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THE STUDY OF CLOUDS.

IT being recognised that specialised study of cloud is highly technical, Mr. G. A. CLARKE, who for many years has made a special study of clouds at the Meteorological Office Observatory at Aberdeen University, has responded to our invitation by contributing the following article, which we are confident will be highly appreciated by marine observers.

This article should not be taken as in any way superseding the instructions for cloud observation laid down in the Marine Observer's

Handbook, 3rd Edition, which specially deals concisely with observations required in the columns of the meteorological log.

If notes are made in the pages provided for "Additional Remarks" at the end of the meteorological log on the lines indicated by Mr. CLARKE under the heading "General Notes on Observation of Clouds" they will be of great assistance and may prove valuable contributions to the Marine Observer's Log.

MARINE SUPERINTENDENT.

THE CLOUDS.

G. AUBOURNE CLARKE.

EVEN the most casual observation will suffice to demonstrate that cloud forms, though infinite in their variety individually, nevertheless group themselves broadly into certain "types" which recur very frequently. Thus, for instance, on one occasion the sky may be covered with a thin uniform veil of "greasy" cloud; on another there may be detached sheets of clouds ribbed or corrugated like the tidal sands on a sea-shore; while at another time huge towering masses of cloud like mountain ranges may be the dominant feature. Nor is it necessary that one type alone should be visible—it is quite common indeed to meet with cases where two distinct forms are visible simultaneously, and when such is the case, careful watching will often prove that the two types are moving from different directions. This fact will at once invest a cloud observation with a special interest, for it will be seen that there must exist a definite reason for this difference of direction. The clouds are borne along by the air currents in which they are situated, and it therefore becomes necessary to assume that the atmosphere is arranged, with increasing height, in a series of horizontal layers, which differ among themselves in the direction and velocity of their movement, and which therefore have probably had different origins. Ascents of registering and pilot balloons have established the correctness of this assumption. It thus becomes reasonable to regard these layers as differing also in their temperatures and in the amounts of moisture they contain in the form of water-vapour. This water-vapour is the origin of all clouds, and is itself produced by the evaporation of water from the surfaces of sea and land by the heat of the sun's rays.

When the air is warm it can hold a very great deal more water-vapour, before becoming saturated, than it can do if it is cold, and therefore, if a mass of warm air, which is nearly saturated, becomes

by any cause sufficiently cooled, then the surplus water-vapour condenses out in very small drops of water, and becomes visible as a cloud or as fog.

Broadly speaking, the temperature of the air diminishes with increasing height, and thus the amount of water-vapour present will be much less in the upper layers of the atmosphere than in those near the surface. This accounts for the thin and filmy nature of the high clouds. In our latitudes the maximum height of clouds is on an average about 30,000 feet (about $5\frac{1}{2}$ miles). At the equator the height is greater, while at the poles it is less.

Summarising the above, it may be said that in general clouds are found as widespread sheets at various levels up to 30,000 feet or thereby. But sometimes a very different arrangement is met with, wherein the clouds are found in detached masses which, instead of being relatively flat or sheet-like, are of great vertical depth, so that they appear as "heaps" of cloud which, in extreme cases, may extend through a vertical depth of over 20,000 feet, or, in other words, through almost the whole range within which cloud is usually formed.

These "heap" clouds possess a special characteristic in the tendency they show to commence forming somewhere about 9 o'clock in the morning, and, after reaching a maximum of development about 2 or 3 p.m., to disperse again during the evening. They are also more in evidence during the summer half of the year. They owe their origin in most cases to the rising upward of those portions of the surface air that have become heated above the temperature of the surrounding air by the power of the sun's rays, and, as the clouds show a sympathetic variation with the diurnal range of temperature, they are often referred to as clouds of diurnal ascending currents.

As the heated air rises, it expands on account of the diminution

of pressure with height, and the expansion in turn causes a fall of temperature with consequent condensation of the surplus water-vapour into cloud. So long as the rising air remains warmer than the surrounding air in which it finds itself, it will continue rising, and the cloud will steadily increase in height until a point is reached where the temperature difference disappears. When the rising currents are not very vigorous the clouds thus formed are not of very great depth, and do not give rise to rain, but when these currents are strong and well developed, the clouds grow to large dimensions and produce heavy showers of rain or hail, and are often accompanied by thunderstorms.

In order to identify, for entry in the meteorological log, the different types of cloud that may be observed, a standardised nomenclature has been devised, based partly upon the form of the cloud and partly upon its apparent height. The classification is by no means perfect, and it is at times a matter for conjecture whether the cloud should be entered as one particular type or another one; but on the whole, the system of classification is fairly satisfactory, and, having the merit of simplicity, is likely to yield fairly concordant observations over a large body of observers.

The classification depends, as regards form, upon the appearance of the cloud, *i.e.*, whether the sheet is uniform, or whether it is broken up into separate units (or cloudlets), while as regards height, it depends upon the apparent size of the individual cloudlets in the case of a discontinuous sheet, or upon apparent density where the sheet is uniform. Generally speaking, it is fairly easy in practice to subdivide the sheet clouds into three conventional sections, an upper, an intermediate, and a lower. The heap clouds are always included as lower clouds, because, no matter how high their summits may reach, their bases are usually found at no great altitude.

As a result of the deliberations of an international conference some 30 years ago, the following classification was agreed upon:—

- A. *Upper Clouds*: average altitude 30,000 feet.
 - (a) Cirrus. (b) Cirro-stratus.
- B. *Intermediate Clouds*: altitude between 10,000 and 23,000 feet.
 - (a) Cirro-cumulus, Alto-cumulus. (b) Alto-stratus.
- C. *Lower Clouds*: altitude below 7,000 feet.
 - (a) Strato-cumulus. (b) Nimbus.
- D. *Clouds of diurnal ascending currents*.
 - Cumulus, base about 4,500 feet, top about 6,000 feet.
 - Cumulo-nimbus, base about 4,500 feet, top 10,000 to 26,000 feet.
- E. *High Fogs* under 3,300 feet.
 - Stratus.

In this classification the various types of clouds are arranged in descending order of average height. All divisions except D are sheet clouds; the subdivisions (a) and (b) shown under A, B and C, indicate that the clouds in subdivision (a) are in detached units, while those in (b) are in uniform sheets, and generally cover the whole sky completely. The Stratus under division E is usually complete and uniform, but may at times be in detached masses, as will be described later. The clouds in subdivisions (b) are usually found associated with cyclonic conditions and rain.

In the accompanying plate there are shown typical examples of eight out of the ten cloud types. The following descriptive remarks may help observers to identify the clouds they see, but it should be remembered that there is often considerable uncertainty when the cloud is a transitional form between any two of the types mentioned. An endeavour will be made in these remarks to mention a few of these indeterminate forms, but observers must use their own discretion as to what name they give to the cloud observed. The clouds will be described in the order they are mentioned in the above classification list.

Cirrus. This, the highest form of cloud, is always of a very delicate structure; in the day-time its colour is pure white, sometimes very faintly seen, but at others quite clear and sharply cut. About sunrise or sunset, the colour may change into a golden orange, and finally into a delicate rose-pink, the colour remaining visible on the cloud long after the lower clouds have become dark against the sky. Cirrus shows itself in long bands or wisps of a fibrous structure, or sometimes as a bundle of very delicate threads, which at times lie parallel to each other, but at others may be interlaced and crossed in a tangled web. Very typical arrangements are:—

- (1) Long bands or lines in which the threads are arranged like

feathery plumes; these bands are often hundreds of miles in length. When the whole sky is covered by a series of these bands, the bands themselves seem to spread outwards, or to radiate from one particular point on the horizon, and to meet again at the point diametrically opposite. The bands are of course parallel, but the fan-like arrangement is the result of perspective.

(2) More or less curved wisps or tufts, generally detached and scattered over the sky. This form is very characteristic and has been named "mares' tails" by sailors.

(3) A third rather striking and not uncommon form is that in which two systems of fairly parallel threads cross each other at an angle, and so produce the appearance of a net or web. This form is very prone to increase in density until the web develops into a uniform sheet of cloud which then becomes one of the two main types of Cirro-stratus. At other times the crossing threads develop into very small detached aggregations of cloud, and eventually become Cirro-cumulus.

Cirro-stratus. Appears generally as a uniform sheet varying in density from a hardly visible hazy layer through which the sun shines with only slightly-diminished lustre, to a sheet of intensely white cloud. Sometimes the sheet covers the whole sky, but at others it may show a fairly definite edge, which is occasionally sharply defined and straight, towards some part of the sky. The two chief varieties of Cirro-stratus are:—

(1) The sky may show, as the first appearance of this cloud, a slow, gradual whitening of the normal blue tint, so that eventually the whole sky assumes a milky or pearly tint which in time develops into an obvious layer of white cloud, showing little or no internal structure.

(2) The second variety is generally a development of the normal Cirrus. The separate threads of the Cirrus begin to increase in number and density, gradually closing up the interspaces between them, until the cloud layer becomes more or less complete. Such sheets of Cirro-stratus usually show a definite fibrous structure, the denser fibres being arranged along the lines where previously the bands of Cirrus were found. In cases where the Cirrus was of the form mentioned in (3), the Cirro-stratus layer, when developed, presents a woven structure.

Both varieties of Cirro-stratus give rise to various optical phenomena, which are caused by the refraction and reflection of the sun's rays by the tiny ice-crystals of which the cloud is composed. Chief among these are solar and lunar halos, mock suns and moons (parhelia and paraselenæ), and sun and moon pillars.

Cirro-cumulus is almost always easy to identify by the delicacy of its structure. In colour it is usually dazzlingly white in the day-time, and golden orange or rose-pink when the sun is rising or setting, but sometimes the tiny cloudlets, when they are globular in form, may exhibit very faint greyish shadows. The typical forms of Cirro-cumulus are as follows:—

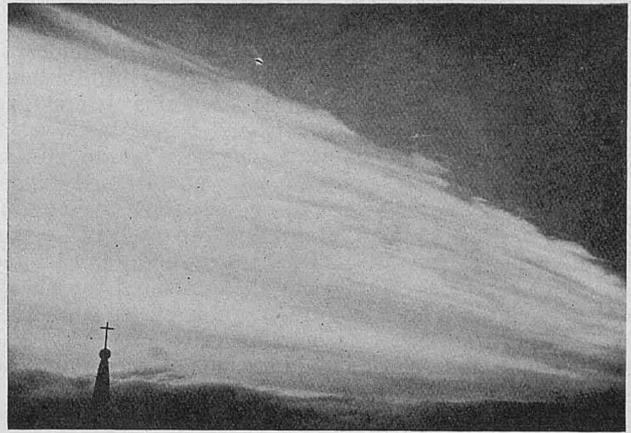
(1) The transitional form between Cirrus and Cirro-cumulus which appears as very minute ripples of cloud, or small nuclei interspersed with threads. This form is subject usually to very rapid changes from thread to ripple or nucleus and *vice versa*. There is no clear line of demarcation between it and the next form.

(2) The globular form. Flotillæ of very small pure white globules of cloud, often arranged in a series of lines or ranks. These lines of cloudlets are usually parallel, and are sometimes crossed at an angle by another series of lines, thus exhibiting "double undulation." The globules vary in size throughout the cloud-sheet; being usually small at the edges, but larger towards the middle of the sheet. Occasionally they may be large and dense enough to show very faint shadows, especially when situated in the neighbourhood of the sun so that part of the incident light is transmitted through the cloud sheet.

