flags. There is also a list of the barges still in service and an index of the vessels mentioned in the text. The title of the book would perhaps have been better as *A Handbook of Thames Sailing Barges*, for no doubt there have been barges of a different rig under sail in other parts of the world. Old-fashioned seamen would consider that the term "aft of" the masthead (page 73) should have been "abaft". Also on page 73 is diagram No. 40 which shows the order in which the standing rigging is put over the masthead. This seems to contain an error, as traditionally the starboard pair of shrouds should go on first, not the port pair as is shown. The same mistake is made in Fig. 42. These, however, are small matters in an excellent book. Anyone who is interested in sailing craft should derive pleasure from this little volume.

C. H. W.

*Further Outlook.* By F. H. Ludlam and R. S. Scorer. 8½ in. × 5½ in. pp. 174.  
*Illus.* Allan Wingate. 15s.

Now that weather forecasts have become such a feature of the radio programme and more recently on the television programme, the man in the street has probably become more interested in the general subject of meteorology than ever before. The centenary celebrations of the Meteorological Office have further tended to stimulate interest in the subject among the general public. *Further Outlook*, written for the layman by two well-known professional meteorologists, appears at an opportune time. As Sir David Brunt (formerly Professor of Meteorology at London University) says in the foreword: "This book, written by men who have established themselves as experts in meteorology, is recommended to the reader as a sound exposition of the growing meteorology of today."

This book is designed to appeal to all who are fascinated by meteorological problems for their own sake. The authors' aim is set out at the start: "... we have tried to explain a philosophy of the science of weather study which will enable us to understand its probable future achievements. We hope also that in describing some of the more important atmospheric processes . . . the reader's appetite will be whetted. There are texts for those who wish to delve deeply into the science; for others there is always the sky to watch."

The authors manage to convey to the reader a readable scientific description of the atmosphere and weather generally, and the difficulties of forecasting its behaviour without going into mathematics. The book is well illustrated and understandable by anybody with normal intelligence. The titles of the chapters themselves give a précis of the book, for they are as follows: The Weather We Observe; Atmospheric Processes; The Turbulent Atmosphere; Exploiting the Atmosphere; the Art of Forecasting; The Science of Forecasting; Weather Control; Uncertainties.

One criticism of the book is that it tends somewhat to stress the aviation aspect. This is perhaps natural when one knows how keen one of the authors is on the art of soaring, and some of the points he brings out about the behaviour of birds in flight are indeed extremely interesting. The authors do not lose sight of the maritime aspect, for they rightly stress the fact that the initiative for organising simultaneous observations of weather over wide areas came principally from seamen "who wished not only for indications of existing storms but also for climatological summaries of ocean weather as a help in choosing routes favourable for quick passages". The authors stress the many difficulties of the forecaster who "all the

while has to watch the clock", and that he can rarely afford to spend "more than an hour over his analysis, and some of this time may have to be sacrificed to allow the plotter to enter upon the chart late information from some important region". He explains the difficulty that the forecaster often has in wording the forecast and the usefulness of such words as "perhaps", "probable" and "risk of".

In the chapter entitled *The Turbulent Atmosphere* the authors discuss in some detail the complexity of the wind and its behaviour—a subject of considerable interest to the seaman—and they take the reader into a fascinating world of whirls and eddies (from the whirls and plumes of smoke on the leeward side of a chimney to the enormous eddy which is a cyclone), and we begin to realise why the wind is frequently so gusty and why it is so difficult to find a draught-free place on the bridge of a ship, and why the exposure of such instruments as anemometers and rain-gauges is so difficult to arrange aboard ship.

Among the modern aspects of meteorology which the authors discuss are the use of electronic computing machines to assist in forecasting the weather for short periods, and the modification of rainfall by cloud seeding.

The diagrams are numerous and mostly original. For the mariner the cloud photographs alone would commend this book to his attention—and the text would certainly help him to understand a bit more about the science of meteorology and how it has progressed during the past 100 years—helped as it has been by the mariner's own observations.

C. E. N. F.

*Admiralty Manual of Seamanship*, Vol. III, 1951. 9 $\frac{3}{4}$  in. × 6 in. pp. viii + 484.  
Her Majesty's Stationery Office, 1954. 12s. 6d.

As stated in the Preface, this volume "comprises information on the more advanced aspects of seamanship and is intended as a book of reference for seamen of experience". Although produced by the Admiralty it is by no means intended solely for the Royal Navy; officers of the Merchant Navy will find much useful advice and information in practically every one of the 19 chapters. This is more particularly so in the chapters dealing with the duties of the Officer-of-the-Watch at Sea, Handling Ships in Narrow Waters, Handling Ships in Heavy Weather, Towing at Sea, Moorings, Salvage Operations, Fire Fighting, Abandoning Ship, Survival and Rescue, Ship Stability and Cargo Stowage.

