

VOL. VII. No. 77.

THE MARINE OBSERVER.

MAY, 1930.

TABLE OF PRINCIPAL CONTENTS.

	PAGE	
The Marine Observer's Handbook, Fifth Edition	99	Lithographic Illustrations after page 118 :—
The Marine Observer's Log (with illustrations)	100	Ships' Wireless Weather Signals, Chart VI.
Wind, Fog and Mist, S.W. Approaches to Great Britain and Ireland	106	Currents on the Tracks from Cape Leeuwin to Perim, direct and via Colombo (Eastern Portion)— May, June and July.
Sea and Swell (with illustrations)	106	Wind and Fog Roses, S.W. Approaches to Great Britain and Ireland and Approaches to Table Bay— May.
Weather Signals :—		Mean Sea Surface Temperature Charts, Mediterranean— May.
List of Wireless Stations detailed to receive Routine Coded Weather Reports from "Selected Ships"	114	
Azores, Portugal, Mediterranean (Western and Eastern)	115	

THE MARINE OBSERVER'S HANDBOOK. FIFTH EDITION.

The fifth edition of MARINE OBSERVER'S HANDBOOK will be published by the time this number is out. A copy will be sent to the Captain of every ship in our list as part equipment for the use of the observing officers. This book has been thoroughly revised and brought up to date. The experience gained and the developments made in the three years since the fourth edition was published have made it necessary to rewrite a great deal of the book. It now contains a complete and concise general description of Marine Meteorological work, also full instructions and guidance for Meteorological Observation at sea based upon modern experience and practice, together with descriptions of instruments, their care and use, and all the necessary International scales and notations, with an appendix giving Tables for the correction of instruments and conversion of the different units of measurement employed in the meteorological services and ships of different countries.

The book in fact embodies the results of 10 years post-war work to which Wireless Telegraphy and renewed interest of Marine Meteorology in the Merchant Navy has given such an impetus.

Its publication following so closely the International Conference of Safety of Life at Sea, London, 1929, the British Empire Meteorological Conference, London, 1929 and the International Meteorological Conference, Copenhagen, 1929, it contains information and advice conforming to agreement reached at those Conferences.

Thus it is hoped that all will adhere to the methods, scales and notations given in this book. Of recent years changes have been all too frequent. Only by a long period of freedom from such changes and by work with uniform scales and notations can it be hoped to effectively deal with data collected, so that the great problems of

Marine Meteorology may have some chance of being solved and suitably compiled information be made available to aid navigation.

This fifth edition should be brought into use on May 1st, 1930, not before, and from that date the use of the 4th edition should be discontinued. Though this book is specially designed for the Corps of Voluntary Marine Observers, it will be found useful for general sea service and candidates for the Board of Trade examinations will find all the necessary information of International scales in it.

This new edition is supplied to regular observing ships with an improved cover of limp cloth so that it may be better preserved, and all members of the Corps of Voluntary Marine Observers are asked to take all possible care of the copy supplied to their ship.

MARINE SUPERINTENDENT.

London.

February 12th 1930.

THE MARINE OBSERVER'S LOG.

It is hoped that these pages will be filled each month with a selection of the contributions of Mariners in manuscript, or remarks from the Logs and Reports of regular Marine Observers. Responsibility for statements rests with the Contributor.

TIDE RIP.

Indian Ocean.

THE following is an extract from the Meteorological Report of S.S. *Tilawa*, Captain P. W. ROWE, Hong Kong to Calcutta.

"May 8th, 1929, at 4.10 p.m., in Latitude $8^{\circ} 55'$ N., Longitude $97^{\circ} 13'$ E. Vessel passed through strong tide rip. This tide rip extended in a North and South direction as far as the eye could see. It was about 2 cables in width and the waves which were from the Eastward were from one to two feet high. Several other smaller rips were seen in this vicinity, all of which lay in a N. and S. direction."

DISCOLOURED WATER.

North Atlantic.

THE following is an extract from the Meteorological Log of S.S. *Clan Macphee*, Captain J. B. GOURLAY, Cape Town to Barbados. Observer Mr. E. H. O. STONE, 2nd Officer.

"May 21st, 1929. In Latitude $10^{\circ} 18'$ N., Longitude $54^{\circ} 22'$ W., from 3.15 p.m. to 3.40 p.m. passed through area of discoloured water, the water was a light green colour with small patches of brown, there was also a very strong smell like that of seaweed. The temperature of the sea at the time was 81° F. and the density 1020.0. There was a light E.N.E. wind, moderate sea and N.E'y swell. At 4.00 p.m. the density was found to be the same as at noon, 1024.5."

SPEED OF PORPOISES.

THE following reports have been received in response to the Notice under the above heading published on the back of the Ice Chart in the June and September 1929 MARINE OBSERVERS.

North Atlantic.

THE following is an extract from the Meteorological Report of S.S. *Accra*, Captain J. B. WRIGHT, Liverpool to West Coast of Africa. Observer Mr. R. B. ELLIS, 2nd Officer.

"On May 14th, 1929, at 1.45 p.m. A.T.S., in Latitude $22^{\circ} 23'$ N., Longitude $17^{\circ} 10'$ W., met a shoal of porpoises. Ship was doing 14.25 knots. Water temperature 66° F. Density 1026. A porpoise swam parallel to the ship, about 40 feet off amidships for 60 seconds, and lost approximately 200 feet. Estimated speed 12.25 knots. Another porpoise swam parallel for 18 seconds, about 30 feet off the ship, abreast of the foremast, and gained 100 feet in a 6-seconds spurt. Estimated speed for 12 seconds 14.25 knots, and for last 6 seconds 24 knots. Another porpoise swam parallel about 30 feet off, abreast of the foremast for 34 seconds, and gained 50 feet by steady leaps from the water. Estimated speed 14.9 knots."

Off Coast of Victoria, Australia.

THE following is an extract from the Meteorological Log of S.S. *Baradine*, Captain C. H. C. ALLIN. Observer Mr. C. B. ROCHE, Chief Officer.

"25th May, 1929, 11 a.m. standard time of Victoria, Australia. Two large porpoises were swimming ahead of the ship evidently with the greatest of ease; they zig-zagged across the stern sometimes swimming on their backs, sometimes rolling over and over. They kept this up for ten minutes. The ship was steaming 15 knots approaching Port Phillip Heads."

THUNDERSTORM.

North Atlantic Ocean.

THE following is an extract from the Meteorological Log of S.S. *Carnarvon Castle*, Captain W. F. STANLEY, R.D., R.N.R., Cape Town to Madeira. Observer Mr. H. L. SHAW, 2nd Officer.

"5th May, 1929, 03.00 ship's time (0349 GMT). Latitude $3^{\circ} 30'$ N., Longitude $12^{\circ} 00'$ W. Whilst a heavy thunderstorm from the N.W. accompanied by torrential rain, was passing over the ship, an extraordinarily vivid flash of lightning appeared to strike the ship, blinding myself and Quartermaster at wheel for several seconds. The lightning appeared to leap up and down on the bridge deck, with a sharp sizzling sound. The wireless aerial, single wire suspended between fore and main, appeared to be white hot from end to end, with small blue lights hanging from it. It remained in this state for 15 minutes.

Japanese Waters.

THE following is an extract from the Meteorological Log of S.S. *Tanda*, Captain E. T. PILCHER, Nagoya to Kobe. Observer Mr. R. S. MILLINGTON.

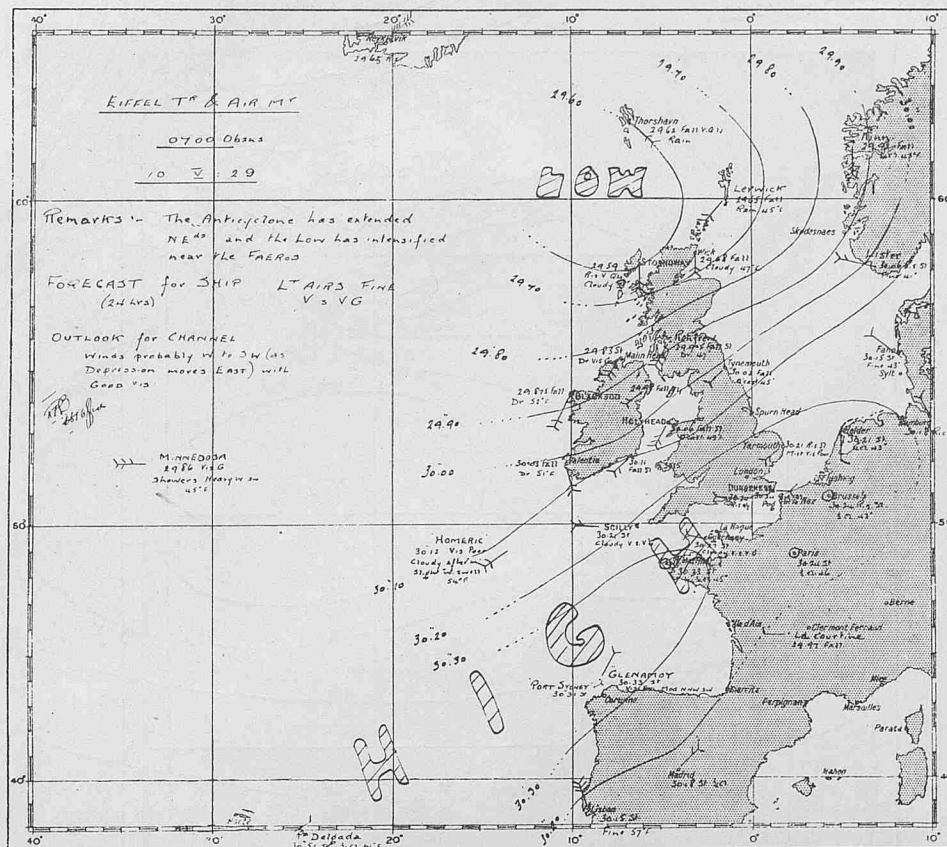
"19th May, 1929, at 02.30 standard time, Longitude 135° E., whilst rounding Shio Misaki in thick rain and a rough sea, ship appeared to be struck by lightning, there being a brilliant flash of light on the forecastle head which blinded one for about three minutes, immediately followed by an explosion as though a gun had been fired within a few feet. The Chinese seaman on the lookout which was kept on the forecastle head reported that a blue light ran up and down the awning chains.

"This was followed at about five minutes' intervals by two flashes of sheet lightning, that being the only lightning seen during the night. Neither the compasses nor the electric lighting were affected and a careful search by daylight failed to show any trace of the occurrence. Wind N.N.W. Force 4, barometer 1003.0 mb. At 04.00 weather began to moderate rapidly."

WEATHER CHARTS MADE AT SEA.

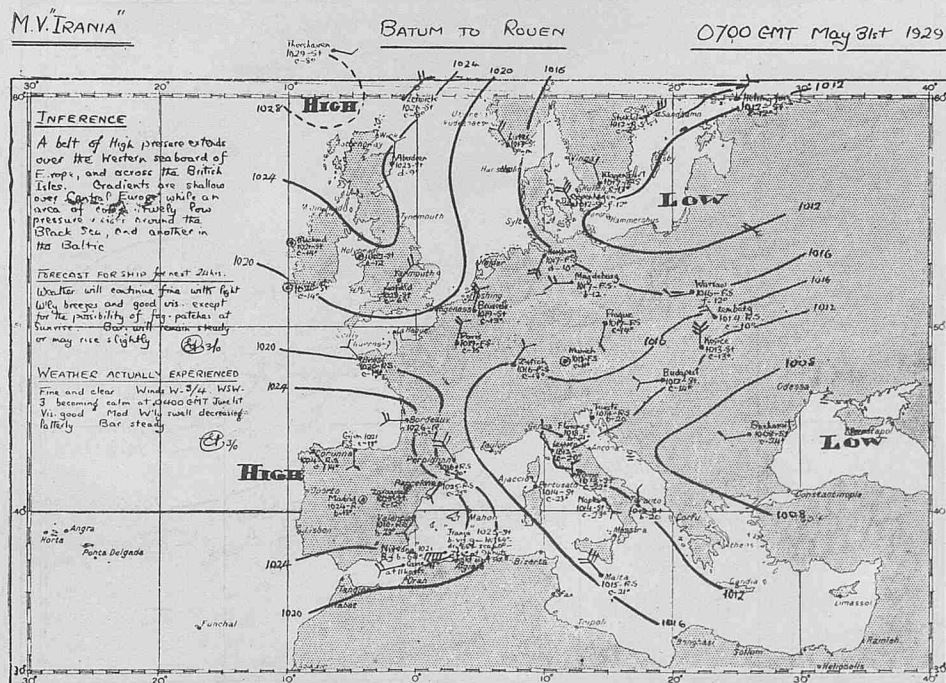
Eastern North Atlantic.

Weather Chart (one of a series) made at sea on board S.S. *Glenamoy*, Captain C. E. HOMAN, Port Said to London, by Mr. R. H. BISHOP.



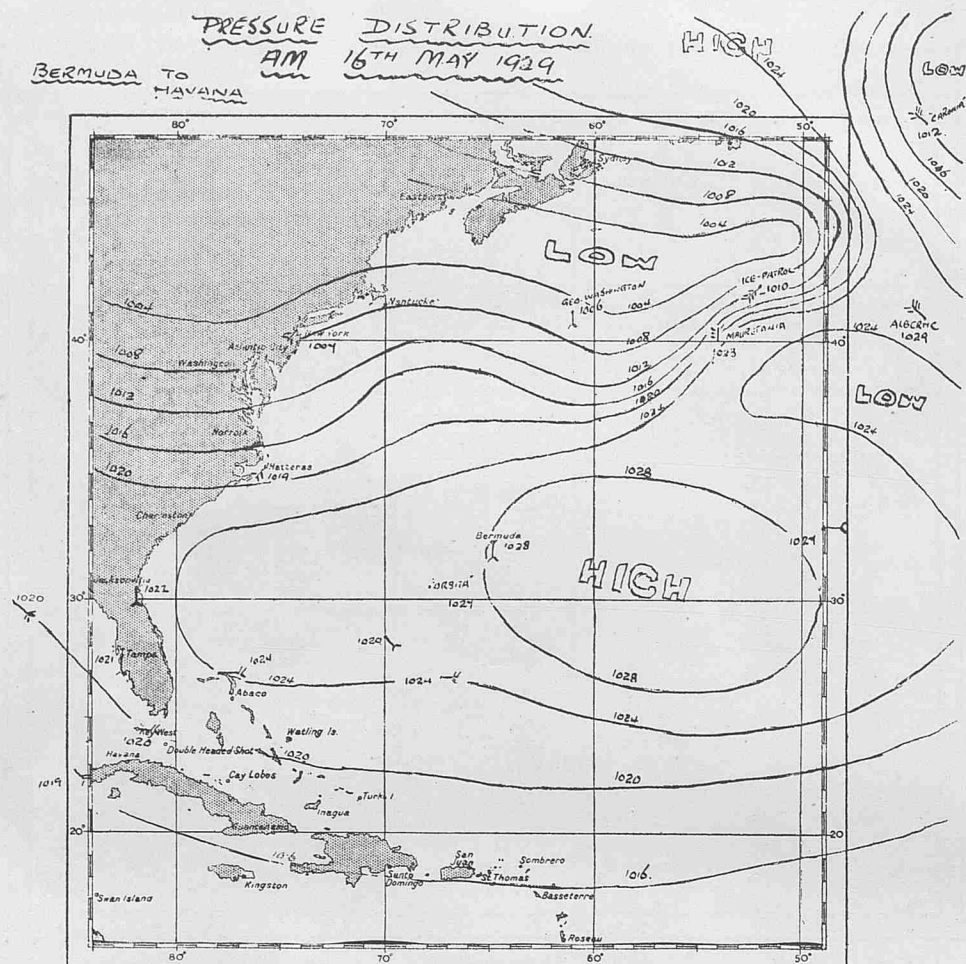
Mediterranean Sea.

Weather chart (one of a series) made at sea on board M.V. *Irania*, Captain P. ADAMS, by Mr. E. ALLEN, 3rd Officer.



Western North Atlantic.

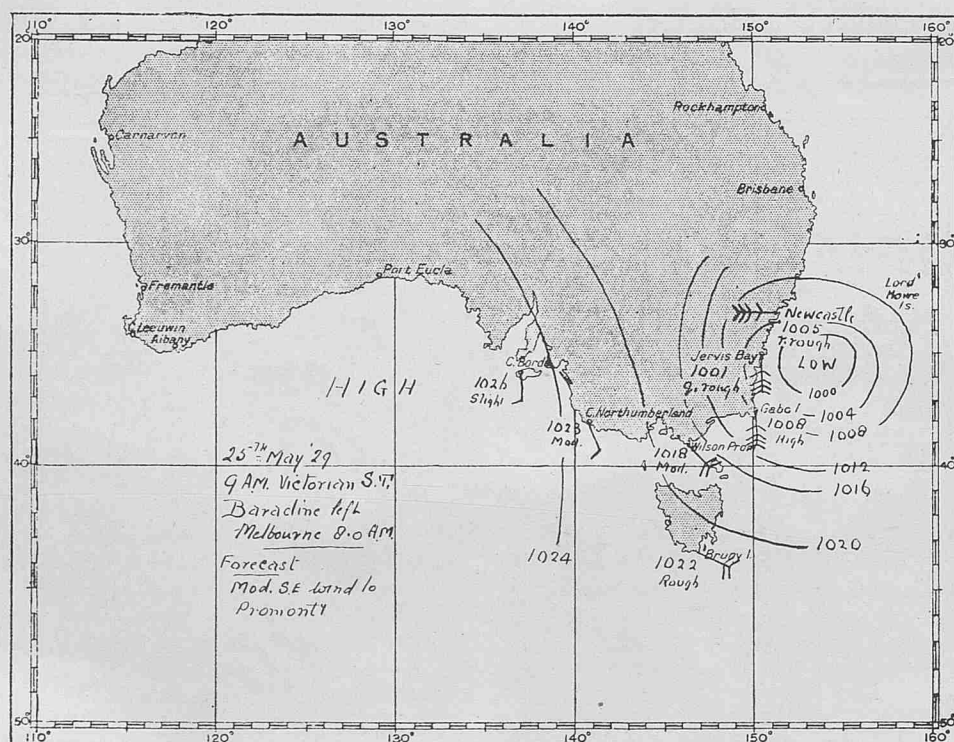
Weather Chart (one of a series) made on board S.S. *Orbita*, Captain R. H. DOMINY, C.B.E., R.N.R., Liverpool to Havana, via Bermuda, by Mr. J. R. BUBB, 3rd Officer.



Forecast for *Orbita*.—Light variable breeze, light south or south-east winds later, cloudy with possibility of rain showers. According to *Orbita's* Meteorological Report, wind was S. force 2 at 8 p.m. and S.E. force 3 at 8 a.m. 17th. Weather bc.

Eastern Australian Waters.

Weather Chart (one of a series) made at sea on board S.S. *Baradine*, Captain C. H. C. ALLIN, Melbourne to Sydney, by Mr. C. B. ROCHE, Chief Officer.



According to the Meteorological Log of S.S. *Baradine*, the wind was S.E'ly, force 3-4 during the day.

GREEN FLASH.

Ceylon.

THE following is an extract from the Meteorological Log of H.M.S. *Enterprise*, Captain H. D. PRIDHAM-WIPPELL, C.V.O., R.N. Observer Lieutenant-Commander C. W. A. G. HAMLEY, R.N.

"In Ceylon at the end of April and beginning of May—just before the break of the S.W. Monsoon—at sunset, which is always very brilliant, as the sun finally disappears under the horizon, a great column of green light appears to shoot up into the heavens and then gradually disappear."

ABNORMAL REFRACTION.

Approaches to Cape Town.