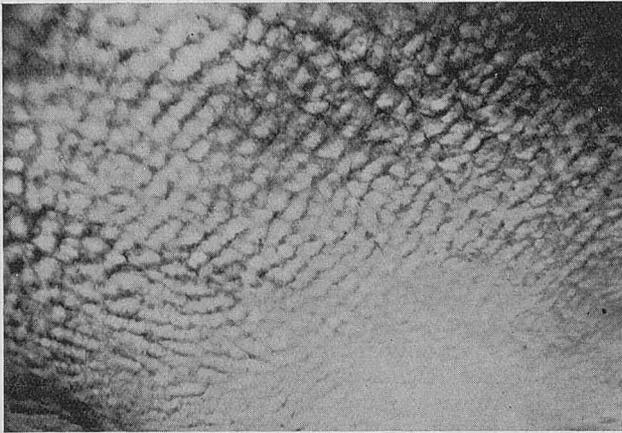
(3) The wave form. This form is very common, and is arranged in much the same manner as the globular form, but the globules are replaced by more or less continuous wavelets, sometimes straight but more often curved. The wavelets may be widely separated or closely packed, when the latter condition is present, the wavelets frequently fuse together into a more or less uniform mass towards the centre of the cloud sheet. The wavelets may occasionally show faint shadows in circumstances similar to those mentioned in the case of the globular form. When the wavelets are interrupted by the crossing of another wave system, the appearance produced is that of a flaked or tessellated sheet.



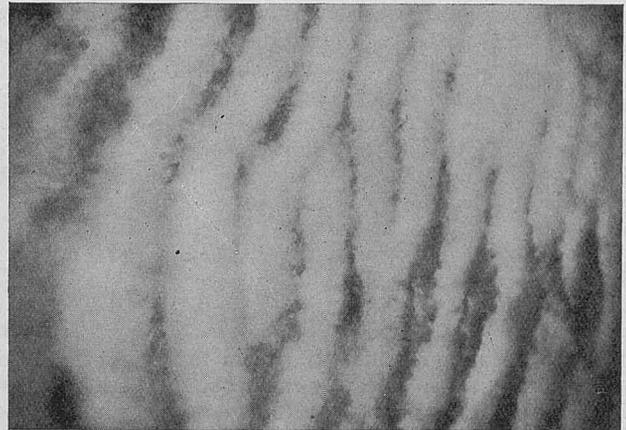
Cirrus, in curved wisps.



Cirro-Stratus, showing clearly defined edge to the cloud-sheet.



Cirro-cumulus, small waves and flakes.



Alto-cumulus, in long thin waves.



Alto-Stratus, some detached Strato-cumulus patches below.



Strato-cumulus, at edge of heavy sheet.



Cumulus, just beginning to form (some slight Cirrus above).



Cumulo-Nimbus, during thunderstorm, showing development of "anvil."

Alto-cumulus is a cloud type having all the characteristics of Cirro-cumulus, but, owing to its height being about half that of the latter, the Alto-cumulus is usually a much denser cloud, with the individual cloudlets larger. The forms shown by Alto-cumulus are similar in most respects to those of Cirro-cumulus, but the rounded masses and waves usually show fairly definite shadows. When, however, the cloud is thin, the waves may be white and without shadows, and the tessellated type may show as flattened thin scales.

There is no clear line of demarcation between Cirro-cumulus and Alto-cumulus; the types merge gradually into each other, and it is often difficult to decide upon the correct designation. A Cirro-cumulus sheet may appear as Alto-cumulus in the centre of the sheet where the cloud is thickest, while an Alto-cumulus sheet may be fringed with smaller cloudlets exactly resembling Cirro-cumulus. The *main* characteristic of the cloud-sheet should, in such cases, serve to establish its correct type.

During thundery weather conditions, Alto-cumulus is often very globular in form, and sometimes may show a vertical structure which resembles in miniature the clouds of the Cumulus and Cumulo-nimbus types. In fact these latter types usually follow the appearance of this specialised Alto-cumulus. Cirro-cumulus and Alto-cumulus, when in the wave form, are known as "Mackerel Skies"; the banding of the cloud being likened to the stripes on a mackerel's back.

Alto-stratus is the name given to the widespread cloud-layer which almost always completely covers the sky. It resembles Cirro-stratus, except that, instead of being white in colour, it is usually bluish-grey or yellowish-grey. The sun may be discerned, shining weakly through it, but the cloud is usually too dense for actual sunshine, and no shadows are cast by the sun's rays. This cloud is often referred to as the "watery sky" partly, perhaps, on account of its almost certain association with approaching rain.

Alto-stratus is a much lower cloud, usually, than Cirro-stratus, but a development of Cirro-stratus into the lower cloud is the rule rather than the exception, and would seem to suggest that condensation was occurring at a steadily decreasing height. Alto-stratus formed in this manner is usually quite structureless, and generally of the bluish-grey colour. But Alto-stratus is formed at times by the degradation and eventual fusing of Cirro-cumulus; in this event the cloud-sheet shows warps of denser cloud running in lines across the cloud-sheet, these may be crossed by another system of warps, giving the cloud a fibrous or web-like structure. The colour of the cloud in this case is often a yellowish-grey.

Strato-cumulus is in reality a much heavier, denser, and lower form of Alto-cumulus. It is seldom so regular in its arrangements, and the individual cloudlets are more lumpy and irregular. The colour is usually some tint of grey, ranging from white cloudlets with definitely light-grey shadows to dark-grey masses separated only by brighter lanes and interstices. This latter form is in fact one of the most common sky-types in our latitudes.

Towards evening the Strato-cumulus shows as heavy purple-grey detached rolls and irregular masses of cloud on a comparatively light-blue sky. Sometimes the Strato-cumulus may appear in long rolls, very straight and parallel, stretched right across the sky; it is then known as "roll-cumulus." On other occasions a cloud-sheet resembling a complete layer of Strato-cumulus may exhibit on its under-surface an "inverted" structure, wherein more or less rounded masses of cloud hang downwards from the cloud-sheet, giving it a "festooned" appearance. Such cloud-sheets are known as mammato-cumulus, but for practical purposes it will be sufficient to enter the observation of cloud as "Strato-cumulus" and to make a note in qualification to this effect "under surface mammillated."

Nimbus. This name is given to the heavy indefinite cloud-structure from which more or less continuous rain or snow falls. In reality the Nimbus is usually a very composite cloud, and may consist of dense layers of Alto-stratus or degraded Strato-cumulus, below which detached sheets and fragments of ragged cloud, commonly known as "Scud" by sailors, are found. Sometimes, however, the layer may be more of the "heap" type, and may have a cumuliform structure which becomes evident only as the cloud sheet begins to break up and disperse. In some exceptional cases, large Cumulo-nimbus clouds may increase greatly in size and their bases may spread laterally and close up into what appears to be an ordinary Nimbus layer. A Nimbus sheet formed in this way is usually very slow-moving or even stationary, whereas the ordinary true Nimbus of a depression moves very rapidly. Broken "scud" cloud is usually classified as Fracto-nimbus, on account of its torn and ragged appearance.

Cumulus is the lesser in size of the two types of heap cloud. In its typical form it appears as a hemispherical or pyramidal mass of condensation, whose base is almost flat. The upper part of the cloud shows a large number of protuberances which are really the heads of the ascending air columns.

According to the position of the cloud with reference to the observer, it shows various aspects. If the cloud is between the observer and the sun, so that the sun's disc is hidden by the cloud, the cloud appears as a fairly uniform dark-grey mass with an edge of dazzling whiteness. If on the side of the observer directly opposite to the sun the cloud is vividly white, with grey shadows round the edges of the protuberant portions. But Cumulus appears at its best when illuminated by sunlight on one side only (that is when the cloud is to right or left of the sun) for then the structure of the cloud is shown in strong relief. Cumulus clouds are usually associated with dry weather unless they continue growing until they develop into the next type, the Cumulo-nimbus.

Sometimes the Cumulus instead of being compact and well formed, is rather broken and ragged, as if torn asunder by wind, or more probably by eddies within the cloud. Such forms are known as Fracto-cumulus, but should be classified as Cumulus.

Cumulo-nimbus are greatly exaggerated Cumulus clouds and grow to much greater heights, as has already been mentioned. When developed on a large scale, their appearance is somewhat different from that of the ordinary Cumulus. They may pile up into heavy long banks, having some resemblance to ranges of lofty mountains, in which case the ordinary rounded top is usually predominant, but the most striking forms are found when individual clouds are specially well developed. The forms then assumed are always fantastic, the ascending currents are very vigorous, and rise upwards from out the main mass of the cloud like castellated towers the tops of which sometimes remain domed or irregularly rounded, but more often flatten out into a spreading form which strongly resembles an anvil in shape. The edges of this anvil are generally brushed out into filaments which are very much like ordinary Cirrus. This fibrous portion is usually known as "false Cirrus."

Cumulo-nimbus clouds are practically always associated with showers of rain, hail, or snow, and when the clouds are very large the showers may be extremely heavy. Thunderstorms are always the result of heavy development of Cumulo-nimbus. When line-squalls occur, a band of this cloud almost always accompanies the squall. Sometimes the development is sufficient to produce a thunderstorm, but at others only showers accompany the squall, and waterspouts may also be present. The band of Cumulo-nimbus in a line-squall may stretch in an unbroken line for hundreds of miles.

Cumulo-nimbus clouds are, like Cumulus, in themselves, dazzlingly white where illuminated by sunshine, but when in shadow, they appear intensely dark; this is due, of course, to the great bulk of the cloud, and is shown at its best when the base of a large cloud passes overhead. Sometimes, in calm weather on land, the thunderclouds show a coppery or reddish-yellow tint, due to the atmospheric impurities such as dust and smoke being drawn up by the air in the neighbourhood of the cloud, and forming a veil between the observer and the cloud itself.

Stratus.—The international definition of this cloud type is "a uniform layer of cloud-like fog, not lying on the ground." A lifted fog will therefore automatically become a sheet of Stratus. The cloud is usually, though not always, uniform, and of a light to dark grey colour, depending upon its thickness. Usually it can be distinguished from Alto-stratus in that the sun's disc is not visible through it, but in cases when the cloud is thin, the sun's disc can be seen dimly. The best indication is that of apparent height, there is usually little difficulty in making sure that the cloud is at no great altitude. When it becomes thin, the cloud may usually be seen moving fairly rapidly across the sun's disc.

Stratus is not always quite uniform in structure. It may at times be broken up into shreds, as when it disperses, or when it floats round mountain summits; it is then known as Fracto-stratus. At other times the layer disperses by gathering into detached more or less woolly and rounded masses, resembling Cumulus or low Strato-cumulus. The obviously small altitude of such "Stratus-cumuliformis," as it is called, will sometimes be a sufficient guide to its true designation, but often it is quite impossible to say whether the cloud is really low Strato-cumulus, or only the Cumuliform stage of Stratus. In such cases it will be well for the observer to use his discretion, and

classify the cloud according to the type its appearance most suggests; true Cumulus may often develop from this Cumuliform Stratus.