Chapter I deals with the duties of the officer-of-the-watch in harbour, and although much of it is entirely naval custom, the paragraphs on the safety of the ship and her crew apply to all ships. The notes include such matters as precautions against fire and the safety of men working over the side or aloft. The chapter on Officer-of-the-Watch at Sea stresses the importance of being prepared to take immediate action, which depends largely on having thought out beforehand what to do in various emergencies such as "man overboard". There is much other useful advice in this chapter. To quote one such piece of advice: "He should therefore keep himself informed of the ship's position and keep a check on her navigation or pilotage. No one is infallible and no instrument is absolutely reliable, and a conscientious check by the officer-of-the-watch on the navigation and pilotage of the ship is one of the greatest safeguards against a stranding caused by human error or a mechanical fault."

The Rule of the Road Regulations, 1948, are given in full in Chapter III. Chapter IV, *Manoeuvring in Company*, is not of course a matter that affects merchant ships as a rule, except when having to sail in convoy. Chapter V, one of the longest in the book, is on *Handling Ships in Narrow Waters*. It will repay study by any officer, and it points out that "experience in handling different types of vessels in different circumstances is naturally of great value, but is not essential if the ship-handler has a good knowledge of the principles of handling ships and of seamanship in general". The chapter deals with propeller and rudder action, steering when going astern, the effects of loading and trim, of shallow water and of

wind. There are some excellent diagrams illustrating the various means of turning short round in harbour without tugs and showing methods of taking a ship alongside in a wind and without tugs. Docking and undocking are also dealt with in this chapter and there is much useful advice on anchoring and weighing.

Chapter VI is on Handling Ships in Heavy Weather and contains much food for thought. Towing at Sea, Chapter VII, is a job that any officer may be suddenly called upon to do, and the chapter on this subject gives many useful hints and should encourage the reader to think out beforehand the methods of dealing with such an emergency as applied to his ship. Obviously a well thought-out plan of the method of passing the tow rope, of leading and securing it and the prevention of bad nips and chafe are important matters in carrying out this difficult job, which may have to be attempted in bad weather and perhaps at night. It is no doubt the dream of every ship's officer at sea that some day he will come across a fine fat salvage job, with the prospect of a large award if it is successful. Chapter IX on Salvage will therefore be well worth reading. Fire Fighting is dealt with in Chapter XII and Abandoning Ship, Survival and Rescue in Chapter XIII, both full of extremely useful information. Cargo Stowage is dealt with shortly in Chapter XIV and contains a glossary of terms and much other useful information. The inclusion of a chapter on Cargo Stowage and on types and design of merchant ships and tonnage measurement may be taken as an indication of the importance that is attached by the Admiralty to the need for officers of the Royal Navy being to some extent "Merchant Navy minded".

The book contains much information based on the experiences gained in the 1939-45 War. Many of the situations and predicaments dealt with are fortunately rare, but a study of them will help to keep in mind the important points in dealing with emergencies. The book is clearly written and very well illustrated and contains a comprehensive index. It would be useful to any officer at sea, particularly to Chief Officers. It is published by H.M. Stationery Office at the very reasonable price of 12s. 6d., and it can confidently be recommended.

C. H. W.

## Personalities

RETIREMENT.—COMMANDER C. H. WILLIAMS, R.D., R.N.R., who has become well known to the masters and officers of innumerable ships during the long time that he was Port Meteorological Officer in London, retired from the Meteorological Office on 16th July, 1955.

Born in 1892, he went to sea in 1908 as an apprentice in the four-masted barque *Hougomont* (2,239 tons), owned by Messrs. J. Hardy & Co. of Glasgow. While aboard this ship he assisted in keeping the meteorological logbook, the fair copy of which is still in this office. On completing his apprenticeship he was promoted acting Third Mate during his last voyage in that ship. He passed his examination for Second Mate in 1913 and joined the Union Castle Line as 4th Officer. In April, 1915, he joined the R.N.R. as a Sub-Lieutenant and served in armed patrol vessels until his promotion to Lieutenant in 1916, when he took command of an anti-submarine trawler in home waters. From 1917 to 1919 he was in command of armed trawlers in the Mediterranean, and he then returned to the Union Castle Line as Third Officer.

In 1930, having served as Chief Officer in cargo ships and First Officer in mail ships, he left the Union Castle Line on being appointed to the newly created post of Port Meteorological Officer in London.

Commander Williams had always been interested in meteorology, and when he was Third Officer with the Union Castle he made what is believed to be the first weather map to be plotted at sea in a merchant ship.