THE following is an extract from the Meteorological Report of S.S. *Ceramic*, Captain T. MUSGRAVE. Observer Mr. H. A. R. DAMAN, 4th Officer.

"May 1st, leaving Cape Town bound North, we noticed a low haze before sunset and the smoke of the town lying low, and later at dusk, Robben Island light remained visible for about 35 miles. Shortly after Robben Island light disappeared, Green Point light became visible again and also the lights of Cape Town. This continued till about 9 p.m. when they disappeared. Weather at the time—Moderate wind, Stratus clouds and blue sky. Atmosphere slightly humid."

Eastern Mediterranean.

THE following is an extract from the Meteorological Report of S.S. *Macharda*, Captain R. G. HANNA, Port Said to Boston U.S.A. Observer Mr. A. C. HOCKING, 3rd Officer.

"May 4th, 1929, 8 p.m. For several hours after leaving Port Said remarkable abnormal refraction over the land was experienced. Brulos light appeared as two lights one above the other, whilst Damietta light when flashing appeared as a column of flame with a bulb at each end—denoting the positions of the true and reflected lights. When vessel was abeam of Brulos light at 9.00 p.m., Port Said light was still visible—a distance of sixty-seven miles."

Red Sea.

THE following is an extract from the Meteorological Report of S.S. *Mangalore*, Captain J. J. MULCAHY, Colombo to Port Said. Observer Mr. JAMES A. LEITCH, 3rd Officer.

"Monday, 27th May, 1929. Latitude 27° 53' N., Longitude 33° 36' E., Steering 316° speed 12.5 knots, wind N.N.E. force 1. Barometer (corrected) 29.85 in., Temperature 81° F., swell Nil, Sea N.N.E.2. Clouds Ci-St. and A-St.9. At 7.30 p.m., A.T.S. Ras Gharib Lt. was sighted at a distance of 40 miles. The ordinary range of the light is 19 miles. At about 8.40 p.m. when 26 miles distant two lights vertically could be distinctly seen, both white, but top one gradually turning to green and remained so until 8.50 p.m. when lights merged into one normal colour (white). The clouds and state of weather as above."

MIRAGE.

St. Helena Bay.

THE following is an extract from the Meteorological Log of H.M.S.A.S. *Protea*, Lieutenant-Commander J. DALGLEISH, Observer Lieutenant F. J. DEAN.

"1st May, 1929. At 07.00 the ship weighed for surveying in St. Helena Bay. The general appearance of the weather was normal. Barometer 1016.3 Mb. Dry Bulb 61° F. Wet Bulb 55° F. Wind S. by E. Force 3. St. cloud to S.E., South and S.W. Sky 5/10 covered. The Stratus cloud continually changing at its upper edges to Ci-St. At 07.50 excessive mirage was observed along the whole of the East Coast of the bay. The mirage effect was especially noticed on the mountain ranges 20 to 40 miles inland.

"At 08.30 the whole coast line of the Bay was affected, but the higher ground underwent more changes than the foreshore.

"A peculiar effect was observed on the Picket Berg Range of blue sky being visible through what appeared to be a hole in the mountain range. This occurred at 09.10. See Figures 2 and 3.

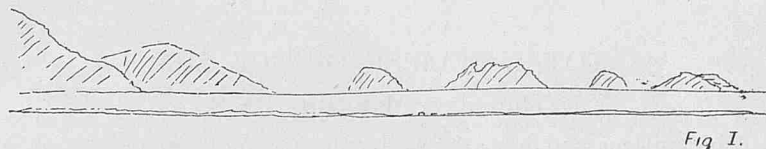


Fig 1.

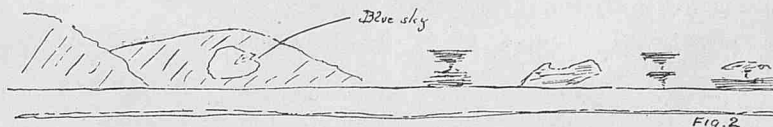


Fig. 2

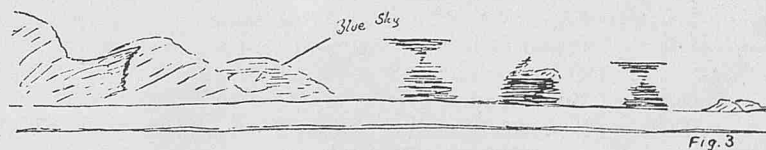


Fig. 3

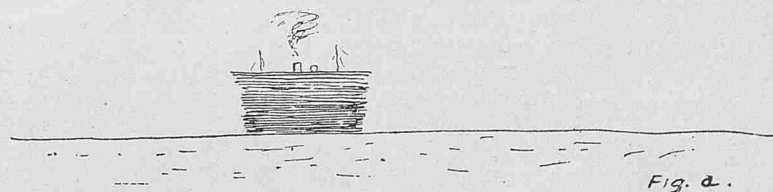


Fig. a.

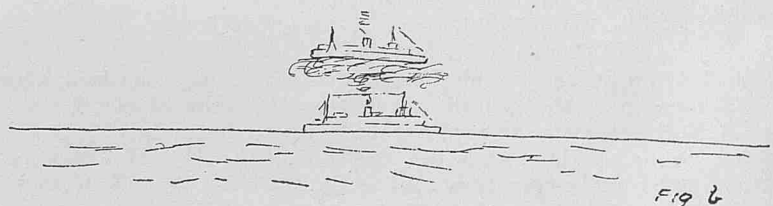


Fig b

"Figure I is the normal appearance of the coast from seaward.

"Figures 'a' and 'b' are the effect of the mirage to seaward as observed from one of the ship's boats sounding between the ship and the shore from 09.00-09.30.

"From 10.00 the mirage effect slowly cleared away and the wind gradually moderated to light airs and calms. All times given are (Zone-2)."

SOLAR HALOS.

Caribbean Sea.

THE following is an extract from the Meteorological Report of S.S. *Colonial*, Captain B. WORTHINGTON, Kingston, Jamaica to Vera Cruz. Observer Mr. A. S. MILNE, 3rd Officer.

"Friday, 3rd May, 1929. Noon at ship (1737 G.M.T.) Latitude 20° 31' N. Longitude 84° 39' W. True altitude of the sun on the Meridian 85° 11' S. Barometer 29.97 in. wind W.N.W. Ci/Ci-St/Ci-Cu. W.N.W. 2, Amt. 7, Visibility 9. Dry 81° F., Wet 75° F., Sea 80° F., smooth sea, swell confused S.E.3.

"Observed very brilliant well defined 22° Solar Halo showing colours of the spectrum (inner edge orange, yellow, greenish blue, and dazzling white at outer edge). At 12.43 p.m. (1820 G.M.T.)

arc of lesser brilliancy appeared 24° below the complete halo and concentric with it, but with broader though duller spectrum and similar colours. At 1.25 p.m. (1902 G.M.T.) this arc had faded away and the complete halo gradually grew dimmer until 1.45 p.m. (1922 G.M.T.) when it had completely disappeared. Weather as before."

TOTAL ECLIPSE OF THE SUN.

Thursday, May 9th, 1929.

Observations and Remarks by Lieutenant A. B. FOULERTON, R.N., H.M.S. *Iroquois*, Captain J. D. NARES, D.S.O., R.N., forwarded through the Hydrographer of the Navy.

"Position Latitude $5^{\circ} 54' 15''$ N. Longitude $99^{\circ} 59' 42''$ E.

Zone Time-7.

0755 Weighed and proceeded from Penang Harbour northwards, towards the line of totality.

0800 Temperature Wet Bulb 78° F. Dry Bulb 82° F. Barometer 1007.8 mb. Wind N.N.E. force 1. Sea calm. Clouds Ci-St. A-St. and Ci-Cu. Watery sun.

0830 Sun clouded over.

0900 Temperature Wet Bulb 78° F. Dry Bulb 82° F. Barometer 1008.0 mb. Wind E. force 2. Sea N.N.E.1. Clouds Ci-St., Ci-Cu., A-Cu., A-St.

0920 Sun out—watery.

1000 Temperature Wet Bulb 79° F. Dry Bulb 85° F. Barometer 1008.2 mb. Wind S.E. force 2. Sea N.N.E.1. Clouds A-St. with a bank of Cu-Nb. to S.W.

1015 Sun stronger, Solar Halo formed.

1100 Temperature Wet Bulb 80° F. Dry Bulb $86\frac{1}{2}^{\circ}$ F. Barometer 1008.0 mb. Wind S.S.E. force 2. Sea N.N.E.1. Clouds A-St. and Cu-Nb. The sun now quite distinct through a dark glass, though still covered by thin film of cloud.

1120 Came to port anchor. Position Latitude $5^{\circ} 54' 03''$ N. Longitude $99^{\circ} 59' 08''$ E.

1200 Temperature Wet Bulb $79\frac{1}{2}^{\circ}$ F. Dry Bulb 86° F. Barometer 1007.5 mb. Wind S.S.W. force 2. Sea S.2. Clouds A-St., Cu., Cu-Nb. Clouds increasing, but sun still fairly clear.

1206 First contact of Moon (approximate).

1230 Clouding over fairly rapidly with A-Cu., A-St. and Cu. The Cu-Nb. has dispersed and spread over the sky in other forms of cloud, mostly low flying Cumulus which at times completely obscures the sun.

1245 Temperature Wet Bulb $80\frac{1}{4}^{\circ}$ F. Dry Bulb $85\frac{1}{4}^{\circ}$ F. Barometer 1007.2 mb. Wind S.W. force 3. Sea S.W.2. Clouds A-Cu., A-St. and Cu. Sky clearing to W. and S.W. Sun is now about one-third covered. As yet no appreciable effect on the light. A faint halo showing. Visibility very good.

1300 Temperature Wet Bulb 80° F. Dry Bulb 85° F. Barometer 1006.9 mb. Wind S.W. force 3. Sea S.W.2. Clouds Ci-Cu., A-Cu. and Cu. Sun showing through fairly steadily.

1305 Becoming slightly darker, A-Cu. drifting across the sun.

1310 Temperature Wet Bulb 80° F. Dry Bulb 85° F.

1315 A-Cu. spreading over the sky. Light is fading in a similar manner to the approach of sunset, but colours are becoming flat.

1320 Temperature Wet Bulb 79° F. Dry Bulb $84\frac{3}{4}^{\circ}$ F. Clouds Ci-Cu., A-Cu., St. and Cu. Sky clouded over except to windward, where the sky is becoming a deep blue—the water dull looking, and shadows slightly indefinite.

Zone Time-7.

1325 Temperature Wet Bulb $78\frac{1}{2}^{\circ}$ F. Dry Bulb $84\frac{1}{4}^{\circ}$ F. Clouds Ci-Cu., A-Cu., St. and Cu. Colours seem now quite flat and it is distinctly darker, though not quite with the darkness of sunset. The undersides of even the thinnest clouds showing deep black shadows.

1330 Temperature Wet Bulb $78\frac{1}{2}^{\circ}$ F. Dry Bulb 84° F. Light and shadows very queer and unreal. Exceedingly dark to the N.W., with black clouds and general appearance of the approach of a very heavy Sumatra.

1333 Temperature Wet Bulb $78\frac{1}{2}^{\circ}$ F. Dry Bulb $83\frac{3}{4}^{\circ}$ F. Start of totality. At first moment of totality the sky and clouds to the S.W. became a vivid emerald green which gradually changed into colour mentioned below. A faint solar corona, and, on the clouds near the sun all the spectrum colours. Through gaps in the clouds the sky showed a deep, dark blue. One planet, Jupiter, clearly visible.

1338 Temperature Wet Bulb $78\frac{1}{2}^{\circ}$ F. Dry Bulb $83\frac{3}{4}^{\circ}$ F. End of totality. A crimson flame suddenly appeared at the trailing edge of the moon; through this shot a thin spear of white light which in an instant became like a small, but very brilliant, arc light, and giving similar lights and shadow—within 30 seconds the sky became quite light again. During totality the general appearance of the sky was the same as will be seen between a quarter and a half an hour before sunrise. The horizon was firm and colours—though flat elsewhere—appeared in the sky and on clouds, to the westward, as they do in that period before the sun rises, but very much accentuated:—that is, all rather hard shades of blue, green, yellow and pink—this was most striking. Except for the crimson flame no colours were observed round the edge of the moon—though spectrum colours were seen inside the corona, reflected on the clouds just previous to totality. The time of the moon uncovering the sun was far more definite than the first moment of totality.

1340 Conditions returning to normal. The light appears to return far quicker than it faded away.

1345 Temperature Wet Bulb 79° F. Dry Bulb $84\frac{1}{4}^{\circ}$ F. Wind S.W. force 3. Sea S.W.2. Clouds A-Cu., Cu., St., Cu-Nb. The corona and halo have both disappeared. Weighed and proceeded for Penang Harbour.

1355 Temperature Wet Bulb 79° F. Dry Bulb 85° F. Light nearly normal.

1405 Temperature Wet Bulb $79\frac{1}{2}^{\circ}$ F. Dry Bulb 86° F. Barometer 1006.6 mb. Light. Shadows and colours all normal.

"The total drop in temperature from the start of the eclipse was from 86° to $83\frac{3}{4}^{\circ}$ F., i.e. $2\frac{1}{4}^{\circ}$.

"The air was slightly cooler during totality, though perhaps this would have been more noticeable ashore, as the ship probably retained the heat of the sun sufficiently to minimise this drop.

"Conditions were not good, the thicker clouds at times obscuring part of the sun, while for the whole period there was a fine layer of cloud tending to make the sun a trifle watery and indefinite.

"The movement of the Barometer was due to normal diurnal variation.

Correct times of Totality.

		h.	m.	s.	
Moon's second contact	...	6	33	26.85	G.M.T.
Moon's third contact	...	6	38	17.35	
Period of Totality	...		4	50.5	

Indian Ocean.

THE following is an extract from the Meteorological Log of S.S. *Titan*, Captain J. POWER, Manila to Singapore, Observer Mr. E. SAVILLE.

"May 9th, 1929, at 0532 G.M.T. 12h. 53½m. A.T.S. in Latitude 8° 10' N., Longitude 109° 27' E., the first contact was observed a little below the centre of the sun's left limb. At this time the thermometer registered 88° F. the clouds were Cirrus 7/10 and Cumulus 3/10 and the barometer at noon 1010.8 mb. At 0645 G.M.T. 14h. 05½m. A.T.S. only a very narrow crescent of the sun's upper limb was visible, temperature being 85° F., barometer 1010.2 mb. and the clouds Cirrus and Cirro-Cumulus 6/10, Cumulus and Cumulo-Nimbus 4/10 and several passing showers were observed. The dimmed light at this period gave the appearance of an approaching storm, it being very dark to the North and West, due, most likely, to the path of totality being in that direction. At 0817 G.M.T. 15h. 37m. A.T.S. the last contact was observed a little above the middle of the sun's right limb, temperature 84° F. barometer 1008.3 mb., the clouds being Cirrus and Alto-Stratus 5/10 Cumulus 4/10. The wind since noon was variable S. to E. force 1 and the upper clouds, although continuously over the sun, did not obscure it. The lower clouds were moving S.E. to N.W./2, only twice obscuring the Sun for about 3 or 4 minutes, thus providing good opportunity for observation."

South Indian Ocean.

THE following is an extract from the Meteorological Report of S.S. *Nirvana*, Captain R. A. M. AYRES, Adelaide to Aden, Observer Mr. J. K. RIGDEN, 3rd Officer.

"The eclipse commenced at 0405 G.M.T. on Thursday, 9th May, 1929, in Latitude 7° 54' S. Longitude 77° 53' E. when the moon was first observed cutting the sun's circumference at the top right hand corner. At 0448 G.M.T. the sun was approximately half covered by the moon and at 0521 G.M.T. (Latitude 7° 45' S. Longitude 77° 42' E.), the Eclipse appeared to have reached its maximum, the sun being approximately 9/10ths covered. At this time (0521 G.M.T.) the sun was covered by heavy Cu-Nb. cloud and was not again visible until 0555 G.M.T. when it appeared to be one half covered, with the moon in the lower right hand corner of the sun. The Eclipse finished at 0649 G.M.T. when the moon was at last contact in the lower right hand corner of the sun. Position Latitude 7° 34' S. Longitude 77° 29' E.

"The temperature was observed to drop 1½° F. (83° to 81½°) from the commencement of the eclipse to the time when it appeared to reach its maximum (0521), but there was no appreciable change of barometric pressure, the barometer remaining steady at 29.965 in. throughout."

THE following report has been received from M.V. *Tantalus*, Captain R. DODDS, Batavia to Perim. Observers Mr. J. RYAN, 2nd Officer, and Mr. F. C. OPPEN, 3rd Officer, May 9th, 1929.

A.M. at Ship.

First contact was not observed.

Weather:—Light N.N.W. wind, slight sea, rather rough confused swell N.W. and S. Clouds Ci-Cu. 3, visibility good, no haze.

Noon at Ship.

Weather:—Nimbus clouds appeared from N.W. and drizzle commenced falling, apparently from overhead, a clear blue sky.

12.35 A.T.S.: Greatest Eclipse.

Latitude 1° 05' S. Longitude 94° 03' E. G.M.T. 0616.

Altitude sun upper limb 70° 04'. Greatest diameter of remaining crescent, 1' 40".

This altitude cannot be relied upon as it was taken very shortly after the eclipse and worked back.

Bright halo visible, diameter 45° 20', unchanging.

Temperature in sun 84° F. Sea 85° F. Barometer 29.73 in.

Clouds, thin Cirrus travelling from South, quickly, Cu-Nb. travelling from N.W., 5.

A few minutes after greatest eclipse, sky became overcast with Nimbus clouds and a heavy shower was experienced till 13.30 A.T.S. when rain ceased and clouds dispersed.

14.12 A.T.S.: Last Contact.

Latitude 0° 56½' S. Longitude 93° 45½' E. G.M.T. 0741.

Temperature in sun, 101° F. Sea 85° F.

Clouds, patches of Cumulus, 3.

Wind, sea and swell as before.

Radio.

During period of eclipse, reception of wireless signals was slightly improved, particularly when at its maximum; very noticeable was the entire absence of atmospherics.

North Coast of Sumatra.

THE following is an extract from the Meteorological Report of S.S. *Euryades*, Captain J. FINDLAY, Singapore to Suez via Colombo. Observers Mr. D. L. HOARE, 2nd Officer and Mr. W. K. HOLE, 3rd Officer.

"May 9th, 1929. Position at commencement of Eclipse Latitude 5° 53' N., Longitude 97° 07' E. Sky clouded in proportion 6/10ths, with Cirrus and Cirro-Stratus cloud, with a heavy bank of Stratus to the S.E. Wind S.S.E., force 3. Air temperature 88° C., Sea Temperature 86° F. Barometer 29.71 in.


"Shadow commenced to pass over the sun at 4h. 58m. 07s. G.M.T., first point of contact being in the top left hand corner or N. by W. point of the sun, gradually moving downwards and to the Eastward until at 6h. 29m. 20s. G.M.T. in Latitude 5° 42' N., Longitude 96° 52' E. by bearings of the land, the whole of the sun, with the exception of a small portion at the bottom, was covered. Temperature fell at 5h. 58m. 00s. G.M.T. to 87° F. Cirro-Stratus cloud had changed to Cirro-Cumulus in the Zenith.




"The shadow remained stationary until 6h. 34m. 00s. G.M.T., when it commenced to move away to the N.E. Wind, which up to the time of the shadow commencing to clear had been steady from S.S.E. now backed to East and fell away to a dead calm. Light became very bad, sky presenting the grey appearance of dawn.

"At 7h. 10m. 00s. G.M.T. the temperature again rose to 88° F. and continued so until the shadow left the sun in the top right hand corner, or the N.N.E. point of the sun at 7h. 55m. 49s. G.M.T. in Latitude 5° 44' N., Longitude 96° 36' E. by bearings of the land. While the shadow was clearing the Cirro-Cumulus cloud in the Zenith again changed to Cirrus haze."