General Notes on Observations of Clouds.

On all occasions, when any noteworthy or striking feature is shown by the clouds, a short descriptive account may with advantage be made upon it, together with a slight sketch, if possible. There are certain appearances of the sky which are intimately associated with the pressure distribution and one or two of these will now be described.

(1) The upper and intermediate clouds are known sometimes to form in detached sheets and patches which have a strong resemblance to the shape of an airship, a torpedo, an almond, a cigar, or generally to the body of a fish, such as the shark. These forms are termed "lenticular" cloud-banks and are of course of the "stream-line" form. They are reputed to be due to the influence of mountains and plateaus upon the flow of the air, and should therefore be confined to land areas. Any observations of this type out over the ocean would therefore be valuable as information as to their true origin.

(2) After a *depression* has passed, it is sometimes seen that a layer of upper cloud is passing off, leaving clear sky beyond it. Usually this upper cloud is itself moving from a direction almost at right angles to the surface wind, while at the same time the whole system is passing away. When this occurs, the upper cloud usually exhibits a very sharp, clear-cut edge to windward, and observations or notes of the following data would be of considerable value:— (a) the time of passage of the sharp edge through the zenith; (b) the direction of movement of the upper cloud itself, if obtainable (*i.e.* the direction *from* which it is moving); (c) the orientation of the edge of the upper cloud (*e.g.* S.S.W.—N.N.E., etc.); (d) the latitude and longitude of the place of observation; (e) the type of the cloud and the apparent density of the sheet.

(3) Any sudden change in the cloud character, or any instance where there appears to be a sharp line of demarcation between two portions of the sky as regards cloud type might be noted, and similar particulars given.

CURRENTS ON THE DIRECT CAPE BLANCO—TABLE BAY TRACK.

(Continued.)

THIS article is a continuation from the January number of the *Marine Observer* in which charts were given for the quarters February to April, and May to July. With this number, charts for the remaining two quarters of the year are given.

The Equatorial Current.

Attention was called to the fact that the line of separation between the Equatorial and Guinea currents on this track lay between the parallels of Latitude $1^{\circ} 30' N.$ and $4^{\circ} N.$, except in the month of October (FIGURE 2 of the January number). In October easterly sets were found right down to the Equator, and in some cases were met with even in Southern latitudes.

To investigate this further, the Annual variation in the Westerly (or Easterly) current velocity have now been computed for each 2° of Latitude between Latitude $16^{\circ} N.$ and $16^{\circ} S.$, and it is found that the type of variation for each interval between the Latitudes of $4^{\circ} N.$ and $4^{\circ} S.$ is very similar. Between these Latitudes the water sets most strongly to westward in June and July, weakly in October, more strongly in November and December, and weakly again in about March. This double maximum disappears north of $4^{\circ} N.$, and south of $4^{\circ} S.$

Captain TOYNBEE'S "Charts of Nine Ten-Degree Squares" were examined and from them the frequency of westerly current in each month computed for the same two degree strips between Longitude 20° – $25^{\circ} W.$ The frequency of Westerly current in that area also showed a double maximum between Latitude $4^{\circ} N.$ and $4^{\circ} S.$ with maxima during the northern summer and winter. North of Latitude $4^{\circ} N.$ and South of Latitude $4^{\circ} S.$, the double maximum in that region also is hardly distinguishable.

It would seem then that on the Equator between Longitude $7^{\circ} W.$ and $25^{\circ} W.$ the westerly current reaches maxima when the sun is furthest from the Equator and minima when the sun is over the Equator, and that the movement south of the Guinea current in October is connected with the autumnal slackening of the Equatorial stream.

In a letter on the currents of this route by Captain L. A. MILLARD of R.M.S. *Kenilworth Castle*, he draws attention to this double maximum. "I have found," he says, "the Equatorial Current to be strongest in May, June and July and again in December, January and February. During other months the Current is generally weak and the Guinea current is then stronger. Last July (1923), I experienced a current which set N. $56^{\circ} W.$ 34 miles, but no appreciable Guinea current—and I have had similar experiences on other occasions at the same time of year.

"In September 1922, I experienced a set of East, 21 miles, and in the following October, N. $87^{\circ} E.$ 19 miles—it would therefore appear that when one current is weak the other is strong.

"The sea temperature always indicates the current, whether strong or weak, and if carefully taken will show with tolerable certainty when the ship passes from one current to another."

Though no explanation can be given of *why* the Equatorial current

should have this double maximum of velocity during the year, the fact is of great interest. It does not seem to have been recorded in any Sailing Directions or other work of that nature, though it may have long been known to other seamen besides Captain MILLARD by their experiences gained in constantly traversing this route.

The Guinea Current.

In Captain MILLARD'S report he suggests there may be an annual variation in the velocity of the Guinea current. As was shown by FIGURE 3 in the previous article, there is a decided annual variation in the position of strongest Guinea current varying between Latitude $3^{\circ} 45' N.$ and $6^{\circ} 15' N.$ Taking the values of Eastward current at the positions corresponding to FIGURE 3, it is found there is a summer maximum of about 15 miles per day and a winter minimum of about 10 miles per day.

The Current between Latitude 10° – $14^{\circ} S.$

Another feature of these charts which does not appear on any other of this region is the small values of the westerly drift in about Latitude 10° – $14^{\circ} S.$ The position is in the heart of the S.E. Trade, but there can be no question of the reality of these values, since they are a feature of the chart for each quarter.

South African Current.

Further South it will be noticed how the resultant current tends to set more and more in the direction of the wind as the Coast of Africa is approached. This is undoubtedly the result of the S.E. wind blowing over the coastline. In old books explaining the circulation of the ocean, the reason of the drift along the African Coast northward of the Cape was given as being the piling up of water driven along by the Westerly gales of the Southern Ocean. This explanation should be modified in the light of present knowledge. Water displaced by Westerly gales in mid-ocean would be speedily compensated by a return flow at the bottom of the ocean. An accumulation of water can only be caused by wind in the *near** neighbourhood of a coast line or of the boundary of a stream current. The westerly gales which blow across the coast of South Africa are not steady, and any effect they may have on the current is passing, and in any case could not cause the northerly set to flow as far to the northward as it is in fact found.

The northerly current is caused by the action of the *steady* South-Easterly wind. That wind has a tendency to draw water away from the African coast—so that the sea must actually slope very slightly down towards the coast,—the pressure gradient in the sea due to this slope will tend to make the current run more northerly, owing to the rotation of the earth, than it would if there were no coast line present.

In support of this theory, that the S.E. wind draws water away from the coast, may be instanced the marked strip of cold water along the coast of Africa, from Table Bay to Mossamedes, which

* Unless the wind is very steady in direction.

suggests most strongly that the cold deep water is there rising to the surface.

A precisely similar feature of a current setting towards the equatorial regions may be observed wherever the Trade winds blow across a Western seaboard.

In making the landfall for Cape Town, as will be seen from the Charts, a north-westerly current is to be expected which attains its greatest velocity in the summer months, *i.e.*, the season of the South-East wind. But, as Captain STRONG pointed out in his remarks on "Weather and Currents in South African Waters," which were published in the "Marine Observers' Log," of the January number, there are occasions on which there is an Easterly set into Table Bay.

Captain MILLARD in the report referred to earlier in this article says, "During N.W. gales or in a strong westerly wind accompanied by the S.W. swell that usually prevails, I have found ships set in towards Dassein Island—but this I attribute to 'drift' (leeway) and not to current—my experience being, that the current usually sets to the N.W. about a quarter of a mile per hour for some 500 or 600 miles N.W. of Cape Town. I have never found a set towards Robben Island, but it is quite possible that on occasions there are local currents which I have not experienced."

An examination of the frequency with which the current had an easterly component between Latitude 32° S. and Table Bay showed, (FIGURE 5), there was a maximum in July and possibly a second maximum about January. The number of observations on which this Figure is based is not very large, 128 for the whole year, but the months seem to corroborate one another.

The principal maximum during the winter is precisely what would be expected, as during that season the S.E. wind has receded northwards,

and in the neighbourhood of the Cape the winds are very much more variable in direction.

As would be expected these Easterly sets are largely influenced by the wind, occurring most frequently with Westerly and North-Westerly winds.

After allowance had been made for the *normal* set and drift for the time of year, the abnormality of east or west current was compared with wind direction. It was found that with winds between E. by S. and S.E. no easterly abnormality of more than $\frac{1}{4}$ knot had been recorded. With winds between S.E. by S. and S. the easterly abnormality had been $\frac{1}{4}$ knot or more once in every 9 occasions, with winds between S. by W. and S.W. once in every 7 occasions, with winds between S.W. by W. and W. just over once in every 3 occasions, and with winds between W. by N. and N.W. once in every 2 occasions.

After this article had been completed, the following note on the current met with on the Track from Sierra Leone to Cape Town was received from H.M.S. *Danae*, Captain F. M. AUSTIN, R.N., Navigating Officer, Lieutenant G. W. HILL, R.N., which confirms on that occasion the deductions already made:—

"December 14th to 22nd, 1923.

"Very light S.E. Trade wind was encountered, a maximum of force 3 and usually 1 to 2. This had the effect of stopping the drift current and practically no northerly set was experienced. An unexpected current was met with on the last day of the passage. At 8.41 p.m. (on 21st), by stars, ship was in Latitude 32° 00' S., Longitude 16° 39 $\frac{1}{2}$ ' E., course 147°, speed 15 knots, the wind variable, force 1. Between this position and the vicinity of Green Point (at 5.52 a.m. on the 22nd), a set of 9 miles in a direction 134° was experienced."

THE MARINE OBSERVERS' 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.

SUNSET EFFECT.

THE following is an extract from the Meteorological log of S.S. *Manistee*, Captain J. M. ISAACSON. Homeward bound from West Indies:—

31st July 1923, Sunset. (Latitude 22° N. Longitude 63° W.)

"Sun set behind bank of cu. clouds giving a peculiar and distinct form of 'afterglow,' consisting of four perfectly formed violet arcs converging at W. by N. and E. by S. points on the horizon. Northernmost and southernmost arcs reaching an altitude of 30° N. and S. respectively. Inner arcs attaining an altitude of 65° N. and S. respectively. Visible for 12 minutes."

CLOUD PHOTOGRAPH.

THE accompanying photograph of cloud was taken on July 9th, 1923, at 5.30 p.m. in Latitude 26° 43' N., Longitude 120° 20' E., bearing West, over entrance of Min River, by Captain G. BYERS, S.S. *Changchow*.

Captain BYERS remarks:—"the narrow white line at top of cloud consisted of a band of spectroscopic colours, the sun being behind the lower part of the cloud, the effect was very fine, the colours lasting over half an hour."



CURRENT OFF ADEN.