In 1940, owing to the severe bombing which had occurred in the London docks, it was decided to close the Port Meteorological Office in London and Commander Williams thereupon volunteered for service with the Royal Navy. He worked on

the Naval Staff of the Admiralty (in the Trade Division). While he was there he prepared—as a spare-time occupation—the comic illustrations for the Admiralty Merchant Shipping Instructions. From June, 1943, to June, 1945, he served as a Commodore of coastal convoys, primarily in the North Sea, and he also took part in the Normandy landings. For his war service he was Mentioned in Despatches.

In 1945 he returned to the Meteorological Office as Port Meteorological Officer in London. In August, 1954, owing to the serious illness of Commander Hennessy, he was appointed Deputy to the Marine Superintendent at Harrow, and he has occupied that post ever since.

Commander Williams is a member of the Honourable Company of Master Mariners and of the Society for Nautical Research. A keen artist, his drawings under the initials "C. H. W." must be familiar to all readers of *The Marine Observer*.

We feel sure that the many friends he has made among the corps of voluntary observers will join us in wishing him health and happiness during his retirement.

C. E. N. F.

RETIREMENT.—CAPTAIN H. D. HOOPER, O.B.E., retired in February, 1955, after 45 years at sea, 41 years of which were spent with the Royal Mail Line. Captain Hooper served his apprenticeship in sail with J. Joyce and Co. of Liverpool, his first ship being the *Irly*. After passing his Second Mate's examination in 1914 he joined the Royal Mail Line as Fourth Officer of the *Trent*. During the 1914–18 War he served as an R.N.R. officer in H.M.S. *Hyacinth* and also ashore in East Africa. Returning to the Company after the war he passed through the usual grades and was promoted to his first command in the *Culebra* in 1939. He subsequently commanded many Royal Mail liners, and in August, 1953, was appointed Commodore of the Company's flagship *Andes*.

During the last war Captain Hooper was officially commended for magnificent work whilst serving in the *Brittany* in evacuating 1,500 Britons from Casablanca, and later he was congratulated by the Government for his work in the Far East after the Japanese surrender, whilst in command of the *Highland Monarch*. In the Birthday Honours List of June, 1946, he was awarded the O.B.E., for "meritorious sea service". Captain Hooper's first association with the Meteorological Office as a voluntary marine observer was in 1925 when he was in the *Orduna*. He has since contributed a number of excellent meteorological logbooks.

We wish him good health and happiness in his retirement.

J. R. R.

OBITUARY.—It is with regret that we record the death, which took place suddenly at the age of 48, of CAPTAIN J. A. SOWDEN of the Union Castle liner *Durban Castle*.

J. A. Sowden joined the Union Castle Mail Steamship Company as a junior officer in 1927 and was promoted through the usual ranks. His first command was in the *Rochester Castle* in 1944. He subsequently commanded several other ships in the Company, joining his last ship, the *Durban Castle*, in 1952.

Captain Sowden's first association with the Meteorological Office was as an officer in the *Llandaff Castle* in 1938. From the end of the war until the present year he contributed several excellent logbooks.

C. H. W.

## Notices to Marine Observers

### Observations in the North Sea

As stated in the April and July, 1955, numbers of *The Marine Observer*, the Meteorological Office is making a special effort to encourage ships to send radio weather messages when in the North Sea area. Although messages in the full code form FM21A are preferable, messages in the shortened form of codes FM22A or FM23A will be extremely useful and the message can be sent either by w/T or R/T as convenient.

It is desirable, as a general rule, that such messages should only be sent when the ship is outside of 20 miles from shore.

If any British ship in the North Sea area is unable to clear such a message direct to a British coast station she can send the message free of charge as follows:

- (a) Scheveningen Radio: the message being addressed " KNMI De Bilt ".
- (b) Blavand Radio, or Skagen Radio: the message being prefixed " OBS " and addressed to " Vejrtjenesten, Kobenhavns lufthavn ".
- (c) Bergen Radio: the message being addressed " Met. Bergen ".

In all cases it is desirable that the message should include the preamble " OBS ".

### 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 Observers' 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.

### Notice to Trawlers

At our request the Canadian Meteorological Service introduced on 1st July, 1955, a special forecast schedule from radio station CFH Halifax for the benefit of trawlers fishing off the west coast of Greenland. These forecasts are broadcast twice daily, immediately following the forecasts for the west and south coast of Newfoundland and the Grand Banks. These forecasts begin at 0900 G.M.T. and 1730 G.M.T. daily and are transmitted on the following frequencies:

115.3, 4271, 6425, 8542, 12813 and 17084 kc/s.