China Sea.

THE following is an extract from the Meteorological Log of H.M.S. *Herald*, Commander P. S. E. MAXWELL, R.N. Observer Sub-Lieutenant H. J. C. STOKES, R.N.

"9th May, 1929, in Latitude 4° 13' N., Longitude 113° 08' E. Wind W.S.W., force 1, sea smooth, clouds Cirrus/Cumulus. The eclipse was first noticed at about 14.00 (zone 7½), and the sun then appeared . The eclipse went on steadily until at 14.40 the sun

appeared . This was about the time of maximum eclipse. At that time the temperature was 82° F., previous to the eclipse it had stood at 84° F. By 15.00 the sun appeared thus  and at 16.00  The temperature had now risen to 85° F. again, and by 16.10, when the eclipse was over, the thermometer stood at 86° F.

"The same evening at 18.00, just on sunset, the whole eastern sky, which was all Cumulus clouds, went a pale green, giving the impression of high green mist. This gave a most extraordinary appearance to the whole sky. This lasted for about 5 minutes and then disappeared, then the whole eastern sky clouded over completely, showing up very black."

WIND FOG AND MIST S.W. APPROACHES TO GREAT BRITAIN AND IRELAND.

COMPILED BY J. HENNESSY, SENIOR NAUTICAL ASSISTANT.

The Wind, Fog and Mist roses which are being published monthly in the present volume of THE MARINE OBSERVER are drawn from observations extracted from Meteorological Logs which have been punched on Hollerith cards since the adoption of that system.

They cover the eight years 1921-1928, and the number of observations used for each rose is sufficient to give reliable information to seamen which should be useful when making a landfall, especially when used in conjunction with the information contained in the "Weather Shipping" Bulletin.

An attempt to summarize the conditions of Wind, Fog and Mist as shown by the roses, served no useful purpose, the desired information being more readily obtained direct from the rose.

The following graph shows the percentage frequency of Fog and Mist and Gales during each month of the year. When examining this graph it must be remembered that no winds under force 8 are here considered as Gales and that both Fog and Mist are combined.

An interesting feature of the graph is the large excess of Fog and Mist experienced in the months of May, July and October.

During May the predominating winds from the S.W. are lighter in force, warmer and moister than in the preceding months. The

sea temperature, however, has not risen greatly so that the conditions in this month are most favourable for the formation of true sea fog.

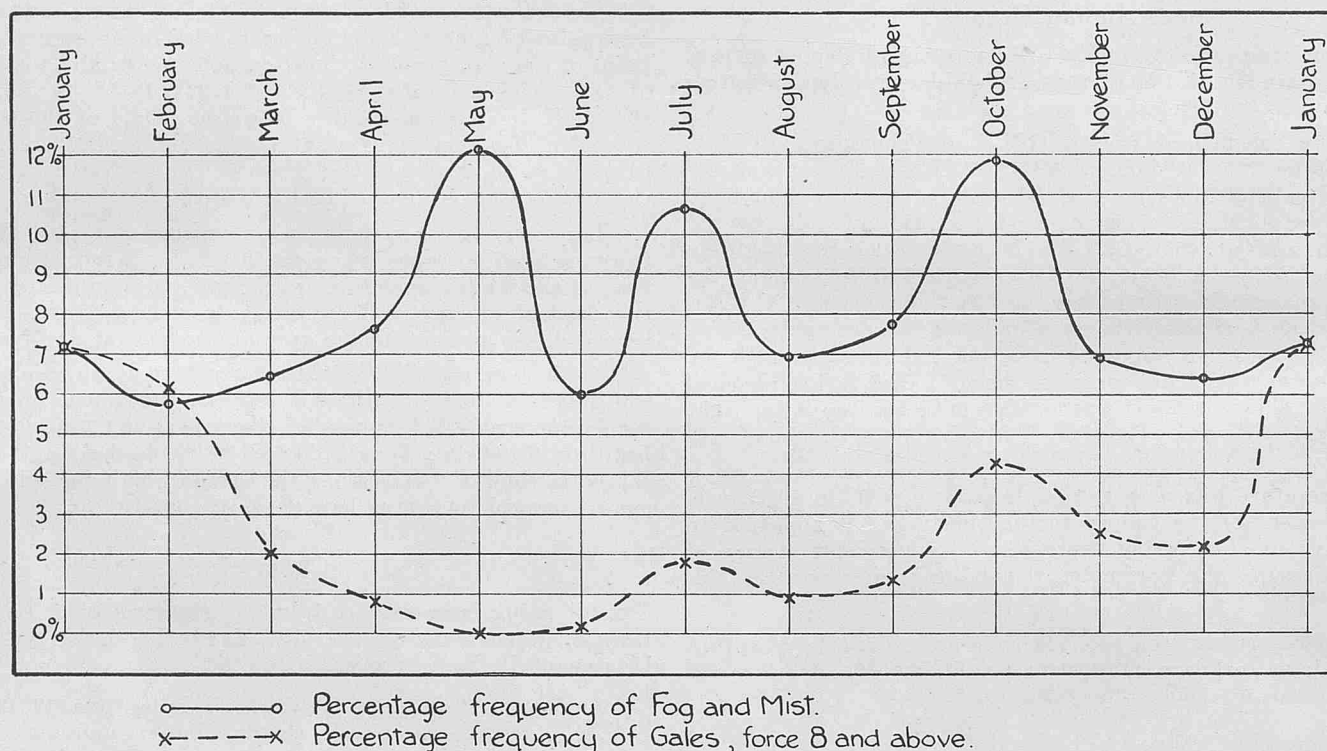
In June there are relatively few warm S.W'ly winds and the fogs of this month show a decrease over those of May.

In July there is a marked increase of warm winds and the sea temperature lagging behind that of the atmosphere, again produces favourable conditions for the formation of sea fogs.

In August although the predominating winds are from the S.W. and West, the mean sea temperature during this month reaches its maximum and the difference of temperature between sea and air is not so pronounced as in the early summer, conditions thereby being less favourable for fog formation.

In September relative conditions differ but little from those of August. The mean sea temperature is slightly below that of the preceding month but the predominating winds coming from the N.W. are relatively cooler than those of August.

During October the fog and mist frequency is again high being mainly due to the occurrence of autumn land fogs spreading out over the sea associated with anticyclonic conditions prevalent in this month.



SEA AND SWELL.

PREPARED IN THE MARINE DIVISION BY H. KEETON, PRINCIPAL CLERICAL ASSISTANT.

The subject of sea and swell is one in which very little progress has been made for a number of years, and the following article, which originally appeared in the July, 1925, number of this JOURNAL, is repeated with some modifications, with the object of further stimulating interest in this question.

A few years ago naval architects drew attention to the importance of statistical information of sea and swell for research work in connection with the form of hull for obtaining sea-kindliness and small resistance; and attention was drawn to the necessity of careful observations of sea disturbance with a view to its correlation with wind force, which would be useful for many purposes.

The following definitions are given of terms which will be frequently used.

The **length** of a wave is the horizontal distance (usually expressed in feet) from crest to crest or hollow to hollow.

The **height** is the vertical distance from hollow to crest (also in feet).

The **period** of a wave is the time, in seconds, between the passage of two succeeding wave crests or hollows past a **fixed** point.

The **velocity** of a wave is the rate at which its crest travels forward, and is of course obtained by dividing the length of the period, the result being the velocity in feet per second.

Waves set up by wind existing at the place and time of observation are termed **sea**.

Waves caused either by wind at a distance from the place of observation, or by winds which have persisted in the locality previous to the time of observation are termed **swell**.

Trochoid Waves.

The action of water when disturbed by waves is sometimes difficult to realise, because of the strong impression one gets, when watching

waves approach, that the crests of the waves are themselves bodily moving forward. If however we watch a log of wood or other floating object, we shall notice that it makes little or no advance forward as the wave crest passes, but simply rises and falls and has a small movement to and fro.

The principle underlying the formation of deep sea waves therefore is that the observed motion is not the bodily advance of a mass of water, but merely the propagation of energy or movement created by the wind.

The profile of an ocean wave is a curve known as a trochoid, which may be simply described as a curve which would be traced on a bulkhead by a marking point fixed to the spoke of a wheel, if we imagined the wheel to be rolled along under the deck head.

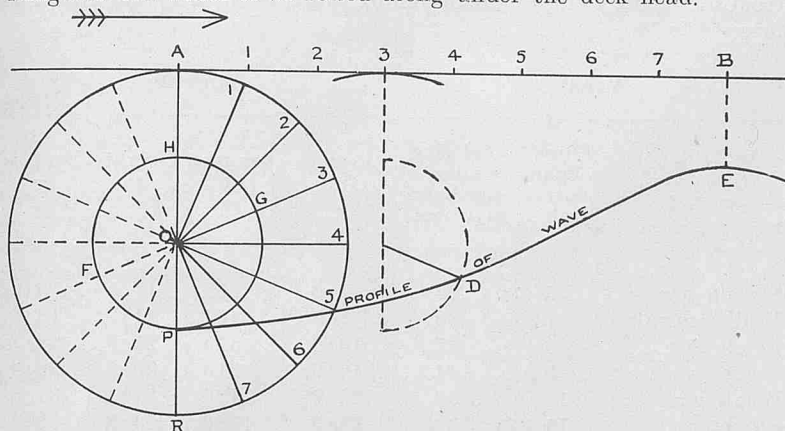


Figure 1.

In the above figure, the large circle represents the wheel, and P the marking point on a spoke, OP (the distance from the axle) being called the tracing arm. The arrow shows the direction in which the circle rolls and the wave is supposed to be travelling. AB is the base, *i.e.*, the straight line under which the circle is to roll, the length AB being equal to the half circumference of the wheel AR. Now as the circle rolls, when 3 of the circle reaches 3 of the base, the semi-circle FPG will be in the position shown by the dotted semicircle; and the marking point P will coincide with the point D, having described part of a trochoid PD. When the circle has completed half a revolution, the marking point P will coincide with E, having described the trochoid curve PDE, which is half a wave length; the diameter POH represents the height of the wave. The nearer the marking point is to the axle of the wheel, the flatter will be the trochoid.

Accepting the condition that the profile of an ocean wave is a trochoid the motion of the particles requires to be noticed.

Each particle revolves with uniform speed in a circular orbit, perpendicular to the wave ridge (the diameter of the orbital circles being the height of the wave) and completes a revolution in the same time as the wave takes to advance its own length.

At the wave crest the motion of the particles is wholly horizontal, advancing in the same direction as the wave; at mid-height on the front slope, it is wholly upwards; in the hollow it is again horizontal but in the opposite direction to the travel of the wave, and at mid-height on the back slope it is wholly downwards.

The disturbance set up by wave motion must necessarily extend for some distance below the surface; but its magnitude decreases very rapidly in accordance with a definite law, the trochoids becoming flatter and flatter as the depth increases. At a depth equal to one wave length, it is less than a five-hundredth part of what it is at the surface, so that the water at that depth may be considered undisturbed; and the motion associated with the largest ocean waves is inappreciable at even moderate depths.

Waves formed in deep sea are modified as they get into shoal water. When the depth is reduced to less than half the wave length, the orbits of the particles commence to become flattened and more elliptical as the water shoals. The period of the wave remains unchanged, but the length and speed are reduced, while the height is increased. Finally when the depth is not sufficient for the complete formation of the undulation, the bottom of the wave is retarded by friction of the sea bottom, the top is thrown forward and the wave breaks into surf.

Where shoaling is very steep, the change in the appearance of the waves will be very rapid. That is why the sea in the Bay of

Biscay is often worse than farther west in the Atlantic; the most marked example however is probably where, during a westerly gale, the long waves from the deep water of the Southern Ocean, are suddenly shortened up by the edge of the Agulhas Bank. Here the sea is much worse on the edge than either on the bank or in the deep water outside it. Of course this notoriously steep sea is also largely due to the action of S.W. wind against the Agulhas current.

The foregoing explanation of the structure of trochoidal waves, with a smooth even profile, closely approximates to the actual observations of swell observed in the open ocean; but the fact that a ship rolling amongst waves is subjected to a certain amount of drift in the direction of the waves' advance, suggests that ocean waves do not conform *entirely* to this pattern. This subject however requires further investigation before a definite explanation can be given.

Relation between Length, Period and Velocity.

Certain relations have been established between the length and the period and velocity of trochoidal waves, the principals of which are as follows:—

$$\text{Length} = \text{Velocity} \times \text{Period.}$$

$$\text{Period} = \text{Velocity} \div 5\frac{1}{2}.$$

$$\text{Period} = \sqrt{\text{Length} \div 5\frac{1}{2}}.$$

By the use of these formulae, if any one of the above wave elements is measured, the other two can be calculated, but for the convenience of observers the following table is given:—

Wave Length in Deep Sea.	Wave Period.	Velocity of Transmission of Individual Waves in Deep Sea.		Velocity of Transmission of the Groups of Waves in Deep Sea.	
		Feet.	Seconds.	Feet per Second.	Nautical miles per Hour.
25	2.2	11.3	6.7	5.7	3.4
50	3.1	16.0	9.5	8.0	4.8
75	3.8	19.6	11.6	9.8	5.8
100	4.4	22.6	13.4	11.3	6.7
150	5.4	27.7	16.4	13.9	8.2
200	6.3	32.0	19.0	16.0	9.5
300	7.7	39.2	23.2	19.6	11.6
400	8.9	45.2	26.8	22.6	13.4
500	9.9	50.6	30.0	25.3	15.0
600	10.9	55.4	32.8	27.7	16.4
700	11.8	59.8	35.4	29.9	17.7
800	12.6	63.8	37.8	31.9	18.9
900	13.3	67.7	40.1	33.9	20.1
1,000	14.1	71.4	42.3	35.7	21.2

Waves at sea are observed to occur generally in series or groups, the region between successive groups consisting of comparatively calm water. If we follow the motion of the first wave of the group, we shall find that it dies out, and that the wave next behind takes the lead. If on the other hand we watch the last wave of the group we shall see that another one appears behind it. The new waves constantly arise in the rear as rapidly as those in front die out, so that the general appearance of a group of waves remains unchanged. The group *as a whole* has a definite velocity of propagation, which has been found to be half of that of the individual waves comprising the group, as shown in the table given above.

An examination of the measured observations of sea and swell recorded on Form 684, which have been received in the Marine Division during the past four years, indicates that the above numerical relation between the length of waves and their period and velocity, calculated from the accepted theory of wave motion, may require modification.

Fifty measured observations of Swell, and eleven of Sea have been received and, with two exceptions, these all show the velocity of waves of observed lengths ranging from 87 to 450 feet to be considerably slower than that calculated from the accepted formula. Measured observations of Swell of 200 feet length had an average period of 11.0 seconds as against 6.3 seconds given in the table above; Swells of 250 feet length had an average period of 12.2 seconds as

against 7.0 seconds given in the table, while **Seas** of 250 feet observed length had an average period of 9.3 seconds.

The number of observations is too small for any definite conclusion to be drawn; and marine observers are urged to systematically measure waves and record them on the Forms provided. Full instructions and guidance are given in the **MARINE OBSERVER'S HANDBOOK**, 5th Edition.

Connection between Ocean Waves and Wind.

There can be, of course, no question that waves result from the action of wind upon the sea, and that there must be some connection between the direction and speed of the wind, and the dimensions and periods of the resulting waves. It is not proposed here to trace the action of wind in the actual formation of waves, but to deal simply with the effects produced by the wind.

At present we know comparatively little of precise numerical relations between the dimensions of waves and the force of the wind which produces them. Apart from the scarcity and incompleteness of measured observations, there is the fact that the waves observed from a ship at any given time are not wholly caused by the wind then actually prevailing, but also depend on the previous direction, force, and duration of the wind at that particular spot or at a distance.

From actual observations made by several investigators, the following facts emerge with respect to the effect of wind upon waves:—

The length of waves is increased when the length of the sheet of water to windward is increased. This explains why the waves in enclosed or narrow seas fail to attain such dimensions as those in the open oceans.

The wave raising power of the wind is much greater when operating upon water already in waves than upon smooth or nearly smooth water.

The height of a wave increases somewhat rapidly with an increase of wind, and soon attains its maximum height for any given wind velocity; it also diminishes more rapidly than any other element of wave motion, when the wind drops. Thus during a squall the height of the waves is seen to increase quite appreciably, and to drop quickly as the squall passes away. The length of waves increases much more slowly, but much more persistently, and with a constant wind may take four days or more to reach its maximum development.

During the years 1867-70 a French naval officer, Lieutenant A. PARIS, recorded a succession of carefully made observations upon the state of the sea, while serving on board the corvette *Dupleix* and the frigate *Minerve* during a passage to the Far East and while cruising in the China Seas and Western Pacific.

Lieutenant PARIS mentions that the relation of the speed of the wind to that of the wave increases fairly rapidly in proportion to the strength of the breeze; and he bases his conclusions in this connection upon the results of observations of waves that for the most part were unaffected by preceding wind or by local conditions, all records of swell and of deep sea waves having been discarded for this purpose.

Assignment of speed in metres and feet per second.	Average speed of the Waves.		Average relation of the speed of the Wind to that of the Wave.	Average relation by square root of the speed of the Wind to the speed of the Wave.	Number of Days of observations forming each group.
	Metres per sec.	Feet per sec.			
Speed of waves included between 8 and 11 metres (26.25 and 36.09 feet).	9.6	31.5	0.63	0.25	8
Speed of waves included between 11 and 14 metres (36.09 and 45.93 feet).	12.5	41.0	0.99	0.27	8
Speed of waves included between 14 and 15 metres (45.93 and 49.22 feet).	14.6	47.9	1.26	0.29	8
Speed of waves above 15 metres (49.22 feet).	16.4	53.8	1.32	0.28	7

The reliable data remaining after these eliminations—in all only thirty-one observations—were arranged in four groups and the average speed of the wind and that of the wave was ascertained for each group.

The results are shown in the foregoing table in reference to which the author expresses the opinion that these indicate that in the open sea the speed of the wave is proportionate to the square root of that of the wind.

Dr. VAUGHAN CORNISH, who has spent many years in the study of waves, put forward in a lecture before the Royal Society of Arts in 1912 as a result of his observations, the following table for calculating the length and height of waves finally produced in the open sea, far from sheltering land, by the action of winds of the different Beaufort forces 6 to 12.

WIND.			WAVES.			
Seaman's Description of Wind.	Force by Beaufort Scale.	Velocity miles per hour (nautical).	Period in Seconds.	Length in Feet.	Height in Feet.	Length ÷ Height.
Strong breeze	6	24	7.2	262	17.5	15.0
Moderate gale	7	30	8.9	404	21.7	18.6
Fresh gale ...	8	37	10.6	575	25.9	22.2
Strong gale	9	44	12.6	813	30.8	26.4
Whole gale ...	10	52	15.2	1180	37.1	31.8
Storm ...	11	60	18.3	1720	44.8	38.4
Hurricane ...	12	Above 65	22.0	2489	—	—

The figures are for average waves. When their speed is equal to that of the wind, there is not the great variation in height which occurs when the wind has a velocity less than that of the swell left by a preceding storm.

Dr. CORNISH anticipated that some seamen would object that the wave lengths given in the table exceed their experience of the apparent length of waves, and this point will be dealt with later in the paragraphs on methods of observation.

Dr. CORNISH has since continued his investigations, and the following abstract from a paper read by him before the British Association meeting at Toronto in August 1924, published in "Lloyd's List" will be of interest.

"During a voyage from Southampton to Trinidad and back by the *Oruba*, the author took the period of the waves several times daily, from which their speed was calculated. The speed of the wind was ascertained by means of a Robinson anemometer (kindly lent by the Meteorological Office), due allowance being made for the speed of ship and direction of wind.