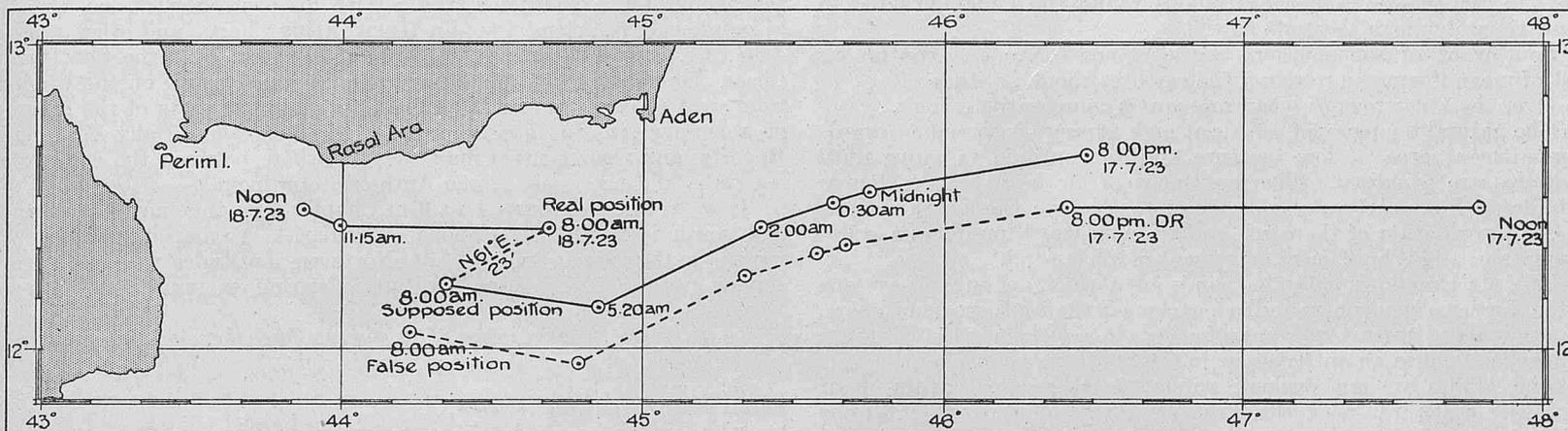
The following note has been received from S.S. *City of Valencia*, Captain W. A. WILLIAMSON, observer Mr. A. R. MUIR, bound Colombo to Perim :—

“Diagram of actual courses steered showing exceptionally strong north-easterly set in the vicinity of Aden, 17th and 18th July 1923. The noon position of the 17th was obtained in the ordinary way, whilst reliable stellar observations of North and South stars showed vessel's actual position to be 12 miles to the northward of 8.00 p.m. D.R. Equally reliable stellar observations a.m. 17th, had shown vessel to be 12 miles to the northward of the noon position, and as it seemed extremely unlikely that the vessel should be set 12 miles to the southward from a.m. sights to noon sights, and again 12 miles to the northward from noon sights to p.m. sights, it was assumed that abnormal refraction had existed at the time of noon observations, and the 8.00 p.m. position was accepted as the vessel's real position.

The horizon at noon was, to all appearances, what is generally termed good. The lower false line of courses shows the position at 8.00 a.m. on the 18th inst. the vessel would have been supposed to be in, had no p.m. stellar observations been obtainable on the 17th, and had those courses been steered. The upper line of courses shows the position at 8.00 a.m. on the 18th vessel was supposed to be in, working from the 8.00 p.m. stellar observation position of 17th.

“The real position was obtained by cross bearings. The set and drift arrived at between 8.00 p.m. of the 17th, and 8.00 a.m. of the 18th was N. 61° E.—23 miles, or equal to nearly 2 miles an hour. The wind throughout the period of observation was northerly and westerly, force 2-4, sea smooth, slight westerly swell, and cloudless sky until 6.00 a.m., when a fierce squall from the north, force 10, and of 45 minutes' duration, brought dull, heavily overcast, showery, and hazy weather, necessitating feeling the way by the lead until land was sighted in the morning.”

Current off Aden, July 17th-18th, 1923.



CURRENTS OFF THE COASTS OF SIERRA LEONE AND LIBERIA.

The following currents experienced by Auxiliary Schooner *Sierra Nevada*, Captain F. T. SKELLERN, may be of interest to navigators in the West African Trade. Observer, Mr. K. A. CLARKE, Acting 2nd Mate :—

1922. Month.	Time and Date.		Position from—		Position to—		Current.		Wind.	
	From—	To—	Latitude.	Longitude.	Latitude.	Longitude.	Set, Direction True.	Knots.	P.M.	A.M.
July	Noon 11th	Noon 12th	8 37 N.	16 33 W.	8 03 N.	15 02 W.	North & East	1½	—	S.W.4
„	„ 12th	„ 13th	8 03 N.	15 02 W.	8 09 N.	14 41 W.	E.N.E.	1½	S.W.4	S.W.5
„	„ 13th	„ 14th	8 09 N.	14 41 W.	8 06 N.	14 33 W.	E.N.E.	1½	S.W.4	S.W.2
„	„ 17th	„ 18th	6 22 N.	11 22 W.	6 36 N.	11 16 W.	N.E.	2	S.S.W.3	Calm
„	„ 19th	„ 20th	6 00 N.	10 38 W.	5 27 N.	10 34 W.	N.	2	S.W.2	S.W.4
„	„ 20th	„ 21st	5 27 N.	10 34 W.	5 49 N.	11 14 W.	N.	2½	S.W. by S.4	S.S.W.4
„	„ 21st	„ 22nd	5 49 N.	11 14 W.	5 56 N.	10 11 W.	N.	2½	S. by E.3	S.S.W.3
„	„ 22nd	„ 23rd	5 56 N.	10 11 W.	6 06 N.	10 31 W.	N.W.	2	S.W.3	S.S.W.3
„	„ 23rd	„ 24th	6 06 N.	10 31 W.	6 11 N.	10 58 W.	N.W.	2	S.W. by S.4	S.S.W.1
„	„ 24th	„ 25th	6 11 N.	10 58 W.	6 23 N.	11 35 W.	N.W.	2	S.E. by S.1	S.S.W.3
„	„ 25th	„ 26th	6 23 N.	11 33 W.	6 26 N.	11 8 W.	N.	2	S. by W.4	S.W. by S.4
August	„ 13th	—	At Cape Mount.				Setting on shore (N'y.)	1½ to 2	Var. 1	Var. 1
„	„ 19th	„ 20th	5 26 N.	10 17 W.	5 13 N.	9 37 W.	Towards land	1¾	S.S.W.4	S. by W.4
„	„ 20th	„ 21st	5 13 N.	9 37 W.	5 06 N.	10 13 W.	North & East	¾ to 1½	S.S.W.4	S.S.W.3
„	„ 25th	„ 26th	4 20 N.	7 12 W.	3 55 N.	4 27 W.	N.65° E.	2	S.W.3	S.W.5
„	„ 26th	„ 27th	3 55 N.	4 27 W.	3 55 N.	3 11 W.	N.64° E.	1	S.W. by S.2	S.W. by S.2
„	„ 27th	„ 28th	3 55 N.	3 11 W.	3 55 N.	2 03 W.	N.45° E.	1¼	S.W. by S.2	S.W.2
November	6th ?	—	Off Cape Lopez.		—	—	N.	1 to 2		
„	10th ?	—	Off St. Thomas Isl.		—	—	N.N.E.	¾ to 1½	Current stronger to N. of Island.	
„	23rd ?	—	Off Cape Palmas.		—	—	E.	1		

Captain SKELLERN, in handing in these observations, stated that on one or two occasions the current was so strong that when the vessel was steaming full speed ahead into it she was actually carried astern.

WIRELESS AND WEATHER, AN AID TO NAVIGATION.

CHAPTER VII.

SOUTHERN WATERS.

THE earth's surface is divided into seven zones of comparative low and high mean barometric pressure lying roughly parallel to the Equator. These zones may be distinguished in CHARTS XXVI and XXVII, "Mean Pressure and Wind in January and July." They move bodily northward and southward, following the sun's declination. The equatorial zone of low pressure is continuous round the earth; in it the Doldrums of the oceans are situated.

The great permanent high-pressure zones or anti-cyclones lie roughly between the parallels of 20° and 40° North and South, and it is important to note that they are not continuous round the globe. Northward of the northern anti-cyclones there is a zone of mean low pressure, which also is not continuous round the globe, situated in approximately mean Latitude 60° N.

Southward of the southern anti-cyclones there is a continuous belt of mean low pressure round the earth in about Latitude 60° S.

Over the Polar regions mean pressure is comparatively high.

The natural tendency of the air at high pressure is to make towards any adjacent area of low pressure and to continue to move until pressures are equalised. The movement of air from high to low is not direct, but nearly at right angles to the line from high to low, due to the rotation of the earth and friction, which produces a spiral circulation. This horizontal movement of air is wind.

The air circulates *with* the hands of a clock in an anti-cyclone in the Northern hemisphere and in a cyclone in the Southern hemisphere.

It circulates *against* the hands of a clock in a cyclone in the Northern hemisphere and in an anti-cyclone in the Southern hemisphere.

The Trades are anti-cyclonic winds; in these great drifts of air from the eastward, near the Equator, Tropical Revolving Storms originate.

We have seen in Chapters III and IV that cyclones originate in the Northern low-pressure zone, and in Chapter I we briefly described the seven fundamental shapes of isobars which distinguish the weather systems of Temperate Northern Latitudes.

In the Southern low-pressure zone, westerly winds predominate to such an extent that the Northern border of this zone between the parallels of 40° and 50° South is called the "Roaring Forties."

These westerly winds are caused by a succession of lows passing to the eastward, southward of the "Roaring Forties," and they may be traced by shifts of wind and barometer changes experienced in ships running their easting down.

In these latitudes sailing ships put up fine performances. The writer had the good fortune to serve in the Ship *Siren*, Captain MALCOLM MACLEAN, when she created the record passage from Cape Town to Sydney in 29 days in October, 1895. A succession of gales was experienced commencing from the north-westward, with falling barometer, veering to west as the centre overhauled and passed the ship to the southward, and shifting to south-west with rising barometer. Occasionally easterly winds are experienced due to "lows" being further north.

On June 1st and 2nd, 1897, in the Barque *Ashmore*, Captain DOLBELL, from Brisbane to London, we were head-reaching in Latitude 56° S., Longitude 62° W., there being an easterly gale which veered to S.E.; bitterly cold, the rigging becoming ice-encased with frozen spray. At this time *Ashmore* was approximately 300 miles S.E. by S. of Cape Pembroke in the Falkland Islands, and it is interesting to note according to the Lighthouse Meteorological Register, that at midnight June 1st, 1897, the wind was W.N.W., force 3; at noon on June 2nd, N.N.W. 4, and at 4 p.m. it had veered to North, from which point it continued until 4 a.m. on June 3rd, the barometer falling, when it backed to N.W. At noon on June 3rd the barometer was at its lowest, wind S.W., force 5.

This depression passed eastward between *Ashmore's* position and Cape Pembroke.

Captain R. H. WYNNE of S.S. *Banffshire* when reciprocating reports with the steamers *Boonah* and *Gilgai* and the French sailing ship *L'Avenir*, between the Cape, and Australia, in April last year, formed the conclusion that a heavy gale which they experienced near the 60th meridian east, covered an area of small width.

During the time of Captain SCOTT's first National Antarctic Expedition, 1901 to 1904, special daily observations were taken at noon G.M.T. by ships in the Southern Ocean; and a set of daily synoptic charts covering the whole of that part of the globe South of Latitude 30° S. was drawn in the Marine Division under Captain CAMPBELL HEPWORTH. Unfortunately the observations were so wide apart or few, that these charts are not sufficiently complete for generalising weather systems.