The areas included in these West Greenland forecasts are as follows:

- (a) *West Farewell*: Southern limit 60°N; Northern limit 63°N; Western limit; the line joining 60°N 49'W and 63°N 55'W.
- (b) *Little Hellefiske Bank*: Southern limit 63°N; Northern limit 66°N; Western limit; the meridian of 55°W.
- (c) *Great Hellefiske Bank*: Southern limit 66°N; Northern limit 69°N; Western limit; the meridian of 56°W.

The Canadian Meteorological Authorities have particularly requested that trawlers when fishing in that area, send radio weather messages to Radio Station CFH whenever practicable in order to assist the Canadian Authorities in preparing these forecasts. The accuracy of the forecast will very much depend on the amount of meteorological information which trawlers themselves can send to the Canadian Authorities by radio.

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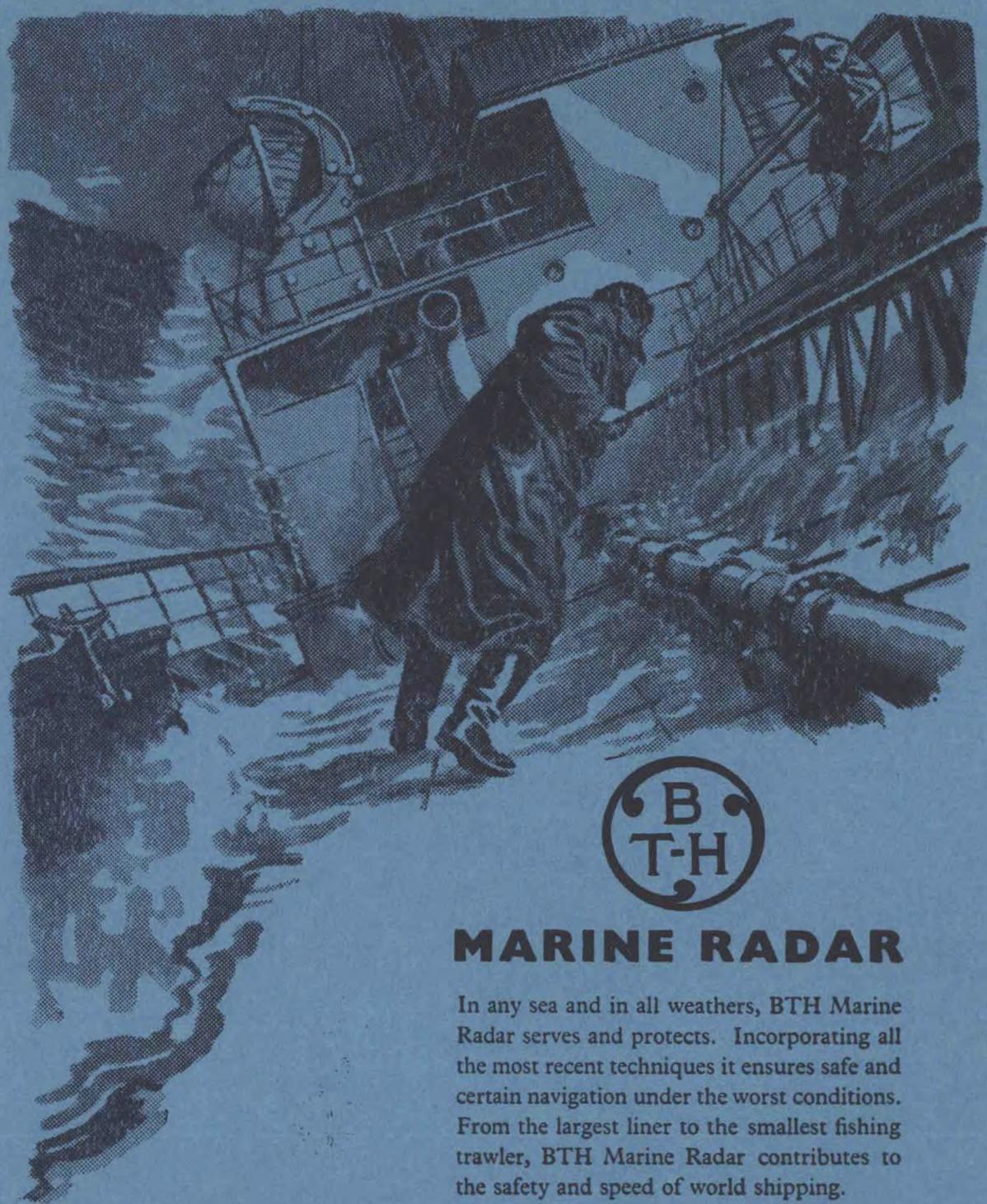
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