"The water is very deep from a short distance beyond Ushant, and free from strong currents as far as Barbados. The speed of the wind ranged from 13.9 to 23.6 statute miles per hour. That of the waves was in all cases less, the difference ranging from 1.0 mile an hour to a little more than 8.0 miles an hour. The latter is sufficient to keep a light flag flying. Anything less than one mile an hour is reckoned a calm. The difference was not proportional to the speed of the wind; nevertheless a relationship emerges when account is taken of the observations which were made simultaneously of the swell of the sea. When swell and wave ran precisely in the same direction (as sometimes occurred in the region of the trade winds) and on one day when no swell was recorded, the speed of the wave was so nearly equal to that of the wind that the breeze blowing over the ridges was only equal to the 'light air' which barely suffices to give steerage way to a fishing smack. Such a light air would be detected on land by drift of smoke, but would not move a wind-vane. Thus there was no longer a battle between wind and wave.

"When the swell followed but crossed the wave the difference in speed of wind and wave was greater, and this difference increased rapidly when the crossing swell was meeting, instead of following, the wave. When the waves were much slower than the wind their height was always small, and sometimes their fronts were short and irregular. It was evident that the growth of waves in both length and height was much hindered by a crossing swell, and it can be safely inferred that the general

absence of swell is a sufficient reason for the rapid rise of waves upon enclosed seas. When a wind comes on to blow in the direction of the ocean swell, with a speed greater than that of the swell, the growth of large, steep, waves is very rapid (doubtless even more rapid than their growth from smooth water), but this occurrence is relatively rare in the North Atlantic.

"The author found that the direction of the breaker out at sea was intermediate between that of wave and swell (the breaker being formed when they override) so that the practice of observing the direction of 'the curl on the water' as a method of determining the direction of the wind gives an erroneous result whenever there is a crossing swell, which is the usual condition upon the oceans. The general run of the waves, on the contrary, shows the direction of the wind reliably."

Swell.

When wave motion is once set up in the ocean, it continues for a considerable time after the originating cause has ceased or passed away; persisting until the energy imparted to the wave is absorbed by the effect of gravity, friction, &c. Series of waves thus travelling away beyond the limits of the wind which raised them, retain their direction unchanged so long as they travel in deep water. The height will rapidly diminish, but the length and velocity will remain the same, and they assume the appearance of long low regular undulations of the water known as swell; and may ultimately appear as rollers or breakers on shores far distant from their place of origin.

The swell often observed at sea even during calm weather frequently has a length far in excess of the waves observed during a storm. When the storm waves travel away from their source of origin, there is no reason why they should increase in length, and we can only suppose that these waves of extreme length are actually present during the storm, but that they are masked by the dominant and steeper storm waves. FIGURE 2, taken from Dr. CORNISH's "Waves of the Sea and Other Water Waves," illustrates the fact that a swell, 20 ft. in height and 1,150 ft. long may be practically invisible when combined with a storm wave 30 ft. high, and 600 ft. in length. The upper curve represents a wave of the given dimensions, and the middle curve the swell; the lower line represents a combination of the two. No datum line is drawn, as in actual conditions at sea, there is no fixed object to supply one.

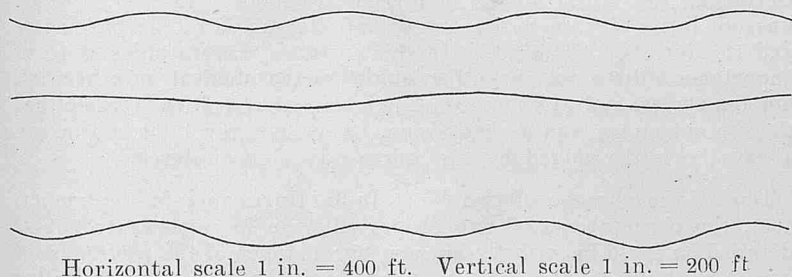


Figure 2.

Wave Development in Cyclonic Gales.

In northern latitudes the greatest development of waves takes place in the right hand rear quadrant of a depression or hurricane, as illustrated in the accompanying diagram, indicating the area

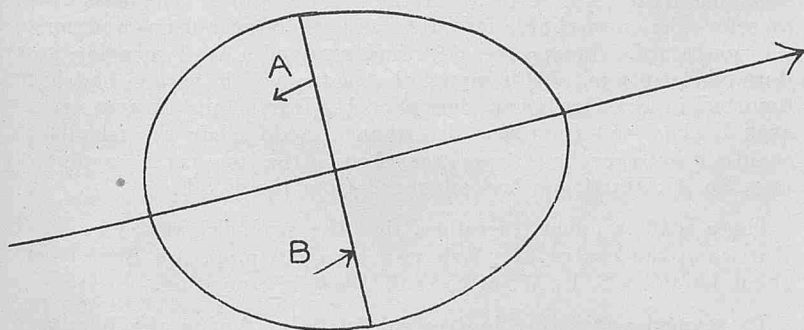


Figure 3.

covered by a depression. The long arrow shows the usual direction of advance of the depression, though this may often vary.

In the position marked A the direction of the wind is opposite to that of the travel of the depression; consequently the depression is continually receding from the waves which its winds create, and we should not, therefore, expect any prolonged development of waves in this quadrant, even if the winds were strong, provided of course that the depression is moving East.

On the other hand, at B, the waves whose direction approximates to that of the advance of the storm, will remain under the influence of the wind for a much longer period, and will obviously attain much greater proportions with a given wind force than at A. Moreover the strongest winds in a cyclone are usually developed in rear of the trough, and thus will add still further to the waves of this area.

It is usually found, therefore, in reports of abnormal seas, that they have occurred in the right hand rear quadrant of a cyclone; or if in the Southern Hemisphere, in the left hand rear quadrant.

From the foregoing, it follows that another important factor in wave development is not only the direction and force of the wind, and direction of the storm, but the **rate of progression** of the storm.

It is clear that waves which are slower than the travelling storm are being left behind all the time. On the other hand, waves whose velocity is greater than that of the storm's progression, run ahead of it as **swell** and beyond the influence of the winds which raised them.

The waves whose velocity is identical with that of the travelling storm will be **continuously** subject to the action of the wind; and such conditions are, therefore, specially favourable for exceptional development of waves.

Abnormal Seas.

Remarkably high seas were encountered in the right-hand rear quadrant of a deep depression in December 1922 by R.M.S. *Majestic*, Commodore Sir B. F. HAYES, K.C.M.G., D.S.O., R.D., R.N.R., Lieut. F. BUTCHER, R.N.R., 5th Officer, in his account of the storm, states that the seas were mountainous, estimated by observers to be about 80 feet.

Lieut. J. A. HEENAN, 4th Officer, made the following report regarding these seas:—

"About 10 p.m. on December 29th in Latitude 48° 30' N. Longitude 21° 50' W., the wind blowing W. to N.N.W. increased to hurricane force and the seas developed to a great height. Several of the Officers tried to estimate the height of the waves from the bridge, this being the only position possible owing to the great length of the vessel. The bridge is 90 feet above the waterline and the crow's nest on the foremast about 20 or 30 feet higher. The waves appeared to rise level with the crow's nest, and assuming that the fore part of the ship dipped as much as 30 feet on the back of a wave, which would probably bring the propellers out of the water—an incident which did not occur—a moderate estimate of the height of the waves would be between 80 and 90 feet.

"During this time the *Majestic* was travelling at about 3 knots, just sufficient to keep her head on."

In his long career in the Atlantic it is understood that Sir BERTRAM HAYES has never seen such precipitous seas.

Dr. VAUGHAN CORNISH, in a letter to the Editor of "Lloyd's List", commenting on the waves experienced by the *Majestic* remarked that the fundamental observation was that the oncoming waves were commonly in a line with the crow's nest. Mr. HEENAN judged 30 feet to be the greatest dip of the bow consistent with the fact that the propellers did not come out of the water. Dr. CORNISH got practically the same result from a consideration of the known steepness of waves in storms of this character, and the fact that the ship, being almost stationary and riding easily, would be taking approximately the average slope of the water.

He considered that the observations made by Mr. HEENAN and other officers of the *Majestic* were consistent with a height of wave of 80 feet, and had never met with any other account of waves of such a great height taken under conditions so favourable for observation.

In 1925 the late Commodore Sir J. T. W. CHARLES, K.B.E., C.B., R.D., R.N.R., of the R.M.S. *Aquitania*, which arrived at Southampton, February 27th from New York, reported having encountered one of the worst gales he had ever experienced. Two days before reaching Southampton heavy seas swept the ship. An officer said that one sea came up on "D" deck, smashed a window of the promenade deck, carried away a locker on the bridge, and smashed three sextants and a chronometer.

The White Star liner *Olympic*, Captain W. MARSHALL, D.S.O., R.D., R.N.R., outward bound from Southampton to New York (where she arrived 20 hours late) apparently encountered the same gale, and on February 27th was struck by a 70-foot wave, which seemed suddenly to have arisen out of the sea, and which badly damaged the navigation bridge.

Yet another example of big waves in the same year was recorded in "Lloyd's List," taken from the "Washington Hydrographic Bulletin." On January 8th, 1925, the American liner *President Jackson* was in Latitude $52^{\circ} 48' N.$, Longitude $159^{\circ} 34' W.$, the wind blowing W. to W. by S. force 11 to 12, with extremely high seas. The bridge of this vessel was 62 feet and the crow's nest 78 feet above the water line. Several of the officers on the bridge observed an occasional wave rise to the level of the crow's nest. The vessel was practically hove to, making only two to three knots, so the seas passed without damage. Assuming that the fore part of the steamer dipped 20 feet on the back of a sea, it was estimated that the highest waves were between 50 and 55 feet in height.

Some years ago the *Brandenburg* steaming 7 knots, in Latitude $42^{\circ} N.$ Longitude $25^{\circ} W.$; shipped "a tremendously high wave of extraordinary dimensions." It was estimated to have had a height of at least 65 feet and a length of 350 feet. The crow's nest, 50 feet above sea level, of quarter-inch steel plating, was stove in and her bridge, deck house, life-boats, and deck gear were all considerably damaged or washed overboard.

In 1904 the S.S. *Menominee*, Captain E. G. CANNONS, was struck by a wave 60 feet high, which broke over her, while crossing the North Atlantic; and in 1905 a wave 50 feet high washed overboard the officer of the watch from the bridge S.S. *Manningtry*.

The Hon. RALPH ABERCROMBY in July, 1885, on board S.S. *Tongariro* in the South Pacific Ocean observed waves 46 feet high during a hard S.W. gale in Latitude $55^{\circ} S.$ Longitude $105^{\circ} W.$; using a very sensitive aneroid to measure the lift of the ship in passing from trough to crest of the waves.

The late Admiral R. FITZROY has left on record that he actually measured seas that were 60 feet in height. In 1875 the late Captain KIDDLE of the White Star liner *Celtic* determined a height of 70 feet for several waves in Mid-Atlantic from good measurements; and the late Admiral Sir W. J. L. WHARTON expressed his opinion that seas of 90 feet may be experienced, although the most probable maximum is 50 to 60 feet.

Solitary Waves.

Huge solitary waves (commonly but erroneously called "tidal waves") are occasionally met with at sea, often in otherwise perfectly calm water, which have caused both loss of life and damage to several ships. There is a strong probability that such waves are due to submarine seismic disturbances, and are similar to the "earthquake" waves which do an enormous amount of damage when breaking on the coast. The following are some examples of solitary abnormal seas:—

In 1881 the barque *Rosina*, on a voyage to New York, was struck by a solitary wave, which swept away all hands on deck. In the same year the *Rosina* encountered another solitary wave, which swept the vessel while the crew were shortening sail, and every man was carried away except a sick seaman lying in his bunk, who was eventually rescued by a passing steamer.

In 1882, off the Cape of Good Hope, the *Loch Torridon*, four-masted barque, was struck by a fearful and unexpected sea, the master, the second mate and the whole of the watch being carried away.

In March, 1893, when 300 miles east of Charleston, S.C., the barque *Johann Wilhelm* was struck by a solitary sea which swept overboard all her crew, except one man, and threw the vessel on to her beam-ends. The sole survivor was rescued by the S.S. *Electrician*.

The S.S. *Rheinland*, Captain RANDLE, was nearly sunk by one some years ago, while cross the North Atlantic. Her commander, from his elevated position on the bridge, observed an enormous wave coming towards the steamer with great velocity; took precautions for ensuring a maximum of safety; and leaped from the bridge to a more lofty position. Soon the sea so completely submerged the steamer, from stern to stem, that Captain RANDLE, from his coign of vantage, could only distinguish her funnel and foremast. Her whole hull was completely under water for a short interval. One man was washed overboard; the second mate, the carpenter, and the other members of the watch suffered from broken limbs; every boat disappeared; and the engine-room was almost full of water. In 1896, the S.S. *Thermopylae*, 800 miles west of Cape Leeuwin, shipped three heavy seas over the bows, although all around the sea was comparatively smooth. Nearly two years later, almost in the same position, the S.S. *Woolloomooloo* had four men washed overboard, and her upper work damaged, by a sea which advanced like a wall upon the steamer quite unexpectedly.

Swell Originating in a Tropical Hurricane.

The action of the violent sustained winds in the right-hand rear quadrant of a hurricane in the Northern Hemisphere (or the left-hand rear quadrant in the Southern Hemisphere) blowing mainly in direction of the line of advance of the hurricane, develops large waves, which pass on beyond the limits of the storm as swell. This swell is carried to great distances, and as it travels at a much greater velocity than the hurricane, an observer may be forewarned of the existence of the latter by as much as 2 to 3 days. Thus the swell, which comes approximately from the direction of the storm centre, frequently gives the **first warning** of a hurricane, and its bearing, before the indications of wind, barometer or cloud are sufficiently definite to act upon.

Captain C. W. BREBNER, Master of the S.S. *Secunder*, who navigated the South Indian Ocean for upwards of 30 years, when describing a cyclone he encountered on a voyage from Mauritius to Rodrigues in December, 1911, says:—"At noon on the 12th December, the *Secunder's* position was Latitude $19^{\circ} 56' S.$, Longitude $59^{\circ} 52' E.$, steering a little north of east. In this position I first encountered storm waves (Swell) and knew at once that a storm was at some distance to the N.N.E., the barometer then standing at 30.07 ins.; the wind was moderate in force, 4 to 5. On the 13th December the storm waves had risen to about "force 7," which was not in proportion to the height and steadiness of the barometer and the force of the wind. In this instance wave studies were of importance; **there was no other guide, meteorological or otherwise, but the waves**, and by their trend, height, and velocities, I knew that the distant storm was a severe one. A violent revolving storm can always be fairly judged by the storm waves encountered."

During the passage of two West India Hurricanes in September, 1921, the observations of swell reported were in some cases not as detailed as could be wished; but another instance of the usefulness of swell as a guide to the existence of cyclonic disturbances is afforded by the observations in the meteorological log of S.S. *Carmarthenshire*, Captain E. C. WAKEMAN.

Carmarthenshire, bound from Hull to Galveston, at 8 a.m. on 9th September, 1921, was in Latitude $29^{\circ} 01' N.$, Longitude $63^{\circ} 23' W.$ The barometer was normal for time of year and conforming to diurnal range, wind S.S.E. light, with a moderate swell from S.E. By 10 p.m. in Latitude $28^{\circ} 14' N.$, Longitude $66^{\circ} 52' W.$, the swell had become heavy from south; the barometer had fallen slightly but the wind remained light from S.S.E. and the weather fine. The swell was, therefore the only reliable indication that there was heavy weather to the southward. *Carmarthenshire* had received a W/T message from Bermuda at 8 p.m. of 9th saying that a tropical hurricane had been reported in the Caribbean Sea (No. II. Hurricane, FIGURE 4) but even if the swell from this disturbance could clear the islands, it could not have reached *Carmarthenshire* in the time, as it was known that No. II. Hurricane had advanced from the E.S.E.

There is little doubt, therefore, that the swell originated in No. I Hurricane the centre of which was then (10 p.m., 9th September) about 150 miles S. by W. of *Carmarthenshire's* position.

To seamen navigating in tropical latitudes during the hurricane season, the importance of swell observation will be apparent. It

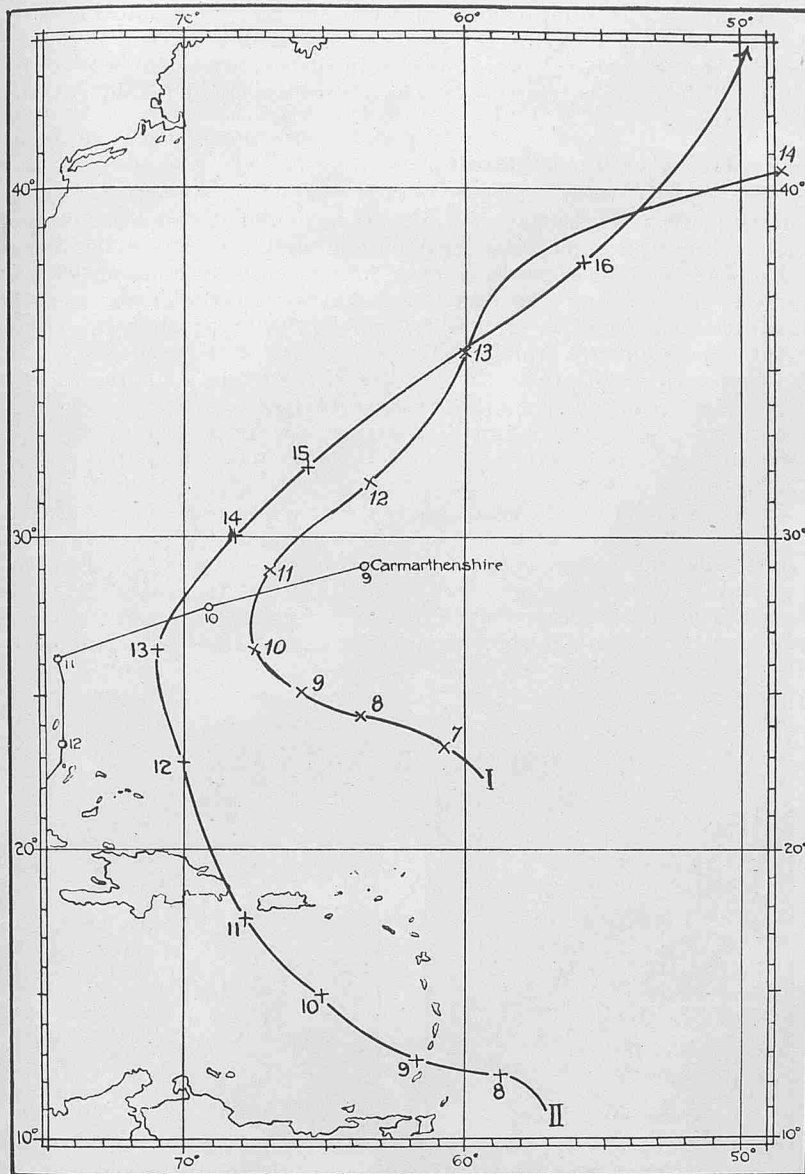


Figure 4.—Tracks of September Hurricanes.

would be well, however, to call attention to the fact that the direction of the hurricane swell may be modified or confused if it meets with obstacles, such as land or shoal water.

Storm Swells of Temperate Latitudes.

Much can be learned from observation of the swells set up by ordinary gales in the temperate latitudes. While a heavy swell does not necessarily indicate a coming storm, the seaman, by noting the changes in its direction and intensity as the ship continues her passage, can obtain a very fair idea of what weather changes are taking place.

An example is given below from observations contributed by Captain J. S. LEDSOME, S.S. *Lexington*, while in the North Atlantic, homeward bound, in November, 1919.