During Captain SCOTT's second expedition to the Antarctic, 1911, 1912, Dr. G. C. SIMPSON, who was physicist of the expedition during the first year, took observations in the Antarctic, which were continued throughout the expedition's stay. With his own observations, those of previous expeditions, Captain HEPWORTH's Charts, and other work done, Dr. SIMPSON came to the conclusion that, over the Southern Ocean there are cyclones and anti-cyclones which travel on the whole from west to east, and in all probability are in all parts of the ocean of a similar size to those shown on the Australian Daily Weather Reports, and their centres may pass anywhere between the Coast of Australia and the Coast of the Antarctic Continent.

If we reverse FIGURES 1 to 6 in Chapter I so that north is south and south is north, the cyclone, secondaries, V shaped depression, wedge, anti-cyclone, and col. of Northern Latitudes will resemble similar systems of Southern Latitudes, bearing in mind that BUYS BALLOT'S Law is reversed.

In the Southern Hemisphere if an observer faces the wind, low pressure will lie to his left and high pressure to his right.

Australian Weather Types.

FIGURES 17 to 25 are reproduced from "Types of Australian Weather" compiled in 1895 by Mr. H. A. HUNT of the Australian Weather Service, in continuation of work initiated by the Hon. RALPH ABERCROMBY, who first generalised the fundamental systems in Northern Latitudes.

According to Mr. HUNT, over Australia the anti-cyclone is the governing type. Weather systems generally travel East.

Rapid East Moving Winter Anti-cyclones.

In FIGURE 17 the weather chart for August 15th, 1893, there is an anti-cyclone over Western Australia. There is another anti-cyclone off the East Coast. These anti-cyclones are separated by a Λ shaped depression centred south of Tasmania, a depression extending from the Tropics, and a "col" between them. They result in off-shore winds on the N.W. coast, southerly winds with rain from the Leeuwin to the head of the Australian Bight; westerly winds and rain on the coast of South Australia, and northerly winds on the Victorian and New South Wales Coasts, while on the coast of Queensland the wind is from east to south with rain.

FIGURE 18, August 16th, 1893. The western cyclone of yesterday has travelled rapidly east, and is now centred over the head of the Australian Bight. The eastern anti-cyclone is now N.E. of New Zealand, while the Λ depression is now centred S.W. of those Islands and the tropical low has merged into the anti-cyclone, leaving a kink in the isobars following the shape of the Gulf of Carpentaria.

The anti-cyclone now results in off-shore winds on the Coast of West Australia. The antarctic low is causing westerly winds and rain over Tasmania, on the coasts of Victoria and New South Wales; while the tropical secondary causes variable winds and some rain in Queensland.

FIGURE 19, August 17th, 1893. The anti-cyclone has travelled further east; the tropical secondary has filled in somewhat, and has remained almost stationary while the Λ depression is now centred S.E. of New Zealand. The winds of the Australian Coast follow the isobars of the anti-cyclones anti-clockwise as would be expected; had there been observations available, no doubt the wind between Cape Howe and New Zealand would be from a westerly and south-westerly direction due to the Λ depression.

These three charts show the rapid easterly movement of winter anti-cyclones of settled weather; in this case the anti-cyclones having

travelled some 1,600 miles in two days. When the sun has Northern Declination the tracks of these anti-cyclones usually lie over the land but in the summer they lie more to the southward, that is, they swing with the sun between the parallels of 30° and 42° South Latitude.

Summer Anti-cyclones and the "Southerly Buster."

In the summer, anti-cyclones being further south and of smaller extent, do not exercise so complete a control of the weather over Australia, for the tropical lows extend further south. FIGURES 20 and 21 illustrate a type of weather well known to all who navigate Australian waters. On November 16th, 1894, there was an anti-cyclone centred S.W. of Cape Leeuwin; another anti-cyclone lay N.E. of Sydney. The tropical low extended well over the Northern Territory and a Λ depression was centred S.E. of Hobart.

There are cool southerly winds in front of the advancing anti-cyclone along the Southern Coasts; from Albany to Cape Otway these winds are of no great strength, probably due to the surface friction of the land. There are hot northerly winds, the "Brickfielder," over Northern Australia. By the morning of November 17th, 1894, the anti-cyclone had travelled east, and was centred over the Bight. Now in Victoria, New South Wales and Queensland, there is a range of mountains which follows the trend of the East coast from Cape Howe to Cape Byron, rising to 6,000 feet, and therefore right athwart the general easterly atmospheric drift.

As the pressure systems travel east, the trough of the Λ depression is tilted in a N.W. and S.E. direction, and when the trough passes the mountains the southerly wind, which has been retarded by surface friction, bursts with great strength along the coast.

The first burst of this cold wind is known as the "Southerly Buster," but the gale which often follows may last as long as ten days. "Southerly Busters" occur on the coast between Cape Howe and Port Macquarie, Port Jackson is thus right in their path. Ball-shaped cirro-cumulus or heavy cumulus thunder clouds in the South are signs that a "Buster" is coming. As the squall approaches, a light fringe rises from underneath the cloud in front, curving over the top of the cloud, and trailing behind it. The northerly wind drops suddenly, and in a few minutes it is blowing from south with gale force. No doubt the East Coast Range has much to do with the changes of weather so often experienced when passing Gabo Island.

Monsoonal Rain Storm.

At all times of the year, but particularly in summer, if the tropical low forces itself far South, much rain and thunderstorms occur over the area it crosses. FIGURE 22—Chart for morning of April 18th, 1894.—The tropical low extends over the whole of Queensland, New South Wales and Victoria; to the East and West there are anti-cyclones, resulting in monsoonal rain in all the Eastern States, in Bass Strait and on the Eastern seaboard.

Development of Cyclonic Storms in the South of Tropical Depressions.

Sometimes, when the tropical depression extends across Australia into the Australian Bight, small cyclones develop in the South. This is illustrated by FIGURES 23 and 24. On the morning of April 15th, 1889, there was an anti-cyclone S.W. of Cape Leeuwin, and another over the Tasman Sea; these were separated by a tropical depression extending to the Bight. On the S.E. Coast of South Australia and on the South Coast of Victoria a strong easterly gale set in. On the morning of April 16th, 1889, a cyclone centred S.E. of Kangaroo Island had developed with steep barometer gradient and consequent winds of gale force and cyclonic circulation.

Wind Contrary to Isobars.

FIGURE 25. The chart for the morning of September 13th, 1895, shows an anti-cyclone west of North-West Cape, a depression south of Cape Leeuwin; there is a large anti-cyclone east of Sydney, another "high" centred south of Adelaide, and a depression south-east of Tasmania. With this pressure distribution, if there were no disturbing factors, we should expect northerly winds on the coast of New South Wales, whereas it will be seen that the wind on the East Coast was actually southerly as far north as Sydney. No doubt the Mountain Range along this coast contributes to this.

Fog in the Bass Strait.

FIGURE 26. The Weather Chart for the morning of July 26th, 1910, shows an anti-cyclone to the West, a depression centred S.E. of King George's Sound; there is a kink in the isobar 1016 mb. indicating a shallow tropical low S.E. of the Gulf of Carpentaria; an anti-cyclone is centred over S.W. New South Wales, with another high over Tasmania; and there is a depression over the Tasman Sea, resulting in light E. to S.E. winds from the Tasman Sea bringing moisture to Bass Strait and the South Victorian Coast, where there is dense fog in the "col" between the two "highs."

There are other types of weather systems including cyclones from the N.W. and N.E., square-headed depressions and vertical straight isobars, all of which were dealt with by Mr. H. A. HUNT in "Types of Australian Weather," and have been summarised in "Climate and Weather of Australia," by H. A. HUNT, GRIFFITH TAYLOR and E. T. QUAYLE. The type of particular interest to the navigator working the Southern Coast of Australia is that which produces Westerly Gales; to illustrate this we have selected a gale which the writer has good reason to remember.

Antarctic Lows and S.W. Gales.

In his "Australian Meteorology," Mr. GRIFFITH TAYLOR writes:—

"Prediction of Storms. These may be divided into two groups, Gales and Hurricanes. The former arise when the gradient of the Low is very steep, and are common along the South and South-East Coasts when 'Antarctics' are numerous, *i.e.*, in winter. They occur with similar charts in other seasons. In October, 1913, a well-developed Low occupied the Bight on the 13th, and moved normally to the east with intensifying gradients. On the 14th the gradient steepened greatly over the Bight, the isobars from 30.2 in. (1022.7 mb.) and 29.6 in. (1002.4 mb.) being closely packed together. The forecast was as follows:—'Squally wind and rough seas East from Bight.' This was abundantly verified; for on the 15th a severe storm swept Bass Strait and the barometer fell to 29.2 in. (988.8 mb.) at Hobart: while the wind rose to 69 miles an hour at Melbourne. It is necessary to consider the aspect of the Coast in connection with Ocean warnings. Thus a S.W. wind has much less effect on the New South Wales Coast than on the Victorian Coast."

We took advantage in the *Omrah* of a lull after a violent squall and left Port Melbourne Pier at 3.16 p.m. on October 15th, 1913, with a fresh W.S.W. gale; proceeding down Port Phillip the squalls were very heavy, and in one of these the Wireless Aerial was carried away. This was repaired and sent aloft, only to be carried away a second time next morning.

Passing out between the Heads, the sea broke right across the entrance, the wind then being from west a fresh gale with frequent heavy squalls. Off Apollo Bay at midnight there was a whole gale from S.W. by W. with frequent violent squalls and a very high steep sea; a considerable reduction of speed was necessary. Off Cape Otway we felt the full force of the gale, ship rolling 40°, which was unusual for *Omrah*, a particularly steady ship. At 4 a.m. the ship had made little headway, it blew a whole gale from W.S.W., and at 6.47 a.m. the wind backed to S.W., sea increasing very high and steep; by 8 a.m. the wind had decreased to a fresh gale and backed to S.S.W.; we were then able to slightly increase speed and proceed on our course N. 80° W., but we could not get steam owing to the men not being able to keep their feet in the stokehold. That afternoon the wind and sea moderated, and we were able to reach Adelaide next day in time to embark His Majesty's homeward mail, and sail as appointed.

Steamers scheduled to sail from Melbourne on October 15th, remained in harbour. On the morning of October 16th, S.S. *Geelong* bound east informed me by W/I that she had been hove to all night about 150 miles to the westward of Cape Otway.

FIGURES 27 and 28. The weather chart for the morning of October 15th, 1913, shows an anti-cyclone centred near Cape Leeuwin; the tropical low extends in a S. Easterly direction over Northern Australia; there is an anti-cyclone east of Townsville and a very deep Λ depression centred S.E. of Hobart; a "col" lies over central Queensland.

On the morning of October 16th, the anti-cyclone had travelled considerably east and was centred over the Bight and the Λ depression had moved east also.

The barometer at Hobart had, according to the chart risen 10 mb. since the morning of the 15th which, if we had not a chart before us, would be an indication that the depression, whose trough lay considerably east of Hobart, had travelled east, or was filling in.