At 10 a.m., 25th November, in $48^{\circ} 54' \text{ N.}$, $29^{\circ} 04' \text{ W.}$, the *Lexington* observed a heavy swell coming from N.W. by W.

The approximate height of the swell was 15 ft. to 18 ft., and the period 10 seconds. This indicates that a considerable strength of wind from between N.W. and W.N.W. had prevailed somewhere on a line drawn N.W. by W. from the ship. The rate of travel of waves of this period is 15 miles per hour, or 360 miles per day; judging by its steepness the swell had not travelled far from its place of origin, and it is probable that the gale causing it had occurred the previous day in about 53° N. 37° W. Presuming the wind to be of a cyclonic character, the centre of the disturbance would be the north-eastward of this position.

The *Lexington* was steering a N. 70° E. course, and two hours later (Noon, 25th) reported the swell as changing more northerly.

At 8 p.m. in $49^{\circ} 13' \text{ N.}$, $27^{\circ} 49' \text{ W.}$, the swell was very heavy from the north, but appeared to be moderating. The inference to be drawn from these changes of direction of the swell is that the depression had moved rather rapidly in an easterly direction, its centre being ahead but to northward of the ship.

At 10 a.m., on the 26th, in $49^{\circ} 40' \text{ N.}$, $23^{\circ} 57' \text{ W.}$, the swell was recorded as coming from N.N.E., period 11 seconds, and height 15 ft. to 19 ft. This points to gales from N.N.E. at some distance N.N.E. of the ship; these gales would be blowing on the N.W. side of a depression, and having regard to the fact that the barometer had fallen 7.4 millibars during the preceding 24 hours, it seems to show that the depression had changed its course to S. or S.E.

At 10 a.m., 27th, in $50^{\circ} 43' \text{ N.}$, $19^{\circ} 37' \text{ W.}$, the swell was coming from N. 50° E. , and had a period of 8.5 seconds, with a height of 10 ft. to 12 ft. The barometer had meanwhile fallen a further 9.1 mb., and the wind at ship had veered to N.N.E. and increased to force 4-5. It seems evident, therefore, that the ship was coming under the influence of the depression whose centre had continued to move S. or S.E. and which was now to the E. or E.S.E. of the ship. These inferences are confirmed by subsequent reference to Daily Weather Reports and observations from other ships; and working on these lines, much useful information may sometimes be gleaned from swell observations. FIGURE 5 illustrates the observations reported by Captain LEDSOME.

Swell in North Atlantic, November 1919.

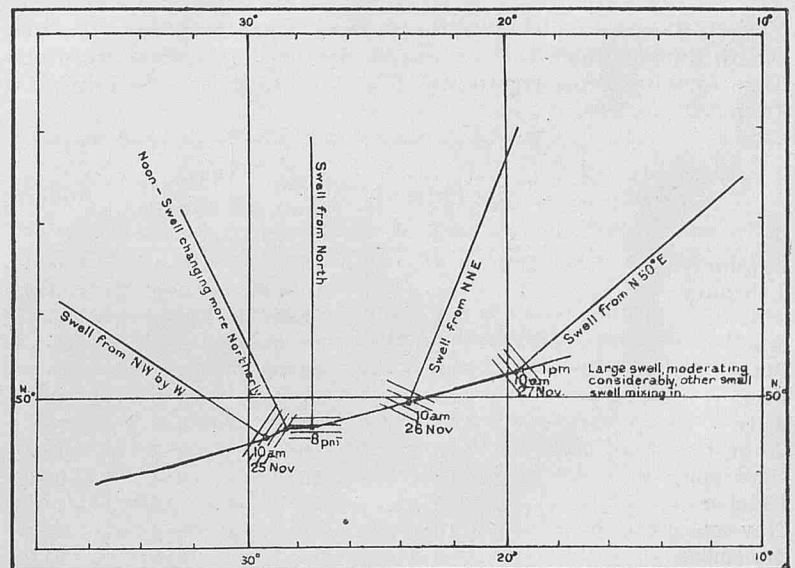


Figure 5.

Coastal Swell.

Many of the islands and shores of the Atlantic Ocean are subject to periodical or permanent swells, some of which assume the nature of Rollers; the best known of which are perhaps the rollers of Ascension and St. Helena, of which an account is given below.

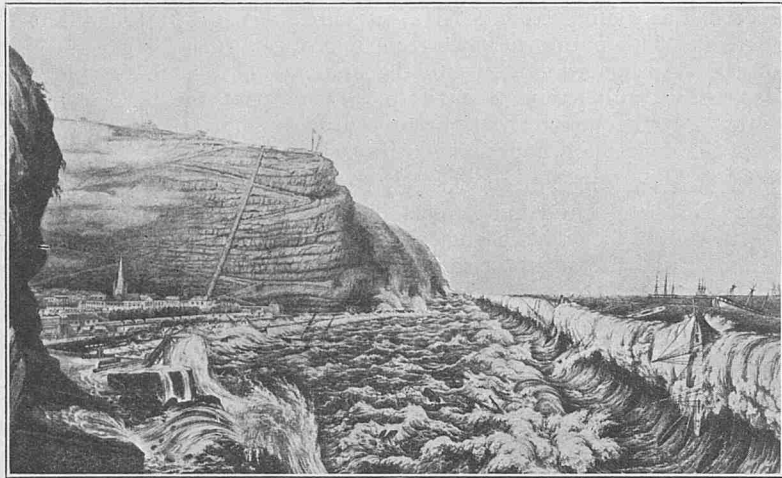
At Ascension, which is in the heart of the S.E. Trades, the rollers break with great violence on the lee side of the island, and arrive without any apparent warning. Their origin has been the subject of much discussion; and they have been attributed to various causes including earthquakes, submarine volcanoes, and the return of the waters after having been heaped up by the trade winds. It is now generally agreed that they are caused by distant gales of wind, either in the North or South Atlantic, blowing in the direction of the island.

The heaviest rollers are those caused by the swell from the North-West gales in the North Atlantic, which occur in the winter and spring of the year, from November to April. The south-easterly direction of this swell brings it to the island without any break.

From June to September the direction of the rollers is from S.W., from the storms prevailing in the Southern Hemisphere during that period.

St. Helena experiences similar rollers to those of Ascension. These rollers usually set in from the N.N.W. and are most prevalent during the months of January and February. During their continuance landing is extremely dangerous and can only be effected by watching for the intervals between the groups of rollers.

Many lives have been lost in consequence of boats being capsized, and in February, 1846, 13 vessels moored near the shore were driven from their moorings and totally wrecked, while the shore works also suffered considerable damage. The picture below, from an old print in the Marine Division illustrates that occurrence.



“Rollers,” St. Helena.

The following table gives the average number of days for each month during which the sea was as described in column headings. It is compiled from records taken at the St. Helena landing place from 1891 to 1898.

Month.	Calm.	Slight swell.	Heavy swell.	Rollers.
January	—	6·1	13·6	6·5
February	—	4·0	10·0	9·0
March	—	11·8	13·0	5·0
April	—	11·0	13·5	5·0
May	—	13·0	12·0	3·7
June	—	9·5	17·0	2·5
July	—	11·0	15·5	3·5
August	—	15·7	10·0	3·5
September	—	10·0	16·0	3·4
October	—	8·0	15·0	7·0
November	—	10·0	9·6	8·4
December	—	6·1	14·7	6·8

The following extract is taken from the Meteorological Log of cable ship *Britannia*, Captain H. G. E. WIGHTMAN, D.S.C., Observer, Mr. H. LAWRENCE, 3rd Officer.

Notes on “Rollers” at St. Helena and Ascension Islands.

“During the vessel’s stay at the above islands (February 7th to March 11 1923) opportunity was taken to note the conditions with regard to ‘rollers.’ These are huge ‘tidal waves’ which can be seen at a considerable distance to the north-west rolling towards the beach in a contrary direction to the prevailing wind, and eventually breaking on the foreshore with terrific violence, and occasionally with thunderous noise. With ‘moderate’ rollers landing was extremely difficult at either of the islands, and was not attempted except by native boats and crews. ‘Heavy’ rollers made landing impossible.

“Throughout the stay at St. Helena, ‘heavy’ rollers were experienced only once (February 8th) but during the stay at Ascension, especially on February 22nd and 23rd, the ‘heavy’ variety were often experienced, at which time the ship rolled heavily at her anchorage. They approached with very short warning and seemed to be heaviest when the off shore breeze was fresh. No meteorological data or observations could be connected with the phenomena, although from members of the E.T.C. staff stationed on the island, they confirm the previous observations which stated the rollers were heaviest at full and change of moon. This was also noticed by the *Britannia* on February 16th when ‘double’ rollers were heavy, the moon one day old. It was regretted that the observations were over so short a period.”

Though the full and change of the moon may often coincide with rollers we have no evidence that these are connected, and probably observers who have noted the coincidence were influenced in their deductions by statements which have appeared in old Sailing Directions.

The Resaca of Rio de Janeiro.

The great wave storms, locally called “Resacas” which occasionally visit the Bay of Rio de Janeiro and the adjacent coasts, afford another interesting example of swell travelling for long distances, and its conversion from long smooth undulations of the water, into leaping and destructive waves. The following account is extracted from an article by R. RYVES, appearing in “The Engineer” for 11th April, 1924:

These waves originate in the travelling storms of the South Atlantic Ocean, in a similar manner to those of St. Helena and Ascension. Such waves may, of course, arrive at the coast on a windless day. If there is a wind which produces local waves, the latter may act independently or intensify the effect of the swells.

In Rio Bay (a gulf with a very narrow entrance) (see FIGURES 6 and 7), the waves have only a narrow passage, little more than a mile wide, by which to enter, with a deep water channel of 10 fathoms or more. The area in which the shore effects of the waves are most marked is that between the entrance and the points B and L, FIGURE 7. On passing the entrance the waves fan out and approach the shores parallel to them, the fanning out in Botofogo Bay (F) being so complete that the waves become parallel to the shore at all points.

Sketch Plans of the Bay of Rio de Janeiro.

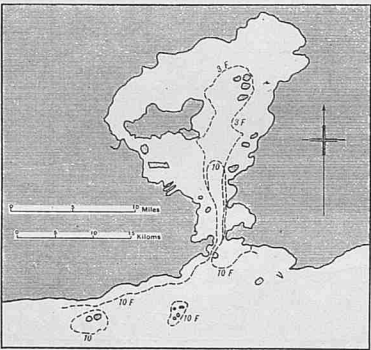


Figure 6.

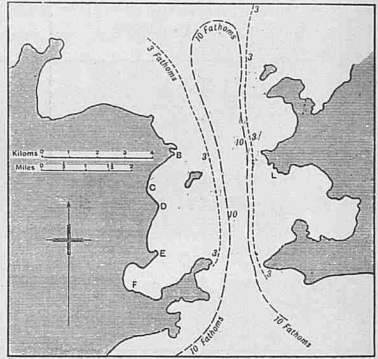
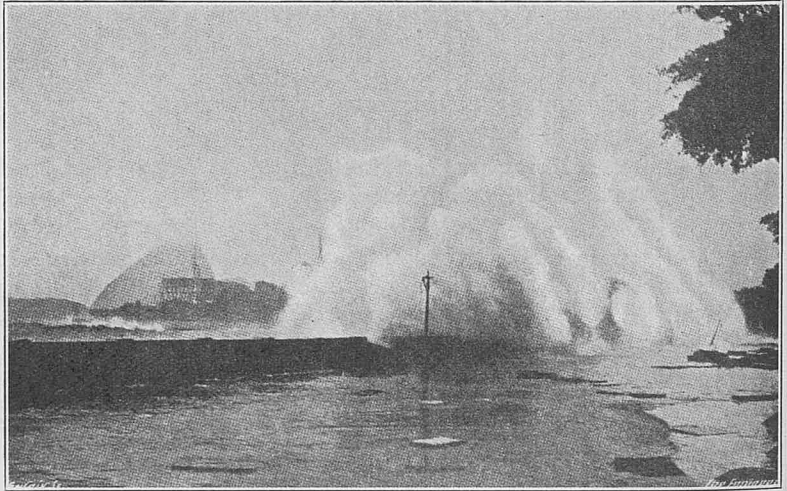


Figure 7.

Reproduced by the permission of the Editor of “The Engineer.”

The shores are protected by a granite wall 10-12 feet high from the beach to the roadway, the depth of water at the foot of the wall hardly anywhere attaining 7 feet at high tide. The height to which the waves leap on striking the wall is remarkable as will be seen by the illustrations below. Not every wave leaps thus, since the shallowness of the water and the position of the retiring water of the previous wave may combine to alter the nature of the advancing wave so that it breaks, or churns up, or crashes against the wall without leaping. The waves that reach the wall without interference leap

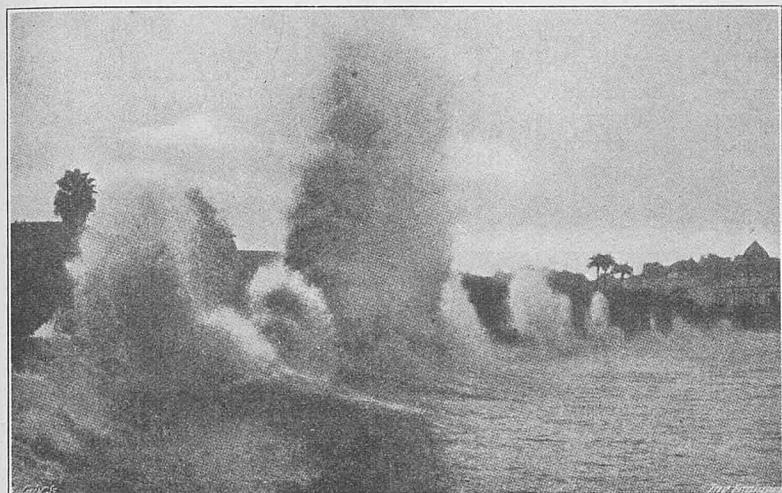


Destructive Resaca. Reproduced by the permission of the Editor of “The Engineer.”

to great heights, often 60-70 feet, and sometimes to 100 feet. The leap is not merely the throwing up of spray, but a continuous wall of water.

The heights of waves approaching ED and CB, judged by the eye, seem to be seldom as much as 5 feet, but the wave lengths are very great in proportion to the heights.

Within the Bay, the damage done by a resaca, unaccompanied by wind, is small; but the shore promenades on the Atlantic coast suffer considerably. When, however, the resaca within the Bay is accompanied by an onshore wind, the damage is sometimes considerable. In this case the waves take high leaps over the parapet, flooding the roadway. The impact on the wall is much heavier, in which breaches are sometimes made, and granite coping stones weighing $\frac{3}{4}$ ton are hurled across the roadway.



Windless Resaca.

Reproduced by the permission of the Editor of "The Engineer."

Coastal swell has of course a considerable influence on the design and construction of breakwaters, harbour works, etc.

For instance, in Colombo Harbour before the North and Island breakwaters were built, the coaling wharfs were situated further to the southward, and were under the lee of the original breakwater. After the other two breakwaters were constructed, the coaling wharfs were built further to the northward, in their present position; and it was found they were much affected by swell entering the western entrance during the S.W. Monsoon. Largely for this reason a protecting arm was built on the South-West breakwater, which now completely shelters the coaling wharfs.

Wave Motion as affecting Stability of Ships.

While a full explanation of the effect of waves on the stability of ships would be out of place in an article of this kind, being more within the province of the naval architect, attention is nevertheless briefly directed to this aspect of the subject, which is of the greatest importance to the seaman in the navigation of his ship; and in which he can assist by providing data regarding waves which will be of use to ship designers.

First as regards the rolling of a ship in a seaway, which has a great bearing on her safety and behaviour. Every ship has her own period of rolling in still water (the **period** is the time taken to complete a **single** oscillation, i.e., from port to starboard, or vice versa), and it is important to know this period in order to predict her probable behaviour at sea.

Where the still water period of a ship is small in comparison with the half period of the waves, she will tend to keep her masts normal to the effective wave slopes; her motions will be rapid and jerky, and in stormy weather she may suffer violent and heavy rolling, and excessive straining.

When the still water period is long compared with the half period of the waves, the ship is likely to be a slow roller and is less able to follow the angle of the waves; and she will incline only through moderate angles from the upright.

A critical case arises where the ship's still water period synchronises with the half period of the waves, to which she is exposed broadside on. In this case a ship will exhibit her heaviest possible rolling, which may at times assume dangerous proportions.

Of course, where a ship is rolling excessively on account of synchronism, the effective wave period relative to the ship's period will be altered by the captain by changes of course or speed; but in any case where there is synchronism, a ship of long period is better situated than one of short period, as in the former case the waves keeping time are longer and less steep.

Were all sea waves of the same length, period, and height, it would be quite possible to design ships, whose equipped conditions are unvarying, of a rolling period which would give great steadiness amongst waves. This would be more difficult for a merchant ship on account of the effect on her behaviour of the nature and stowage of her varying cargoes.

Sea waves, however, at different times and places, vary greatly in their dimensions, and an analysis of carefully kept records of such dimensions would doubtless yield much information of value to the designer.

A Japanese professor (K. SUEHIRO) a few years ago demonstrated from model experiments in a tank, that rolling induces "drift," which reaches a maximum when synchronism is present. He states that with a wave slope of $2\frac{1}{2}^\circ$ synchronous rolling, of itself, will produce a drifting force corresponding to that of a moderate breeze, while with storm waves having a maximum slope of 9° or so, the drifting force would be enormous. Whether these experimental conclusions can be applied to the conditions affecting a ship in a gale and a heavy sea, has yet to be proved. Seamen have experienced this drift, which they call the "scend of the sea," to distinguish it from the effect of ocean current; but it is doubtful whether the "scend" experienced has been so great as Professor SUEHIRO arrives at from his model. In any case, he has indicated another reason for reducing rolling as much as possible.

Scales of Sea and Swell Disturbance.

For the purpose of recording or reporting the state of the Sea and Swell, the Douglas Sea and Swell Scale given below is used.

In 1921 a circular was sent to the Captains of Regular observing ships, asking for their views upon the existing scales and notations for logging weather, wind and sea.

The consensus of opinion obtained was that the Beaufort notation of weather, and the Beaufort Scale of wind force were satisfactory; but that the existing scales for recording sea and swell could be improved.

A number of scales drawn up by marine observers were received, of which the most suitable was that devised by Captain H. P. DOUGLAS, C.M.G., R.N., of H.M. Surveying Ship *Mutine*, now Hydrographer of the Navy.

This scale was circulated by the International Hydrographic Bureau to all its States members, and at the meeting of the International Meteorological Conference, held at Copenhagen in 1929, it was recommended for International use.

DOUGLAS SEA AND SWELL SCALE.

SEA.			SWELL.									
			No swell.	Low.		Moderate.			Heavy.			Confused.
				Short or Average.	Long.	Short.	Average.	Long.	Short.	Average.	Long.	
0	1	2	3	4	5	6	7	8	9			
0	Calm	00	01	02	03	04	05	06	07	08	09
1	Smooth	...	10	11	12	13	14	15	16	17	18	19
2	Slight	...	20	21	22	23	24	25	26	27	28	29
3	Moderate	...	30	31	32	33	34	35	36	37	38	39
4	Rough	...	40	41	42	43	44	45	46	47	48	49
5	Very Rough	...	50	51	52	53	54	55	56	57	58	59
6	High	60	61	62	63	64	65	66	67	68	69
7	Very High	...	70	71	72	73	74	75	76	77	78	79
8	Precipitous	...	80	81	82	83	84	85	86	87	88	89
9	Confused	...	90	91	92	93	94	95	96	97	98	99

I.—SHIPS' WEATHER SIGNALS.