On a small scale Mercator CHART XXVIII at the position of coast stations, with a protractor lay off wind arrows, each feather representing one of the Beaufort scale; the arrows fly with the wind, their heads indicate position. Abreast these stations, write the barometer in millibars or inches (both are given here for the convenience of all concerned). Unfortunately, the tendency of the barometer is not available; if it were, it and the weather would also be written abreast the stations. Plot the position of the reporting ships, and draw wind arrows, heads at positions. Write the name of the ship reporting, the barometer, weather, course and speed, and barometer tendency.

Next, pick out the lowest barometer reading plotted on the chart and, facing the wind to the *left* with soft pencil write LOW; also pick out the highest barometer on the chart and facing the wind to the *right*, write HIGH.

When this has been done, if there are well defined weather systems, it will be seen that the wind arrows give a general idea of how the wind is circulating at the surface.

In this case, it is evident that *Berrima* is in rear of a depression and that the winds reported at the Leeuwin, logged by *Orsova* herself, and reported by the Ship *Monkbarns*, conform to the circulation in the fore part of a cyclonic depression. We rough in the isobars hereabouts first, the wind giving us their trend, for it blows along the isobars, inclining towards the Low. Therefore, remember BUYS BALLOT'S Law, for it helps us greatly, especially at sea, away from the land and local causes. Ashore, or on the coast, the wind may not conform so nearly to this Law, as we have seen in FIGURE 25. The lowest barometer reported, at *Berrima's* position is 989 (29·21). For practical purposes at sea isobars drawn for every four mbs. (·12 of an inch) will be convenient, stepped from 1,000 mb. (29·53 in.).

Thus the lowest proved isobar of this stepping will be 992, but it is evident that there are actually isobars of lower value to the S.E. We therefore dot in the 988 (29·18 in.) isobar S.E. of *Berrima* on CHART XXIX. As there are three barometers of not more than 1 mb. different from 1012 (29·89), well spaced along what appears to be the outskirts of this probably great cyclonic depression, we next draw the 1012 (29·89) isobar, from north of Perth where the wind direction is probably due to land breeze (ignoring BUYS BALLOT'S Law here), north-east of *Orsova* and west of Ship *Monkbarns*.

The 1008 isobar is drawn with barometers and winds at C. Leeuwin, Albany, S.S. *Orsova* and Ship *Monkbarns* as our guide. The 1004 (29·65), 1000 (29·53) and 996 (29·41) isobars are spaced in as dotted lines in the absence of observations over a considerable distance.

Next examining the region near the highest barometer at Hobart 1025 (30·27) it is seen that the wind at Cape Borda, Hobart and Gabo Island, all of which have high barometers, conforms to anti-cyclonic circulation. The 1024 (30·24) isobar is drawn southward passing east of Cape Borda, west of Hobart, whence it curves round to the northward and passes west of Gabo Island.

Having fixed the two main systems it will be well to examine other low and high barometers which obviously indicate the presence of other systems within the limits of our chart.

We find a LOW, north of Barque *Garthgarry's* position and a HIGH, east of New Zealand, and write these words in in pencil.

Returning to the Main High, the 1020 (30·12) isobar fits in, passing south-east to the west of Cape Borda and west of Hobart, then curves east and north passing through Sydney.

The 1016 (30·00) isobar is drawn from south of Carnarvon through Port Eucla, east of Ship *Monkbarns* and probably extends over the Tasman Sea in the direction shown by its dotted line, there probably being a LOW, south-west of the Bluff. The two eastern systems may now be conveniently dealt with. A 1012 (29·89) isobar is drawn through Barque *Garthgarry's* position trending S.W. and curving to the northward between Norfolk Island and Brisbane. A 1016 (30·00) isobar passes north of Russell, curves to pass close north of *Hawraki's* position and thence west of Brisbane.

A 1020 (30·12) isobar is drawn in from the eastward passing south of Russell, curves sharply south and passes west of Wellington, then turns south-east between the last station and the Bluff.

We have now roughed in all the isobars which can be drawn with the observations available, and using pencil and india-rubber, we improve them, making them close together where the wind is strong and wider apart where it is light, so that their spacing roughly shows the gradient.

These isobaric lines give us a general idea of pressure distribution, having been drawn through places estimated to have the same barometric pressure.

The CHART XXIX shows us that there is an anti-cyclone over Tasmania and Victoria, probably extending to the Northern Territory. A cyclonic depression is centred far S.W. of C. Leeuwin. There is an anti-cyclone east of New Zealand and a depression N.E. of Norfolk Island.

Orsova left Adelaide at 1.4 p.m. on July 9th. Until midnight she had moderate winds to light airs from S.W. with barometer nearly steady at 1028 (30·36); she was then in the anti-cyclone now far astern.

On July 10th the wind was northerly, barometer falling slowly as she crossed the isobars on the western side of the anti-cyclone.

She now (morning of July 11th) sees by CHART XXIX that, with her own barometer falling slowly, that of Ship *Monkbarns*, steering east at 7½ knots, steady, and the rising barometer of *Berrima*, steaming east at 8 knots, that the Low to the S.W. is travelling east. She may expect an increase of wind and that it will back to the westward.

According to her log, the wind increased to a strong breeze, and backed to W.N.W. at noon; at 4 p.m. it was W. by S.; fresh, after which the wind veered to the northward and fell light, probably caused by a secondary, not shown on our chart through lack of observations, between Cape Leeuwin and *Berrima*, or it was of later development. From midnight until 4 a.m. on July 12th *Orsova's* barometer fell quickly.

On July 12th, the operation is repeated, CHART XXX, and it is seen that another depression is overhauling *Berrima*; the strong N.W. wind at *Orsova's* position is probably caused by an extension or secondary north of yesterday's south-western LOW; with a slowly falling barometer, steaming N. 79° W., 15 knots nearly parallel to the isobars, after the quick fall in the night, this secondary depression is probably deep. She therefore may expect an increase of wind to gale force, and that after rounding the Leeuwin as she steams north the wind will back to the westward and moderate.

According to the log, the wind increased rapidly with violent rain squalls in the forenoon; at noon it had reached force 9; at 10.55 p.m., when C. Naturaliste was abeam, the wind had moderated to force 4, and was from west. *Orsova* arrived at Fremantle at 7.53 a.m. on July 13th and sailed again that evening, the wind remaining westerly, fresh to moderate.

Special advantages for Sailing Ships.

To the sailing ship, the foreknowledge of wind to be experienced which is made possible by the use of long range wireless telegraphy and weather charts, would be invaluable, and we are lucky in having the observations of two of the very small fleet now remaining afloat with which to illustrate the method.

Supposing the Ship *Monkbarns*, Captain W. DAVIES, from Cape Town to Sydney, 32 days out on July 11th, 1923, had been able to make CHARTS XXIX, XXX, XXXI and XXXII. On July 12th, she would have seen that the anti-cyclone which, according to the chart of the previous day, was centred near Bass Strait, was giving way (*i.e.*, pressure reducing) and that the depression centred near the one hundredth meridian yesterday had probably moved east and developed the secondary now near Cape Leeuwin; also, that there was a secondary centred between her position and Cape Otway. *Monkbarns* steady barometer when steering E. ¾ N. at 7 knots is an indication that the secondary ahead of her is also moving east; the Antarctic Low is probably moving east. She may expect the wind to veer and fall light, later coming from northward and increasing as the western secondary overhauls her.

At 8 a.m. on July 13th *Monkbarns* is distant 180 miles from Cape Otway, her point of landfall, whence she will shape a course to pass through Bass Strait. CHART XXXI shows her that the depression near Norfolk Island has intensified and moved east; the anti-cyclone over Australia has further given way, and another anti-cyclone is approaching Australia from the westward and she is apparently in advance of a depression centred to the S.W.

All this points to the probability of the wind now N. by W., force 6, backing to the westward and remaining there for a time.

Monkbarns ended her observations on making Cape Otway, but the pressure distribution and coast reports in the vicinity of Bass Strait, given on CHART XXXII, indicate that the forecast made on July 13th was a good one, and she had a slant.

(To be continued.)

WEATHER SIGNALS.

II. WIRELESS WEATHER BULLETINS.

MEDITERRANEAN SEA (WESTERN).

MARIGNANE W/T Station, approximate Latitude 43° 26' N., Longitude 5° 16' E., call sign FNM, transmits weather bulletins at 0840 and 1435 G.M.T. on a wave length of 1,525 metres (C.W.). The bulletins are in two parts. PART I commences with the words "Météo Méditerranée," and contains the 0700 and 1300 G.M.T. observations respectively of the following stations:—

Indicator Figures.	Station.	Position (approx.).		Indicator Figures.	Station.	Position (approx.).	
		Lat.	Long.			Lat.	Long.
022	Genoa ...	44°25' N.	8°55' E.	091	Toulon ...	43°07' N.	5°53' E.
030	Mahon ...	39°54' N.	4°18' E.	092	Antibes ...	43°35' N.	7°07' E.
047	Oran ...	35°42' N.	0°41' W.	093	I. du Levant ...	43°05' N.	6°30' E.
049	Malta ...	35°53' N.	14°27' W.	094	Cuers ...	43°15' N.	6°01' E.
053	Bizerta (1435 G.M.T. only).	37°17' N.	9°52' E.	095	Ajaccio ...	41°55' N.	8°44' E.
064	Barcelona ...	41°23' N.	2°09' E.	096	Cap Corse ...	43°01' N.	9°25' E.
086	Valencia ...	39°28' N.	0°22' W.	097	Iles Sanguinaires ...	41°52' N.	8°36' E.
087	Cap Béar ...	42°32' N.	3°05' E.	098	Pertusato ...	41°22' N.	9°11' E.
088	Cette ...	43°25' ...	3°40' E.	099	Algiers ...	36°45' N.	3°02' E.
089	Montpellier ...	43°37' N.	3°59' E.	100	Cap Falcon ...	35°47' N.	0°48' W.
090	Marignane ...	43°26' N.	5°16' E.	101	Croisette ...	43°14' N.	5°21' E.
				102	St. Raphaël ...	43°25' N.	6°45' E.

Explanation of the code figures used in Part I.

The stations' indicator figures are first sent followed by four groups of figures in each case.

First Group.—1st and 2nd figures give the corrected barometer reading in whole millimetres, initial 7 omitted. (See Table V, p. 28 February number, for conversion to mbs. and ins.)

3rd and 4th figures give the wind direction true. (See Table IV, p. 15, January number. 50 is added to the code figures if wind force more than 9.)

5th figure gives the wind force by Beaufort Scale.

Second Group.—1st figure gives the weather at the time of observation (Table XXXIX).

2nd and 3rd figures give the temperature of the air in degrees Centigrade. (See Table VII, p. 29, February number, for conversion to Fahr.)

4th figure gives the characteristic of barometric tendency. (See Table XV, p. 44, March number.)

5th figure gives the amount of cloud (Table XL.)

Third Group.—1st and 2nd figures give the barometric tendency in tenths of a millimetre, the sign of the tendency being indicated by the "characteristic" figure in the 2nd group.

3rd figure gives the state of the sea. (See Table XXI, p. 45, March number.)

4th and last figure of group gives the visibility seawards. (Table XVI, p. 45, March number.)

Part II of the bulletins commences with the word "Navires" and contains the 0700 and 1300 G.M.T. observations from ships in the Western Mediterranean.

Explanation of code figures used in Part II.