No. 73, MARINE OBSERVER, the list below gives information of those stations which have been detailed, up to the time of going to press, to receive on C.W., reports from **A Selected Ships**, and Chart VI, herewith illustrates this, also spark stations which may intercept reports from **B Selected Ships**, addressed to **CQ**.

Request for Information.

THE ATTENTION OF METEOROLOGICAL SERVICES IS INVITED TO THE INVITATION GIVEN ON PAGE 14 OF VOL. VII, NO. 73, JANUARY
MARINE OBSERVER.

[illegible]

II.—WIRELESS WEATHER SIGNALS.

WIRELESS WEATHER BULLETINS.

The method of decoding station weather reports made in code from shore stations intended for shipping was described in the British "Weather Shipping" Bulletin, on page 52 of Volume VII, No. 74. (The February, 1930 Number.)

The same method of decoding weather reports applies in all cases where the International Ships' Wireless Weather Telegraphy Code is used having regard to the Key figures given in each case where they differ from the British Weather Shipping Bulletin.

Spain.

C.W. Issues.

Madrid (Carabanchel) W/T Station, approximate position Latitude 40° 24' N., Longitude 3° 50' W., call sign **EGC**, broadcasts weather bulletins at 0820, 1420 and 1920 G.M.T. on a wavelength of 2,650 metres (C.W.)

The bulletin broadcast at 0820 G.M.T. contains observations of 0700 G.M.T.; that broadcast at 1420 G.M.T., observations at 1300 G.M.T.; and that broadcast at 1920 G.M.T., observations of 1800 G.M.T., taken at the following stations:—

Index Number.	Station.	Position (approx.) Latitude.	Longitude.
50	San Sebastian	43° 09' N.	01° 34' W.
51	Gijon	43° 33' N.	05° 39' W.
52	Vigo	42° 14' N.	08° 43' W.
53	Madrid	40° 24' N.	03° 41' W.
54	Seville	37° 23' N.	05° 59' W.
55	Almeria	36° 51' N.	02° 28' W.
56	Alicante	38° 21' N.	00° 29' W.
57	Mahon	39° 53' N.	04° 16' E.
58	Barcelona	41° 23' N.	02° 10' E.
59	Valencia	39° 28' N.	00° 23' W.
60	Zaragossa	41° 39' N.	00° 53' W.
61	Santander	43° 29' N.	03° 47' W.
62	Corunna	43° 23' N.	08° 22' W.
63	Burgos	42° 20' N.	03° 42' W.
64	Valladolid	41° 38' N.	04° 44' W.
65	Badajoz	38° 54' N.	06° 58' W.
66	Cordoba	37° 53' N.	04° 49' W.
67	Malaga	36° 43' N.	04° 23' W.
68	Los Alcázares	37° 44' N.	00° 51' W.
69	San Fernando	36° 26' N.	06° 12' W.
70	Tenerife	26° 19' N.	16° 30' W.
71	Izafia	26° 15' N.	16° 40' W.
72	Guadalajara	40° 38' N.	03° 10' W.
73	Granada	37° 11' N.	03° 36' W.

MOROCCO, etc.:—

20	Tangier	35° 47' N.	05° 49' W.
21	Melilla	35° 17' N.	02° 59' W.
22	Tetuán	35° 32' N.	05° 24' W.
23	Larache	35° 03' N.	06° 05' W.
24	C. Juby	27° 56' N.	13° 00' W.
25	Rio de Oro	23° 40' N.	15° 54' W.

The bulletins commence with the letters "SME" and are in two parts.

0820 G.M.T. Bulletin.

Part I.—Contains observations made at stations in the above list, broadcast in five five-figure groups.*

Part II contains groups of figures giving observations of upper winds.

1420 G.M.T. Bulletin.

Part I.—Land stations' observations broadcast in four five-figure groups.*

Part II.—Same form as Part II of 0820 G.M.T. bulletin.

1920 G.M.T. Bulletin.

Parts I and II.—Same form as 0820 G.M.T. bulletin.

* No information is available up to time of going to press as to changes of Key Letters or Code, following the Conference of Safety of Life at Sea, 1929, and the International Meteorological Conference at Copenhagen, 1929.

Azores.

C.W. Issues.

Sao Miguel W/T Station, approximate position 37° 48' N., 25° 46' W., call sign **CUA**, broadcasts weather bulletins at 1332 G.M.T. and 1832 G.M.T. on a wavelength of 2,200 metres (C.W.).

The bulletin broadcast at 1332 G.M.T. contains observations of 1300 G.M.T. and that broadcast at 1832 G.M.T., observations of 1800 G.M.T. taken at the following stations:—

Index Number.	Stations.	Position (approximate) Latitude.	Longitude.
96	Ponta Delgada	37° 44' N.	25° 40' W.
97	Angra	38° 39' N.	27° 14' W.
98	Horta	38° 32' N.	28° 38' W.
99	Flores	39° 27' N.	31° 08' W.

The bulletins are broadcast in International code but the groups are not arranged in accordance with those for "Weather Shipping" Bulletins as described on page 37 of Vol. VII, No. 74.

Spark Issues.

Terceira W/T Station, approximate Latitude 38° 40' N., Longitude 27° 08' W., call sign **CUT**, broadcasts weather bulletins at 1325 G.M.T. and at 1825 G.M.T., on a wavelength of 1,000 metres (Spark).

The bulletin broadcast at 1325 G.M.T., contains observations of 1300 G.M.T., and that broadcast at 1825 G.M.T. observations of 1800 G.M.T., taken at the stations given in the list above.

The bulletins are broadcast in International code, the form of message being the same as given above for the broadcast from Sao Miguel W/T Station.

Portugal.

Containing observations from Madeira and Azores.

C.W. Issues.

Monsanto W/T Station, approximate Latitude 38° 44' N., Longitude 9° 11' W., call sign **CTV**, broadcasts weather bulletins at a wave length of 2,500 metres (C.W.) at the following times:—

0845 G.M.T. (containing observations of 0700 G.M.T. taken at the undermentioned stations, and also ships' observations). The observations broadcast in this bulletin from stations in the Azores are taken at 0800 G.M.T.

1445 G.M.T. (containing observations of 1300 G.M.T., taken at the undermentioned stations, and also ships' observations).

1945 G.M.T. (containing observations of 1800 G.M.T., taken at the undermentioned stations, and also ships' observations).

Index Number.	Stations.	Position (approximate) Latitude.	Longitude.
81	Oporto	41° 12' N.	8° 43' W.
82	Coimbra	40° 12' N.	8° 25' W.
83	Berlenga Lt.	39° 25' N.	9° 30' W.
84	Lisbon	38° 44' N.	9° 11' W.
85	St. Vincent Lt.	37° 01' N.	9° 00' W.
86	Faro	37° 01' N.	7° 56' W.
87	Alverca	38° 54' N.	9° 01' W.
88	Tancos	39° 29' N.	8° 19' W.

Index Number.	Stations.	Position (approximate). Latitude. Longitude.	
89	Villa Real de Santo Antonio	37° 11' N.	7° 25' W.
90	Vendas Novas	38° 41' N.	8° 27' W.
93	Praia (C. Verde Is.)	14° 55' N.	23° 31' W.
94	St. Vincent (C. Verde Is.)	16° 53' N.	24° 59' W.
95	Pargo Madeira	32° 48' N.	17° 16' W.
96	P. Delgada	37° 44' N.	25° 40' W.
97	Angra	38° 39' N.	27° 14' W.
98	Horta	38° 32' N.	28° 38' W.
99	Flores	39° 27' N.	31° 08' W.

The bulletins are broadcast in International code but the groups are not arranged in accordance with those for "Weather Shipping". Bulletins as described on page 37 of Vol. VII, No. 74.

Monsanto W/T Station also transmits a weather message at 1130 and 2300 G.M.T. en clair, in Portuguese and English, on a wavelength of 1,000 metres (Spark) and 1,000 metres (R/T), giving:—

A statement of weather conditions and also a forecast for the next 24 hours for the coast of Portugal, Azores, Madeira, Straits of Gibraltar and the Bay of Biscay.

Italy.

C.W. Issues.

Rome (S. Paolo) W/T Station, approximate Latitude 41° 52' N., Longitude 12° 31' E., call sign **IDO**, broadcasts weather bulletins at 0835, 1435 and 1935 G.M.T. on a wavelength of 5164 metres (C.W.).

The bulletin broadcast at 0835 G.M.T. contains observations of 0700 G.M.T., that at 1435 G.M.T. observations of 1300 G.M.T., and that broadcast at 1950 G.M.T. observations of 1800 G.M.T., taken at the following stations:—

Index Number or Letters.	Stations.	Position (approximate). Latitude. Longitude.	
01	Turin	45° 01' N.	7° 38' E.
02	Milan	45° 28' N.	9° 11' E.
03	Trient	46° 04' N.	11° 07' E.
04	Padua	45° 24' N.	11° 52' E.
05	Trieste	45° 39' N.	13° 45' E.
06	Genoa	44° 24' N.	8° 55' E.
07	Florence	43° 46' N.	11° 15' E.
08	Leghorn	43° 33' N.	10° 18' E.
09	Ancona	43° 37' N.	13° 32' E.
10	Chieti	42° 21' N.	14° 10' E.
11	Rome	41° 54' N.	12° 28' E.
12	Maddalena	41° 15' N.	9° 25' E.
13	Naples	40° 52' N.	14° 08' E.
15	Cagliari	39° 13' N.	9° 05' E.
16	Messina	38° 12' N.	15° 33' E.
17	Palermo	38° 07' N.	13° 20' E.
19	Taranto	40° 29' N.	17° 15' E.
20	Venice	45° 37' N.	12° 18' E.
21	Vigna di Valle	41° 54' N.	12° 37' E.
22	Zara	44° 07' N.	15° 13' E.
30	Tripoli	32° 58' N.	13° 20' E.
31	Benghasi	32° 06' N.	20° 04' E.
TO	Tobruk	32° 04' N.	24° 00' E.

0835, 1435 and 1935 G.M.T. Bulletins.

Part I.—Contains observations from Stations in the above list broadcast in five five-figure groups*.

Part II.—Preceded by the word "Pilots," contains groups of figures which refer to observations of upper winds.

Egypt.

C.W. Issue.

Ismalia W/T Station, approximate Latitude 30° 35' N., Longitude 32° 16' E., Call Sign **GHK**, broadcasts a weather bulletin at 1100 G.M.T., containing observations from stations in the List below.
Wavelength 5,400 metres (C.W.).

Index Number.	Station.	Position (approximate). Latitude. Longitude.	
680	Qosseir	26° 08' N.	34° 18' E.
681	Helwan	29° 52' N.	31° 20' E.
682	Alexandria	31° 12' N.	29° 53' E.
683	Sollum	31° 33' N.	25° 11' E.
684	Mersa Matruh	31° 22' N.	27° 14' E.
685	Port Said	31° 16' N.	32° 19' E.
686	Siwa	29° 12' N.	25° 29' E.
687	Suez	29° 56' N.	32° 33' E.
688	Tor	28° 14' N.	33° 37' E.
689	Hurghada	27° 14' N.	33° 51' E.
690	Assiut	27° 11' N.	31° 13' E.
691	Aswan	24° 02' N.	32° 53' E.
692	Wadi Halfa	21° 55' N.	31° 19' E.
693	Port Sudan	19° 37' N.	37° 13' E.
694	Khartoum	15° 37' N.	32° 33' E.
695	Limassol	34° 41' N.	33° 03' E.
696	Aboukir	31° 18' N.	30° 06' E.
697	Heliopolis	30° 05' N.	31° 22' E.
698	Ismalia	30° 36' N.	32° 14' E.
760	Haifa	32° 48' N.	34° 59' E.
762	Ramleh	31° 54' N.	34° 54' E.
763	Amman	31° 57' N.	35° 57' E.
764	Ma'an	30° 11' N.	35° 39' E.
770	Mosul	36° 20' N.	43° 08' E.
771	Kirkuk	35° 33' N.	44° 27' E.
772	Baiji	34° 55' N.	43° 30' E.
773	Palkanah	34° 49' N.	44° 44' E.
774	Hinaiidi	33° 17' N.	44° 29' E.
775	Diwaniya	31° 58' N.	44° 51' E.
776	Rutbah	32° 55' N.	40° 05' E.
777	Shaibah	30° 26' N.	47° 41' E.

The observations of the stations in the list above are taken at 0600 G.M.T.

Observations from selected stations in S. Europe in the List published on p. 94 of Vol. VII, No. 76 are also broadcast:—

The Bulletin is broadcast in two five-figure groups for each station.*

III. WIRELESS TIME SIGNALS.

Spain.

C.W. Issue.

San Fernando W/T Station, Latitude 36° 28' N., Longitude 6° 12' W. (approx.), call sign **EBY**, broadcasts a time signal daily, except Sundays, according to the International (Onogo) system as follows:—

Wavelength 1,900 metres (C.W.).

G.M.T.						Signal.
h	m	s	h	m	s	
12	56	00	12	56	55	etc.
	57	00		57	50	etc.
	57	55		58	00	Time signal.
	58	08		58	50	etc.
	58	55		59	00	Time signal.
	59	06		59	50	etc.
12	59	55	13	00	00	Time signal.

The time signal is followed by the general call CQ and call signal EBY.

The end of the final dash of each time signal represents the exact even minute.

The final dots of the signals N and G coincide with the 10th, 20th, 30th, 40th and 50th seconds of each minute respectively.

Portugal.

Spark and C.W. Issues.

Monsanto W/T Station, Latitude 38° 43' 47" N., Longitude 9° 11' 17" W., call sign **CTV**, broadcasts time signals three times daily according to the following procedure:—

* No information is available up to time of going to press as to changes of Key Letters or Code, following the Conference of Safety of Life at Sea, 1929, and the International Meteorological Conference at Copenhagen, 1929.

(1) Wavelength 600 metres (Spark).

G.M.T.		Signal.
h m s	h m s	CQ Time Signal from Lisbon Observatory (in Portuguese).
9.28.00 to 9.28.39		— — — — — (MST) repeated 12 times.
9.29.32 „ 9.29.37		— — — — —
9.29.40 „ 9.29.46		— — — — —
9.29.50 „ 9.29.57		— — — — —
9.30.00		■ (Time signal).

(2) Wavelength 3,070 metres (C.W.).

G.M.T.		Signal.
h m s	h m s	CQ Time Signal from Lisbon Observatory (in Portuguese).
9.38.00 to 9.38.39		— — — — — (MST) repeated 12 times.
9.39.32 „ 9.39.37		— — — — —
9.39.40 „ 9.39.46		— — — — —
9.39.50 „ 9.39.57		— — — — —
9.40.00		■ (Time signal).

(3) Wavelength 3,000 metres (C.W.).

G.M.T.		Signal.
h m s	h m s	CQ Time Signal from Lisbon Observatory (in Portuguese).
9.59.00 to 9.59.49		— — — — — (MST) (repeated 15 times).
10.00.00 „ 10.04.59		A series of continuous dots at every second, omitting the 60th.
10.05.00		■ (Time signal).
10.06.00 „ 10.10.59		A series of continuous dots at every second, omitting the 60th.
10.11.00		■ (Time signal).
10.12.00 „ 10.16.59		A series of continuous dots at every second, omitting the 60th.
10.17.00		■ (Time signal).

The above time signal is not broadcast without previous warning.
NOTE.—The time signals are controlled from **Lisbon Observatory** (Latitude $38^{\circ} 42' 30.5''$ N., Longitude $9^{\circ} 11' 10.2''$ W.). The duration of a dot = $1/7$ sec. and that of a dash $3/7$ sec.

IV. VISUAL GALE WARNINGS.
Spain.

The system of Visual Gale Warnings explained on p. 97 of Vol. VII, No. 76 (the April, 1930, Number of this Journal) for France is also in operation at a number of Spanish ports. It should be noted that according to the latest available information there is no system in general use.

Portugal, West and South Coasts.

The following system of storm signals is in use at semaphore stations and port offices on the coast of Portugal:—



West Coast
Signification.

Gale probable
from W. to N.

Gale probable
from S. to W.

South Coast
Signification.

Gale probable
from E. to S.

Gale probable
from S. to W.

By night, at the port offices, the cone is replaced by three red lights in the form of a triangle.

Malta.

South Cone.

By Day.



Hoisted for Gales.

From S.E., veering to S.W., W., or N.W.
„ S.W., veering to W. or N.W.
„ W., veering to N.W.
And also from E., veering to S. or S.W.

Moderate “Gregale.”

By Day.



By Night.



North Cone.

By Day.



Hoisted for Gales.

From S.E., backing to E.
„ N.W., veering to N.

By Night.



Strong “Gregale.”

By Day.



By Night.



Hoisted when the wind is expected from between N. and E., of force 5, 6 or 7 (Beaufort Scale).

Hoisted when the wind is expected from between N. and E., of force 8 and above (Beaufort Scale).

When one of these signals is hoisted it indicates that information has been received by the station exhibiting the signal, that a gale or “gregale” is expected in the vicinity of Malta.

Station:—Castille Signal Station.

Black.



Red.



Green.



Italy.

The following system of storm signals is in use on the coasts of Italy:—

By Day.

Signification.

By Night.



Gale probable, commencing from N.W'd.



Gale probable, commencing from N.E'd.



Gale probable, commencing from S.E'd.



Gale probable, commencing from S.W'd.



Gale probable, direction of wind uncertain.



Red White

Special Notices Regarding Personnel.

The Marine Superintendent will be glad to receive information of special distinctions gained and retirements, &c., of Marine Observers.

Lieutenant Charles H. Williams, R.N.R.

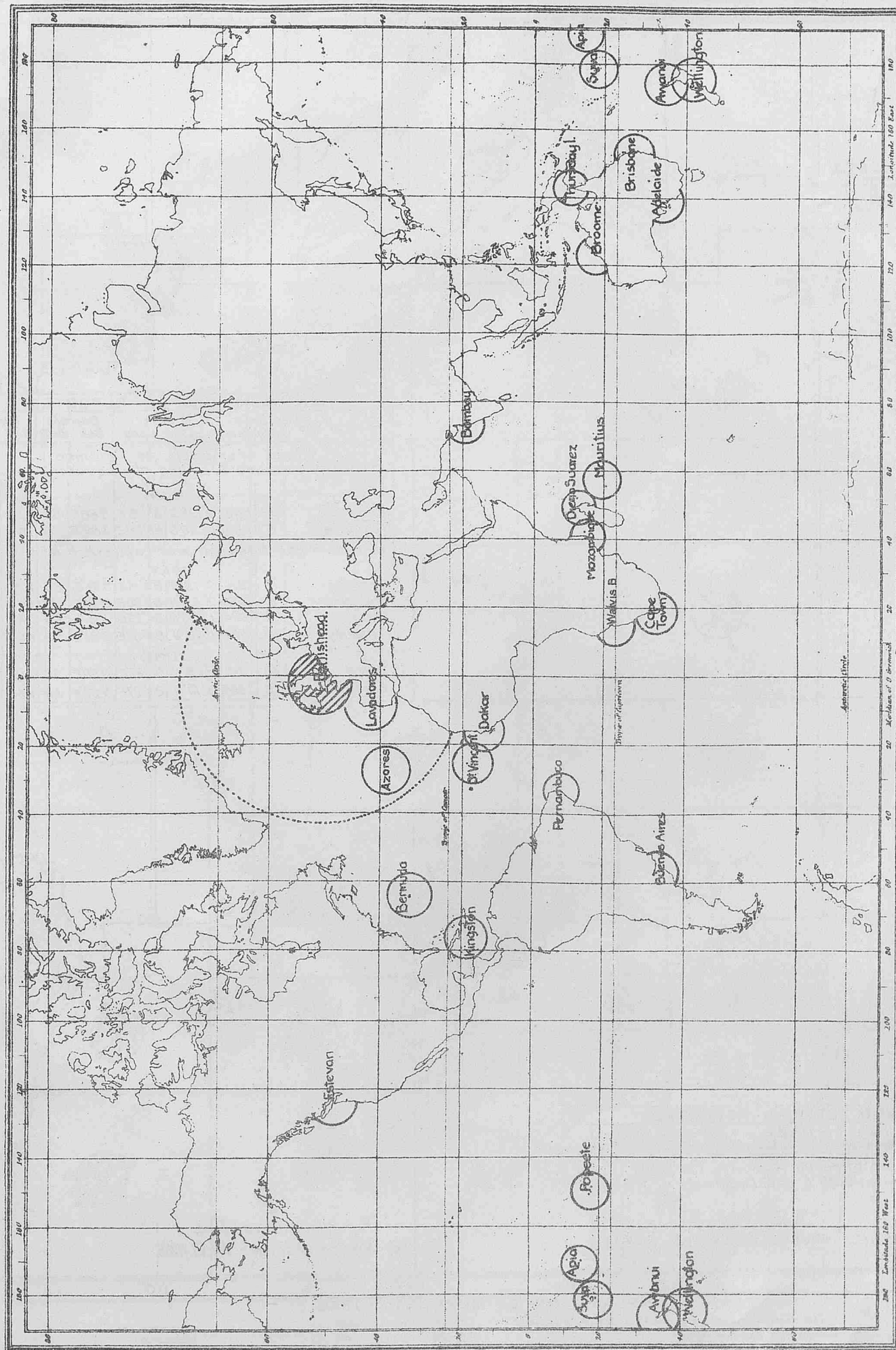
Lieutenant C. H. WILLIAMS, R.N.R., of the UNION CASTLE LINE, has been appointed a Senior Professional Assistant on the staff of the Meteorological Office as from 1st April, 1930.