The ship's indicator figures are first sent, followed by five groups of figures, in each case.

First Group.—1st figure gives the day of the week, 1 = Sunday, 2 = Monday, &c. The day refers to G.M.T. and not to local time.

2nd figure gives the quarter of the globe in which the ship is situated. (See Table XI, p. 29, February number.)

3rd, 4th and 5th figures give the latitude in degrees and tenths. By multiplying the 5th figure by 6, the approximate minutes can be obtained.

Second Group.—1st, 2nd and 3rd figures give the longitude in degrees and tenths, the minutes (approx.) being obtained as for latitude.

4th and 5th figures give the time of observation (G.M.T.), 01 = 1 a.m., 12 = noon, &c.

Third Group.—The 1st and 2nd figures give the corrected barometer reading in whole millimetres, the initial 7 being omitted. (See Table V, p. 28, February number, for conversion to mbs. and ins.)

3rd and 4th figures give the wind direction (true).

5th figure gives the wind force by Beaufort scale. (Forces 9 and above being sent as 9.)

Fourth Group.—1st figure gives the weather at the time of observation (Table XXXIX).

2nd figure gives the past weather during the last hour. (Also by Table XXXIX.)

3rd figure gives the visibility. (See Table XVI, p. 45, March number.)

4th figure gives the state of the sea. (See Table XXI, p. 45, March number.)

5th figure gives the amount of cloud (Table XL).

Fifth Group.—1st figure gives the form of lowest cloud (Table XLI).

2nd figure gives the amount of lowest cloud.

3rd figure gives the form of high cloud (Table XLII).

4th and 5th figures give the amount of barometric tendency in tenths of a millimetre. 50 is added when tendency is negative.

NOTE (1).—Missing observations from land stations are replaced by X's.

NOTE (2).—When there are no ships' observations for transmission the words "Navires—Nil—" will be sent.

Tables used in conjunction with foregoing Bulletins.

Code Table XXXIX. Present Weather Table.

Figure.

- 0 = Present weather determined by amount of cloud.
- 1 = Continuous rain or drizzle.
- 2 = Continuous snow.
- 3 = Rain showers, intermittent rain or hail showers.
- 4 = Snow showers.
- 5 = Thunderstorm (with or without squall).
- 6 = Squall (or line squall), or rain and hail, or heavy rain showers.
- 7 = Squall, wind very strong at or near the surface.
- 8 = Thick mist or fog; visibility below 1,000 metres (1,100 yards)
- 9 = Mist or fog of appreciable vertical thickness.

Code Table XL. Cloud Amount Table.

Figure.

- 0 = No cloud, sky clear.
- 1 = Sky almost clear, traces of cloud or detached cloud.
- 2 = 1/10 to 2/10 covered.
- 3 = 3/10 to 4/10 "
- 4 = 5/10 to 6/10 "
- 5 = 7/10 to 8/10 "
- 6 = 9/10 covered.
- 7 = Overcast, with interstices.
- 8 = Entirely overcast.
- 9 = Observation of cloud amount impossible.

Table XLI.

Form of Low Cloud Table.

Code Figure

- 0 = No low cloud.
- 1 = St. or Fr. St. or both.
- 2 = Cu. or Fr. Cu. or both.
- 3 = St. and Cu. or St. and St. Cu.
- 4 = St. Cu. alone.
- 5 = Nb. and Cu.
- 6 = Cu. Nb. and Cu.
- 7 = Nb. and Cu. Nb.
- 8 = Cu. Nb. alone.
- 9 = Nb. alone.

Table XLII.

Form of Upper Cloud Table.

Code Figure.

- 0 = No high or middle cloud observable.
- 1 = Ci. alone.
- 2 = Ci. Cu. alone or Ci. Cu. and Ci.
- 3 = Ci. St. alone or Ci. St. and Ci.
- 4 = Cirro-cloud and A. Cu.
- 5 = Cirro-cloud and A. St.
- 6 = Cirro-cloud and A. Cu. and A. St.
- 7 = A. Cu. alone visible.
- 8 = A. Cu. and A. St.
- 9 = A. St. (uniform, or alone visible)

Malta.

RINELLA W/T station, approximate Latitude 35° 53' N., Longitude 14° 32' E. Call sign BYZ transmits weather bulletins at 0900 and 2100 G.M.T. on a wave length of 4,700 metres (C.W.). The bulletins are sent *en clair* and contain local observations of barometric pressure, wind, temperature, visibility, state of sea and swell, together with a forecast of local weather conditions.

Special Notices regarding Personnel.

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

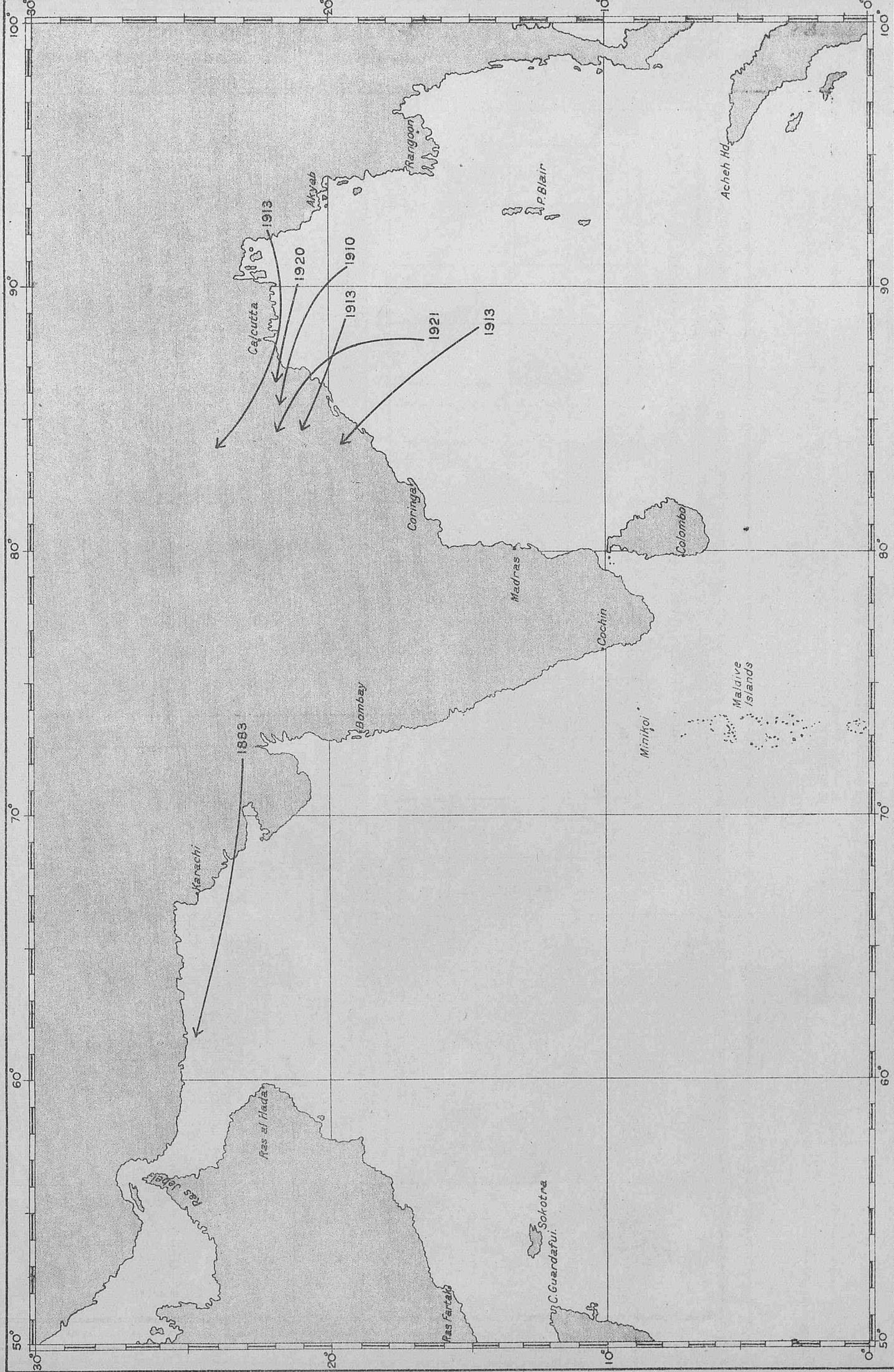
Captain G. B. Sturdy.

Captain G. B. STURDY, F.R.G.S., the Marine Agent at Hull for the Meteorological Office, has retired from the position of Assistant Marine Superintendent to the Ellerman Wilson Line, on reaching the age limit, after 43 years' service with that Company.

Marine Observers will join with the Marine Division in the good wishes to Captain STURDY on his retirement, and will be glad to know that he will continue to act as Marine Agent for the Meteorological Office at the Port.

Captain STURDY is also continuing his ardent activities encouraging training of future navigators.

CYCLONE TRACKS OF THE ARABIAN SEA AND BAY OF BENGAL.