A sail trained officer who served his time in the Four Masted Barque *Hougomont*, Mr. WILLIAMS has since served throughout, except for the war period when he commanded armed trawlers, in ships of the UNION CASTLE LINE, having been chief officer in cargo ships and second officer in mail steamers, his last appointment being second officer of R.M.S. *Balmoral Castle*.

He has taken a keen interest in Marine Meteorology for many years, and has been a member of the Corps of Voluntary Marine Observers since 1920, his name having appeared in the list of Excellent awards on several occasions.

Mr. WILLIAMS is now performing a course in the Marine Division, on completion of which he will take up the duties of Port Meteorological Officer for the Port of London, where his knowledge of marine meteorology and London ships will be of great assistance to the service.

Stations for Reception of Routine Wireless Weather Reports from "Selected Ships."



The dotted circle indicates the area in which British ships report to Portishead.

The small shaded circle

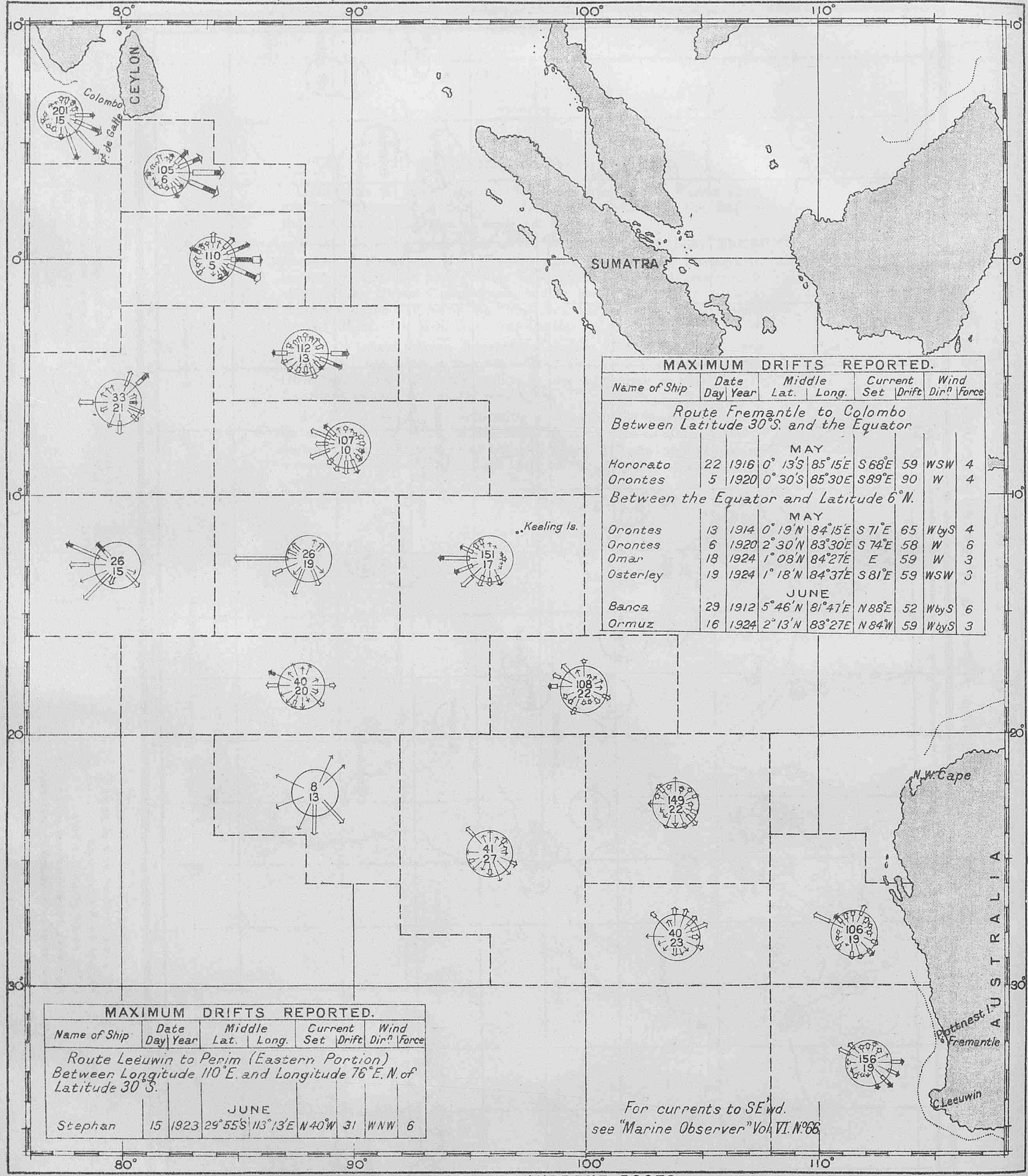
indicates the area from which reports are prohibited to Portishead

The full-line circles indicate the areas round islands and coast stations which can receive spark "Selected Ships" reports to C.Q.

CURRENTS ON THE TRACKS FROM CAPE LEEUWIN TO PERIM, DIRECT AND VIA COLOMBO, (EASTERN PORTION).

MAY, JUNE AND JULY.

Observations of ships regularly observing for the British Meteorological Office 1910-1928.



EXPLANATION OF CURRENT ROSES.

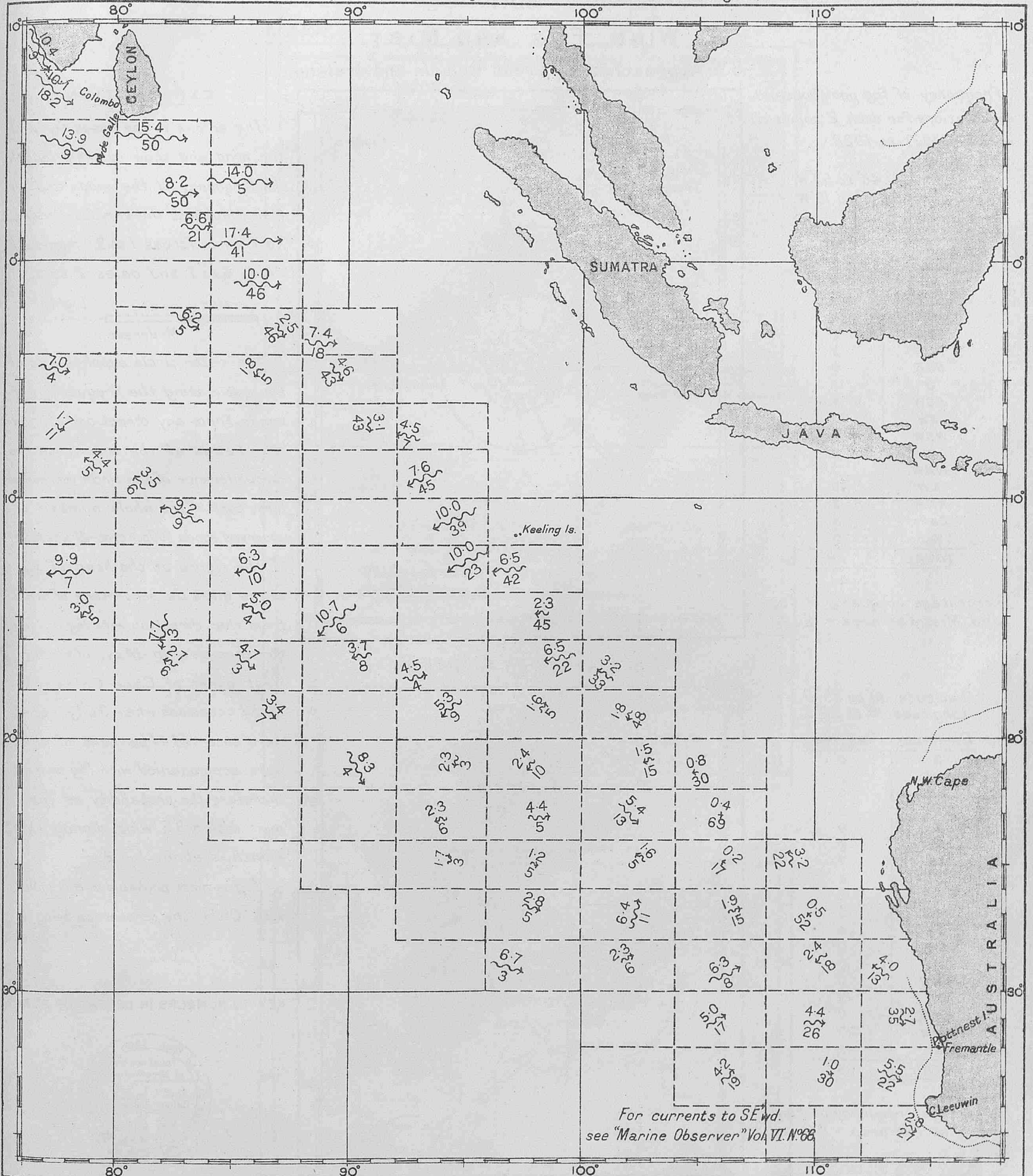
The current roses are drawn from observations 6-12 miles per day ...
within the pecked lines. 13-24 " " " ...
Arrows flow with the current, length represents 25-48 " " " ...
frequency, thickness strength. 49-72 " " " ...
73 " " " and above ...

Distance from tail of arrow to circle represents 5%. Scale 10 20 30 40 50%

The upper figure in centre of rose gives total number of observations, the lower figure the percentage frequency of currents less than 6 miles per day.

CURRENTS ON THE TRACKS FROM CAPE LEEUWIN TO PERIM, DIRECT AND VIA COLOMBO, (EASTERN PORTION). MAY, JUNE AND JULY.

Observations of ships regularly observing for the British Meteorological Office 1910-1928.



EXPLANATION OF CURRENT ARROWS.

The arrows flow with the current and represent the resultant of currents observed within the pecked lines. The centre of each arrow lies in the mean position of observation. The figures above the arrows give the velocity of current in miles per day; the figures below the arrows the number of observations.

MAY

WIND, FOG AND MIST.

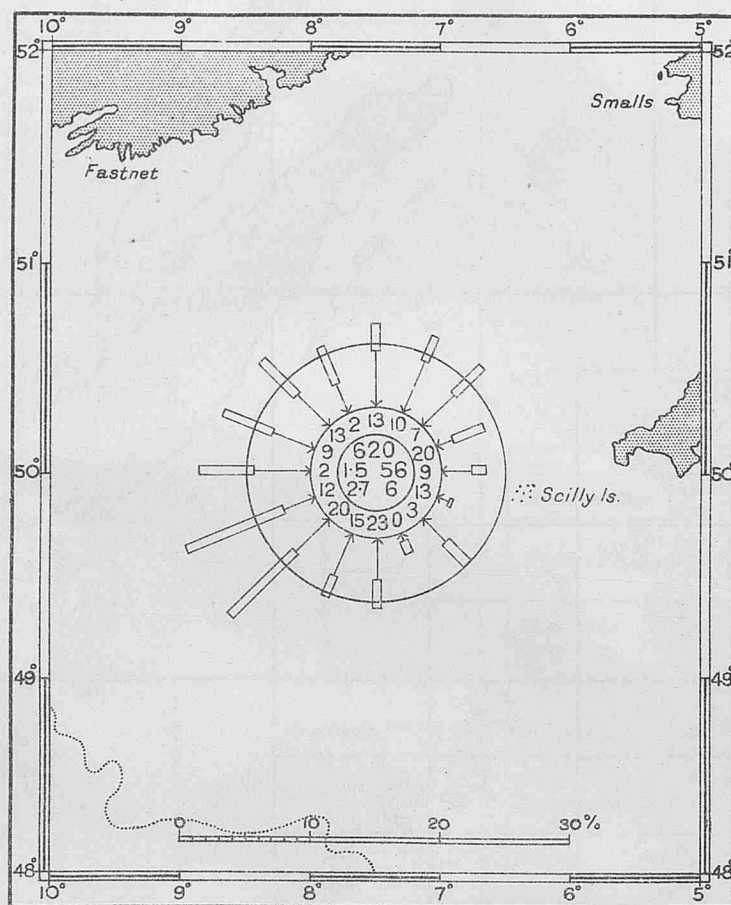
S.W. Approaches to Great Britain and Ireland

Frequency of fog per thousand observations for each 2 points of compass, 1921 to 1928.

Latitude 48° to 52° N.
Longitude 5° to 10° W.

Direction.	Frequency.
N	8
NNE	7
NE	5
ENE	8
E	3
ESE	2
SE	2
SSE	0
S	13
SSW	8
SW	21
WSW	13
W	2
WNW	7
NW	10
NNW	2
Calm	8
Var.	2
TOTAL	121

Percentage Frequency of Fog and Mist for area = 12.1%.



EXPLANATION.

The arrows in the roses fly with the wind and show by their length the frequency of the winds and by their thickness the various forces, light winds forces 1 to 3, moderate winds 4 to 7 and gales 8 to 12.

Gales Light
Moderate

The outer circle supplies a scale for estimating the frequency of winds from any direction. From the heads of the arrows to the circumference of the circle represents 5 per cent of the whole number of observed winds. (100 per cent = 10° longitude).

The figure at the head of the arrow gives the percentage of wind from that direction with fog or mist, for example:- In May, off the West coast of Cape Colony on all occasions when SE'ly winds were observed 47 per cent of them were accompanied with fog or mist, therefore the probability of fog or mist with a SE wind during this month is about 1 in 2.

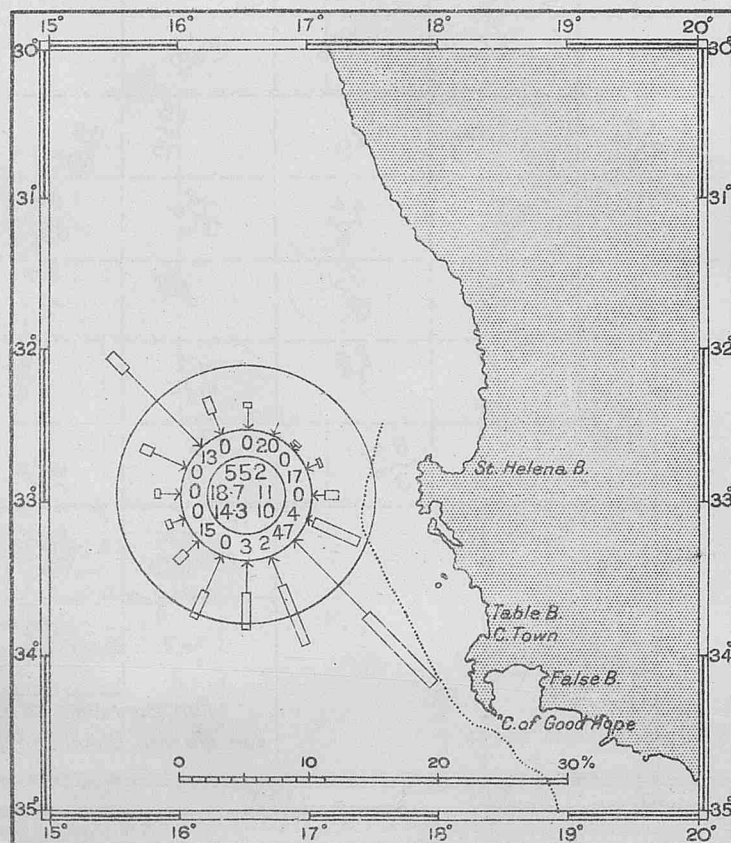
Fog is most probable in this month with Calm the percentage being 2.

Approaches to Table Bay.

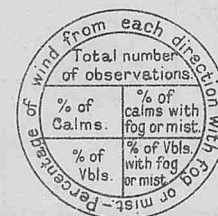
Latitude 30° to 35° S.
Longitude 15° to 20° E.

Direction.	Frequency.
N	0
NNE	2
NE	0
ENE	2
E	0
ESE	2
SE	7
SSE	2
S	2
SSW	0
SW	4
WSW	0
W	0
WNW	0
NW	13
NNW	0
Calm	20
Var.	15
TOTAL	69

Percentage Frequency of Fog and Mist for area = 6.9%.



KEY TO NUMBERS IN CENTRE OF ROSES.



Compiled from observations of British Ships received since the adoption of the Hollerith system of extraction covering the years 1921 to 1928.

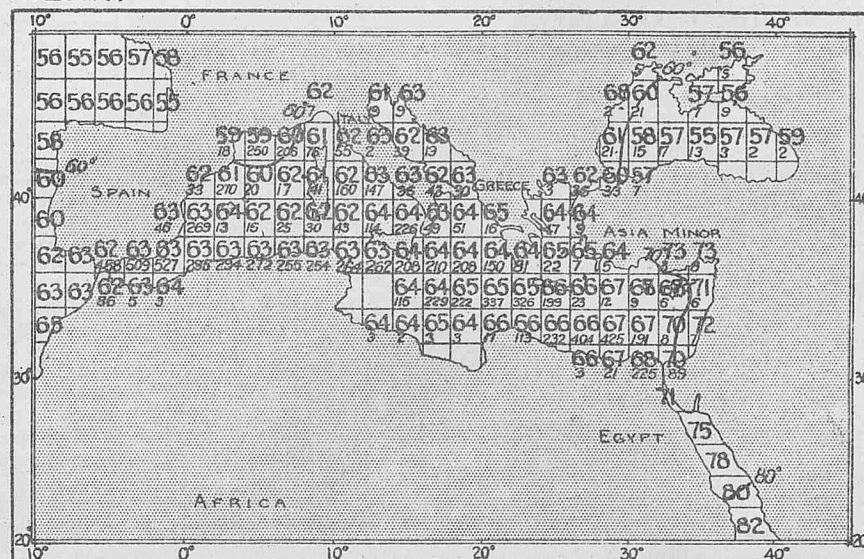
MEDITERRANEAN SEA

SEA SURFACE TEMPERATURES

Vol. VII. N^o 77.

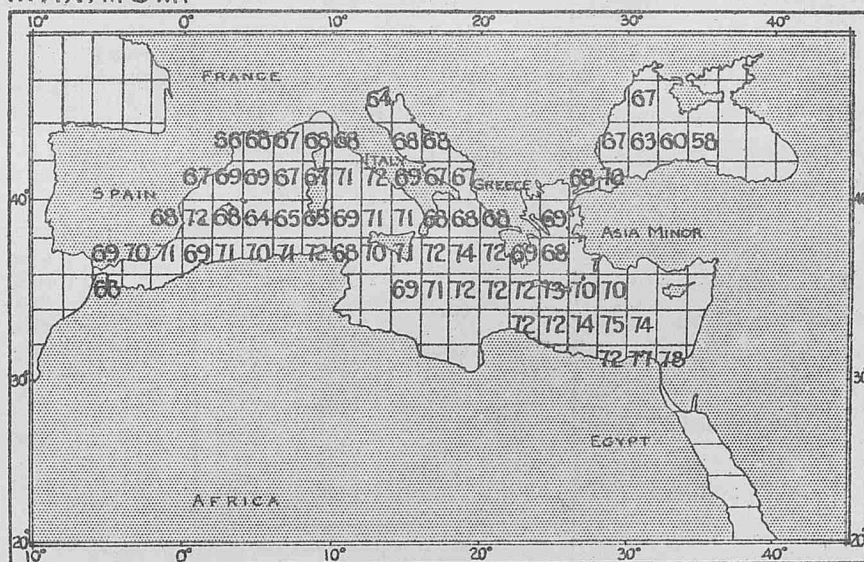
MEAN.

MAY.

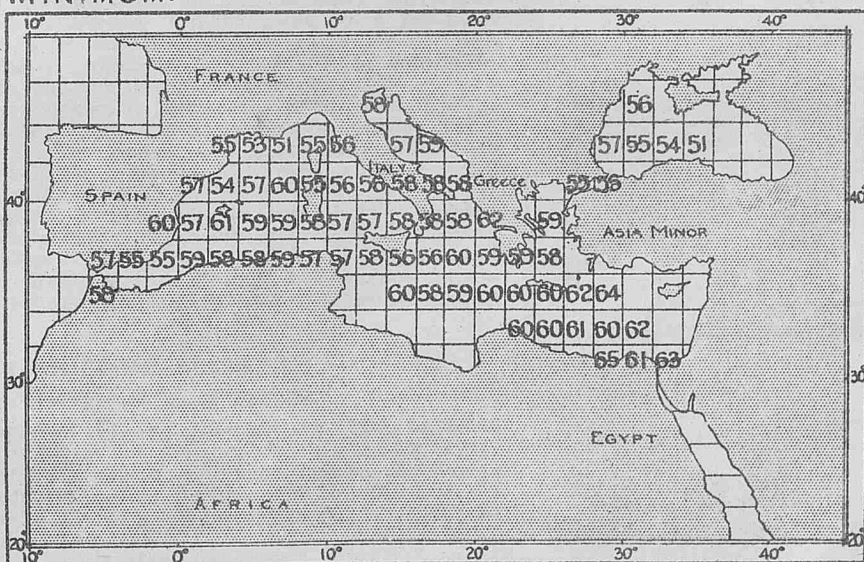


Small figure gives number of observations.

MAXIMUM.



MINIMUM.



Computed from observations of British Ships during the years 1900-1914 in the Mediterranean and Black Seas.

Maximum and Minimum figures are not shown unless the Mean Temperature has been computed from not less than 12 observations.

NOTICES.

COPY OF NOTICE TO MARINERS.

BOARD OF TRADE

MARCH 1st 1930.

WIRELESS TELEGRAPHY.

W/T General Notices.

VOLUNTARY WORLD WIDE SYSTEM OF SELECTED SHIPS' WIRELESS METEOROLOGICAL REPORTS TO AID NAVIGATION COMMENCING 1ST MAY, 1930.—Following the International Conference on Safety of Life at Sea, and in accordance with recommendations of the International Meteorological Conference at Copenhagen in 1929—

Commencing on 1st May, 1930, British *Selected Ships* in the Meteorological Office voluntary observing Fleet List will make wireless meteorological reports for the information of all ships and meteorological services in all parts of the world, as part of an International system.

These reports will be made by certain *Selected Ships* fitted for C.W. transmission, addressed to certain meteorological services, and they may be intercepted by all ships.

Other *Selected Ships*, fitted for spark transmission only, will broadcast these reports to all ships. They may be intercepted and used as desired by meteorological services.

Reports by Type A.1 (C.W.) *Selected Ships* will be made to specified wireless stations addressed to Weather Offices and use the frequency (wave length) allotted to those stations. In parts of the world where stations are not detailed to receive these reports these ships will make their reports on a frequency of 143 kc/s (wave length 2100 metres) to C.Q.

Reports by A.2 (I.C.W.) and B (Spark) *Selected Ships* will be made on a frequency of 500 kc/s (wave length 600 metres) addressed C.Q.

Schedule.

All times are G.M.T.

Zones between Greenwich Meridians	First Weather Report.			Second Weather Report.		
	Times of observations.	Times of reporting by Type A.1 (C.W.) Ships.	Times of broadcasting by Type A.2 (I.C.W.) and Type B (Spark) Ships.	Times of observations.	Times of reporting by Type A.1 (C.W.) Ships.	Times of broadcasting by Type A.2 (I.C.W.) and Type B (Spark) Ships.
30° W.—30° E. ...	0600	{ 0618 } { 0818 }	0830	1200	1218	1230
30° E.—80° E. ...	0600	{ 0618 } { 0818 }	{ 0630 } { 0830 }	1200	1218	1230
80° E.—160° E. ...	0000	0018	0030	0600	{ 0618 } { 0818 }	0830
160° E.—140° W.	0000	0018	0030	1800	{ 1818 } { 2018 }	2030
140° W.—70° W. ...	0000	0018	0030	1800	{ 1818 } { 2018 }	1830 2030
70° W.—30° W. ...	1200	1218	1230	1800	{ 1818 } { 2018 }	2030

These weather reports will be made in the International Ships Wireless Weather Telegraphy Code, a figure code which was adopted by the International Meteorological Conference at Copenhagen in 1929, and information of Ice, derelicts, and set and drift of current being added in plain language where necessary.

Arrangements are under consideration for the necessary particulars for shipping, together with a Decode, will be given in a pamphlet entitled, "Decode for use with the International Code for Wireless Weather Messages from Ships," which it is hoped will be obtainable from H.M. Stationery Office, through any bookseller, price 3d.

This international scheme provides at present for 1,000 *Selected Ships* of all nations to make these reports (each nation's proportion being according to her tonnage). The names and particulars of British *Selected Ships* are published in the "Marine Observer," which is issued monthly by H.M. Stationery Office, price 2s. (2s. 2d. post free).

Guidance in the collective use of these reports is given in "Wireless and Weather an Aid to Navigation," obtainable from H.M. Stationery Office, price 5s. The pamphlet "Decode for use with the International Code for Wireless Weather Messages from Ships," will replace Appendices I, II and III of that book, which gave the experimental system previously used.

WEATHER SHIPPING BULLETINS.

The British Weather Shipping Bulletin.

Following agreements reached at the International Meteorological Conference at Copenhagen in September, 1929, to secure uniformity where possible, the arrangement of the groups of code figures giving the station reports in the *British Weather Shipping Bulletin* will be altered on 1st May, 1930, and the code tables altered to conform with the International Ships Wireless Weather Telegraphy Code.

This Bulletin remains unaltered in other respects.

Changes in Weather Bulletins for Shipping in other parts of the world may be expected, following the agreements reached at Copenhagen in September, 1929.

The pamphlet, "Decode for use with the International Code for Wireless Weather Messages from Ships" gives the key for decoding the figure groups in the *British Weather Shipping Bulletin* on and after 1st May, 1930. 1st March (36/2123).

COPY OF NOTICE TO W/T OPERATORS.

BOARD OF TRADE

No. 3 of YEAR 1930.

VOLUNTARY WORLD WIDE SYSTEM OF SHIPS' WIRELESS METEOROLOGICAL REPORTS.

Commencing on 1st May, 1930, British *Selected Ships* will make routine wireless weather reports twice daily in all parts of the world as part of an International system to certain shore stations and to all ships, in accordance with the following schedule.

SCHEDULE.

All times are G.M.T.

Reports by A 1 (C.W.) "Selected Ships" will be made to specified stations on the frequencies (wave lengths) allotted by these stations.

In parts of the world where Land stations are not detailed to receive these reports, "Selected Ships" will broadcast their reports (at the times indicated below) on 143 kc/s (2100 m.) in the case of Type A 1 transmitters and on 500 kc/s (600 m.) in the case of Type A 2 or Type B transmitters.

Here follows the Schedule given in Notice to Mariners opposite.

These reports will be drawn up in the International Ships' Wireless Weather Telegraphy Code, a figure code which was adopted by the International Meteorological Conference at Copenhagen in 1929.

Portishead Radio will collect information from C.W. "Selected Ships" in the Eastern North Atlantic for the Meteorological Office, London. Portishead will call up these ships at 0430 and 1030 G.M.T. daily and indicate the order in which they should make their reports, thus ensuring a minimum of signalling and the best distribution of reported observations.

The following Schedule shows the procedure.

Ocean.	Station and Call Sign.	Frequency (Wave Length) with times of observations and reports.		Area and limits covered by Station.	Telegraphic Address of Meteorological Centre.	Notes.
		For Station to call up "Selected Ships."	For "Selected Ships" to report to Station.			
North Atlantic and North Sea.	Portishead Radio G.K.U.	149 kc/s. (2,013 metres). First Observations: 0600. Second Observations: 1200.	143 kc/s. (2,100 metres). Corresponding Reports: *0618. Corresponding Reports: 1218.	Eastern North Atlantic and North Sea to about 1,500 miles from Station, but not within 300 miles of Station.	Weather, London.	Control system "Selected Ships" chosen to report in given order notified by station daily at 0430 and 1030 G.M.T. Roll call thus—Weather begins—Call signs of "Selected Ships"—Weather ends.

* These Reports will be repeated at 0818 by "Selected Ships" for the benefit of single-operator ships.

Note.—Full particulars of this scheme, together with Code and Decode, were given in the January, 1930, number of the MARINE OBSERVER.

Arrangements have now been made for the publication of the Pamphlet referred to in Notices to Mariners above, and it will be on sale at H.M. Stationery Office.

ICE CHART. WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE.

- NOTE.—In case of necessity owing to extreme southerly drift of ice, operative dates will be fixed for Track A.
- (B) From 1st April to 31st August, inclusive.
 - (E) From 11th April to 15th May, or until the Cape Race route clear of ice.
 - (F) From 16th May to Opening of Belle Isle route.
- Westbound, on approaching Cape Race steer a course to pass 10 miles S. of Cape Race.
Eastbound, steer from position 25 miles S. of Cape Race.

These routes are liable to alteration when, owing to abnormal ice conditions, it is considered advisable by the steamship lines who are parties to the Track agreement.

ROUTE NOTICES.

For latest information re Tracks see pages 89-90 of Vol. VII, No. 76, April 1930 Number.

SYMBOLS USED ON THE CHART.

- Iceberg.
- Floeberg.
- Growler.
- Field Ice, Floe Ice, Pack Ice, Hummocky Ice, Bay Ice.
- Drift Ice, Brash Ice, Sludge Ice, Pancake Ice.
- Indicates W/T Ice Warning Station.

PHENOMENAL POSITIONS OF ICE.

Date.	Ship or Source of Report.	Position. Lat. Long.	Remarks.
May 20, 1907	S.S. Lord Landsdowne.	31°00'N. 38°00'W.	2 small pieces, 6 ft. by 6 ft. and 12 ft. by 4 ft. out of water.
" 6, 1908	S.S. Oceano ...	150-200 miles N. of Bermuda.	Pieces.
" 27, 1909	S.S. Reventazon ...	32°28'N. 44°10'W.	60 ft. long, 10 ft. high.
" 15, 1911	S.S. Camillo ...	10 miles E. of Nantucket Shoal L.V.	Small berg.
" 11, 1914	S.S. Indradeo ...	42°18'N. 62°43'W.	Large slabs of field ice and growlers 100-150 ft. long, 5 ft. out of water.
" 17, 1915	S.S. Pola ...	38°16'N. 61°50'W.	Some field ice.
" 15, 1920	U.S. Hydrographic Bulletin.	45°11'N. 36°42'W.	Berg.

Reports of Ice sighted between March 1st and March 31st 1929, which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

March 1st and March 31st 1929, Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

NOTICES.

MARINE METEOROLOGY.

CO-OPERATION OF SHIPOWNERS, MASTERS AND MATES.

Captains and officers who wish to co-operate regularly with the Meteorological Office should apply *by letter* to The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2, or in person to the Marine Superintendent at the same address, or any of the gentlemen whose names and addresses appear below, acting as agents at the respective ports. A general description of Marine Meteorological Work, including the particulars desired from intending Marine Observers, is given in Chapter I of *THE MARINE OBSERVER'S HANDBOOK, 5TH EDITION*, which may be obtained from H.M. Stationery Office direct, or through any bookseller, price 2/6.

The names of vessels regularly observing for the Meteorological Office, London, together with their Commanders and Observing Officers, are given monthly in *THE MARINE OBSERVER*, which may be obtained from H.M. Stationery Office, price 2s., 2s. 2d. post free.

The Captains and Officers of regular observing ships constitute the Corps of Voluntary Marine Observers. For certain branches of this work tested instruments are lent to the Captains of British ships registered at ports in Great Britain. A certain number of Regular Observing ships are detailed as "Selected Ships" for the purpose of the World Wide Scheme of Routine Ships' Wireless Weather Telegraphy Reporting. These "Selected Ships" are indicated monthly in the "Fleet List" in *THE MARINE OBSERVER* by a number.

Only ships registered at Ports in Great Britain will, in future, be included in the Meteorological Office, London, "Fleet List."

Marine Observers are asked to send in their Meteorological Log through the appropriate Port Meteorological Officer or Agent (accompanied by Form 138 in the case of "Selected Ships") at intervals of not more than six months. The Meteorological Record Form 911 (accompanied by Form 138 in the case of "Selected Ships") should be posted direct to the Meteorological Office, London, at the end of each voyage.

When sending in the Meteorological Log or Record, Regular Observing ships will render great assistance if they will notify the Port Meteorological Officer or Agent of their requirements.

The Port Meteorological Officers and Agents inspect official instruments at regular intervals, replacing those which are defective.

Where ships' instruments are found by comparison to be reliable they may be used for the work of "Selected Ships." A reliable mercurial barometer is essential as part of the equipment of a "Selected Ship."

A copy of *THE MARINE OBSERVER* is sent monthly to the Captain of every observing ship for the information and guidance of the officers doing this work. He is also supplied with *THE MARINE OBSERVER'S HANDBOOK* and such charts and atlases as are considered necessary as Meteorological equipment for *The Work* of a Regular Observing ship in a particular trade.

WIRELESS AND WEATHER AN AID TO NAVIGATION, published by H.M. Stationery Office, which affords information and guidance for the practical application of Marine Meteorology to Navigation, may be purchased through any bookseller, price 5s.

Returns made by Regular Observing ships are acknowledged monthly in *THE MARINE OBSERVER*, and a list of those Commanders and Officers who have performed specially fine work is published yearly in *THE MARINE OBSERVER* and Excellent Awards are made to them.

The work done by Regular Observing Ships in making written returns, and by "Selected Ships" in broadcasting routine information by W/T, together with "Weather Shipping" Bulletins broadcast from the shore, conforming with the recommendations of the International Convention of Safety of Life at Sea, 1929, provide the necessary information for the use of all shipping. Thus by shipowners encouraging the specialist work in those of their ships whose names appear in *THE MARINE OBSERVER*, this Voluntary Work under the supervision of the Meteorological Office provides a service to all shipping at minimum cost to the National funds.

Shipowners are asked to facilitate the forwarding of postal matter from the Air Ministry addressed to the Captains of their ships.

LATE PRESS.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
7.3.30	51°36'N.	2°28'E.	Red conical buoy with letters <i>W</i> and <i>H</i> drifting.
19.3.30	51°09'N.	1°38'E.	Can buoy, painted red and white vertical stripes and carrying letters <i>K</i> and <i>A</i> .
ENGLISH CHANNEL.			
4.3.30	50°26'N.	0°31'E.	Floating raft.
20.3.30	50°23'N.	2°22'W.	Heavy wooden object.
BRISTOL CHANNEL.			
1.3.30	10 miles N.E. of The Bull.		Submerged object.
ST. GEORGE'S CHANNEL.			
5.3.30	51°44'N.	5°47'W.	Submerged wreckage.
15.3.30	52°18'N.	5°37'W.	Mast about 10 ins. in diameter, projecting 9 ft. above water ; dangerous to navigation.
IRISH SEA.			
19.3.30	20 miles S.W. by W. of Skerries Light.		Wooden wreckage, apparently portion of a pier, partly submerged, showing about 3 ft., drifting in a Northerly direction.
BAY OF BISCAY.			
20.3.30	1½ miles South of Le Loc'h Bay, near Audierne.		Dangerous wreckage.
MEDITERRANEAN.			
7.3.30	42°24'N.	10°36'E.	Object dangerous to navigation.
NORTH ATLANTIC.			
3.3.30	51°48'N.	7°20'W.	What was presumed to be a big baulk of timber, submerged.
3.3.30	40°48'N.	42°32'W.	Large gas and whistle buoy, showing a flashing white light every 5 seconds.
4.3.30	32°39'N.	74°19'W.	Gas and whistle buoy, showing a flashing white light ; the buoy was painted red.
5.3.30	47°07'N.	15°07'W.	Conical buoy 8 ft. high, dangerous to navigation.
8.3.30	42°18'N.	61°47'W.	Schooner's mast with spider band attached, showing about 3 ft. out of water and apparently attached to submerged wreckage.
16.3.30	47°59'N.	5°02'W.	Conical buoy, painted red, adrift.
GULF OF MEXICO.			
2.3.30	28°57'N.	93°41'W.	Tree trunk about 4 ins. in diameter, projecting vertically about 5 ft. out of water ; this log had the appearance at a distance of a black can buoy.
3.3.30	28°52'N.	91°50'W.	Large log, about 3 ft. in diameter and showing 2 ft. out of water.
NORTH PACIFIC.			
7.3.30	44°48'N.	124°26'W.	Wreckage about 10 ft. long and showing 5 ft. out of water.

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, AIR MINISTRY.

LONDON ... Captain L. A. BROOKE SMITH, R.D., R.N.R., Marine Superintendent.
Commander J. Hennessy, R.D., R.N.R., Senior Nautical Assistant.
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(Telephone No.: Holborn 3434 Extension 421).
Nearest station Temple, District Railway.

THAMES ... To be announced shortly.

MERSEY ... Lieut. Commander M. CRESSWELL, R.N.R., Port Meteorological Officer, Dock Office, Liverpool.
(Telephone No.: Bank 8959). Telegraphic Address: Meteorite, Liverpool.

Agents.

BELFAST ... Captain J. MCINTYRE, Harbour Master, Harbour Office. (Telephone No.: Belfast 4090).

CARDIFF ... Captain T. JOHNSTON, Technical College, Cathays Park. (Telephone No.: Cardiff 6813).

CLYDE ... Mr. ROBERT CLEARY, Master Mariner, The Clutha Stevedoring Co., Ltd., Princes Dock, Glasgow. (Telephone No.: 513 Ibrox).

FREMANTLE, W. Australia. Captain J. J. AIREY, Deputy Director of Navigation, Customs House.
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Agents (contd.).

HONG KONG, China. Lieut. Commander R. G. H. MILLIGAN, R.N., Superintendent, Admiralty Chart and Chronometer Depot, H.M. Dockyard.
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LEITH ... Captains G. BLACK and C. G. BONNER, V.C., D.S.C., Leith Salvage and Towage Co., Ltd., 2, Commercial Street.

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