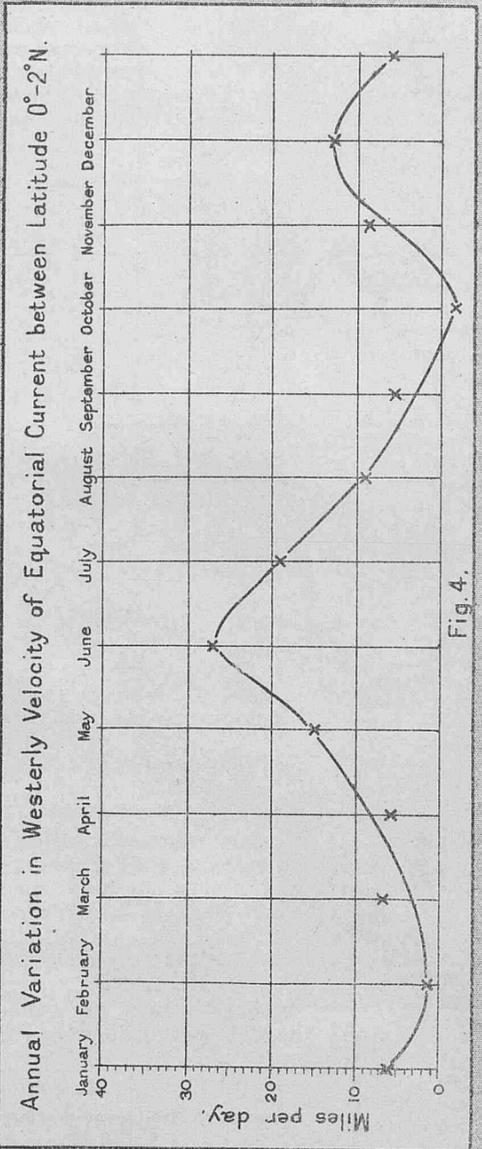
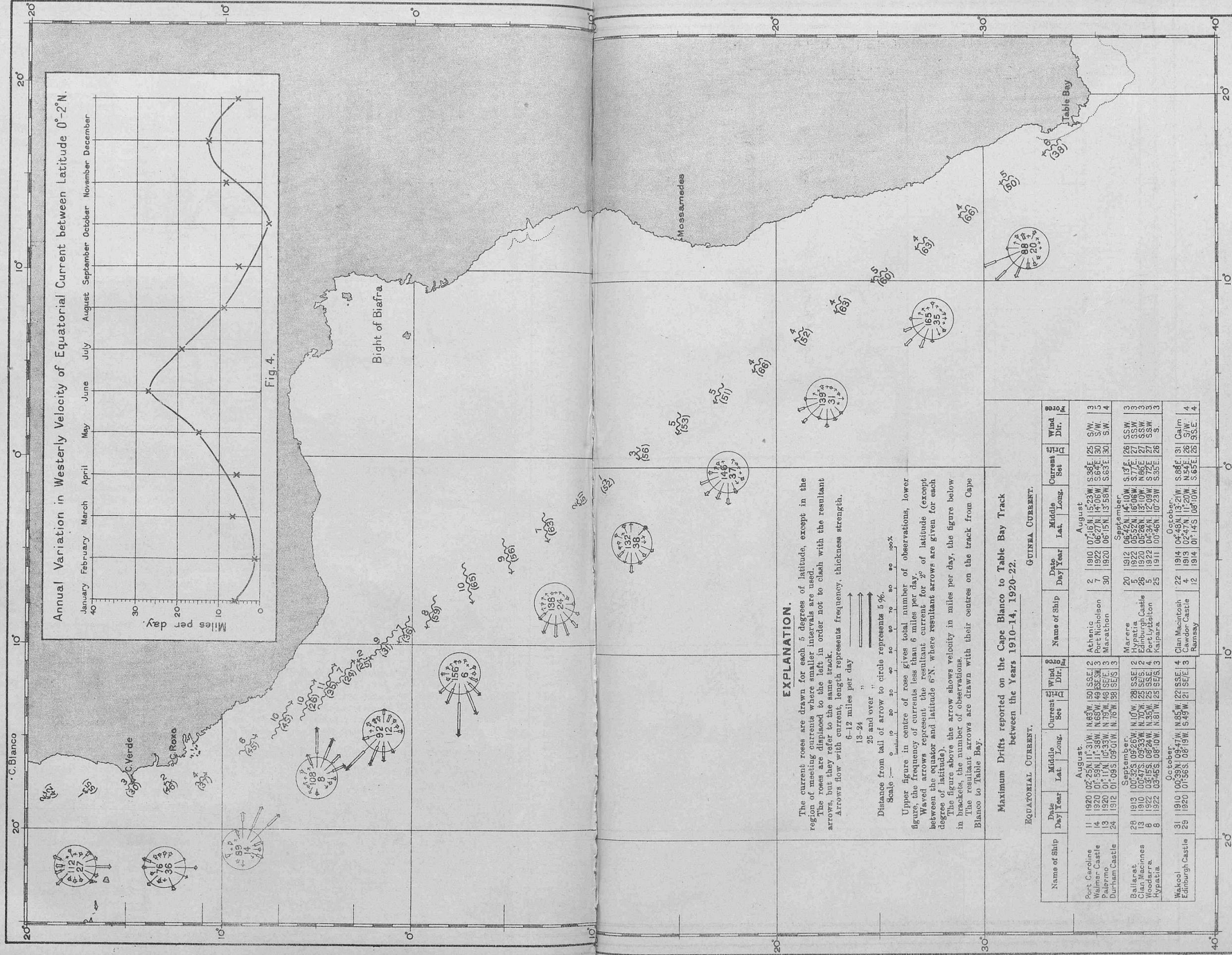
Tracks of cyclones which have occurred in the Arabian Sea and Bay of Bengal during the month of July. The year is indicated by the figures at commencement of track.

From "Monthly Meteorological Chart of the East Indian Seas," and "U.S.A Pilot Chart of the Indian Ocean," for July 1923.

CURRENTS ON DIRECT CAPE ROUTE. Cape Blanco to Table Bay.

AUGUST, SEPTEMBER AND OCTOBER.

Observations of Ships Regularly Observing for the Meteorological Office.
1910 to 1914 and 1920 to 1922.



EXPLANATION.

The current roses are drawn for each 5 degrees of latitude, except in the region of meeting currents where smaller intervals are used.
The roses are displaced to the left in order not to clash with the resultant arrows, but they refer to the same track.
Arrows flow with current, length represents frequency, thickness strength.
6-12 miles per day
13-24
25 and over "

Distance from tail of arrow to circle represents 5%.

Scale: — 0 10 20 30 40 50 60 70 80 90 100%.

Upper figure in centre of rose gives total number of observations, lower figure, the frequency of currents less than 6 miles per day.
Waved arrows represent the resultant current for 2° of latitude (except between the equator and latitude 6°N. where resultant arrows are given for each degree of latitude).
The figure above the arrow shows velocity in miles per day, the figure below in brackets, the number of observations.
The resultant arrows are drawn with their centres on the track from Cape Blanco to Table Bay.

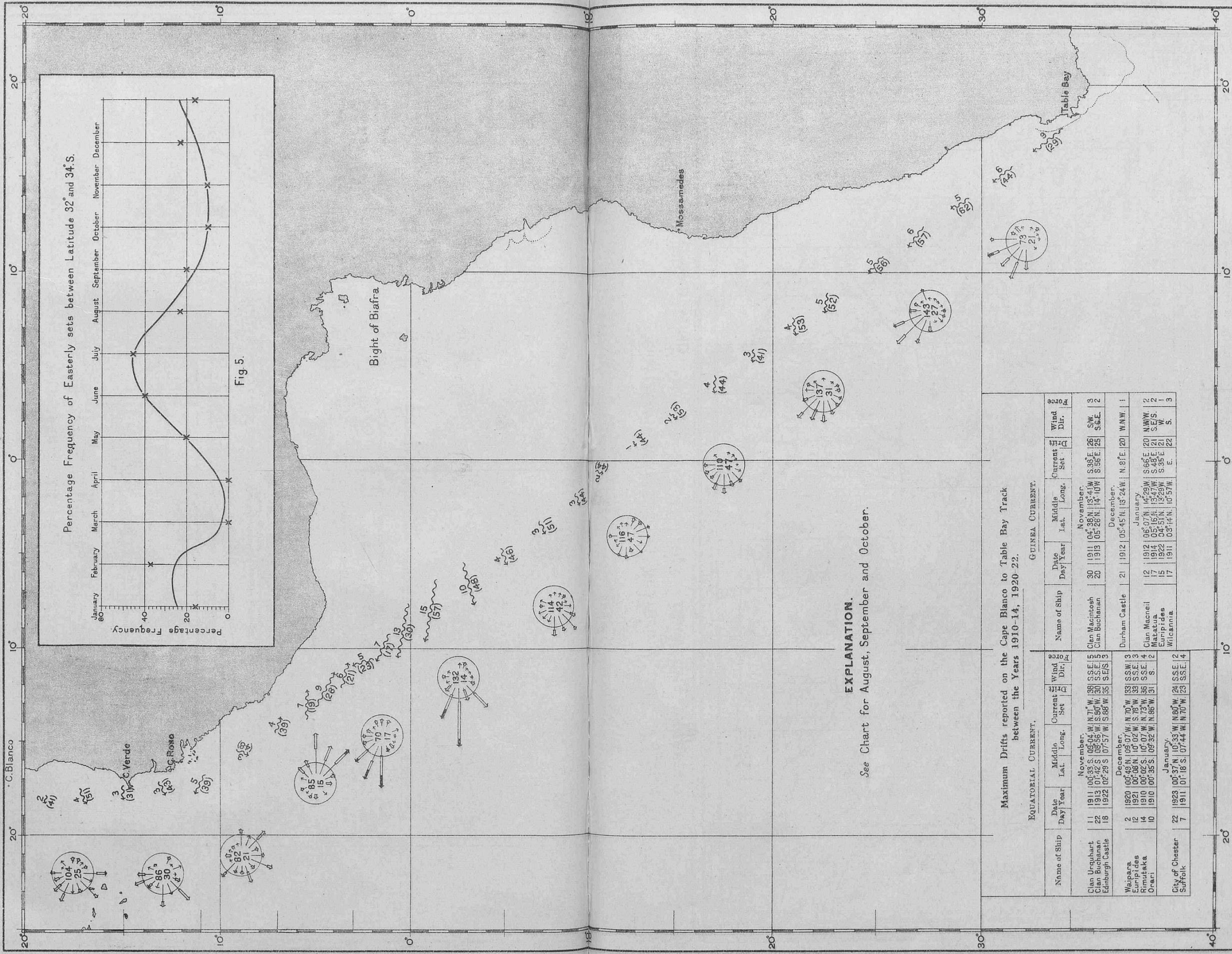
Maximum Drifts reported on the Cape Blanco to Table Bay Track between the Years 1910-14, 1920-22.

EQUATORIAL CURRENT.				GUINEA CURRENT.					
Name of Ship	Date Day Year	Middle Lat. Long.	Current Set	Wind Dir.	Name of Ship	Date Day Year	Middle Lat. Long.	Current Set	Wind Dir.
Port Caroline	11	1920 02°25'N 11°31'W	N.83°W 50	SSE 2	Athetic	2	1910 10°16'N 15°23'W	S.38°E 25	S.W. 3
Weimar Castle	14	1920 01°59'N 11°38'W	N.68°W 49	SE/SW 3	Port Nicholson	7	1922 06°27'N 12°06'W	S.60°E 30	S.W. 3
Palermo Castle	13	1920 01°11'N 10°33'W	N.79°W 49	SE/E 3	Marathon	30	1920 06°15'N 13°58'W	S.63°E 30	S.W. 4
Durham Castle	24	1912 01°09'S 09°01'W	N.76°W 38	SE/S 3					
Ballarut	28	1913 00°32'S 09°26'W	N.10°W 28	SSE 2	Marere	20	1912 06°42'N 14°10'W	S.13°E 26	SSW 3
Clan Macinnes	13	1910 00°47'S 09°33'W	N.10°W 25	SE/S. 2	Hypatia	26	1920 05°52'N 16°06'W	S.77°E 27	SSW 3
Woodarra	8	1922 03°15'S 08°24'W	N.35°W 25	SSE 4	Edinburgh Castle	5	1920 05°26'N 13°10'W	N.66°E 27	SSW 3
Hypatia	8	1922 03°45'S 08°10'W	N.81°W 25	SE/S 3	Port Lyttelton	25	1922 04°34'N 12°09'W	S.72°E 27	SSW 3
					Kaipara	25	1911 00°46'N 10°23'W	S.35°E 26	S. 3
Wakool	31	1910 00°30'N 08°47'W	N.85°W 22	SSE 4					
Edinburgh Castle	29	1920 01°30'S 08°19'W	S.49°W 21	SE/E 3	Clan Macintosh	22	1914 04°45'N 13°21'W	S.88°E 31	Calm 4
					Cawdor Castle	12	1914 02°47'N 11°20'W	N.54°E 26	S.W. 4
					Ramsay	4	1914 01°14'S 08°10'W	S.65°E 26	S.S.E. 4

CURRENTS ON DIRECT CAPE ROUTE. Cape Blanco to Table Bay.

NOVEMBER, DECEMBER, AND JANUARY.

Observations of Ships Regularly Observing for the Meteorological Office.
1910 to 1914 and 1920 to 1922.



EXPLANATION.
See Chart for August, September and October.

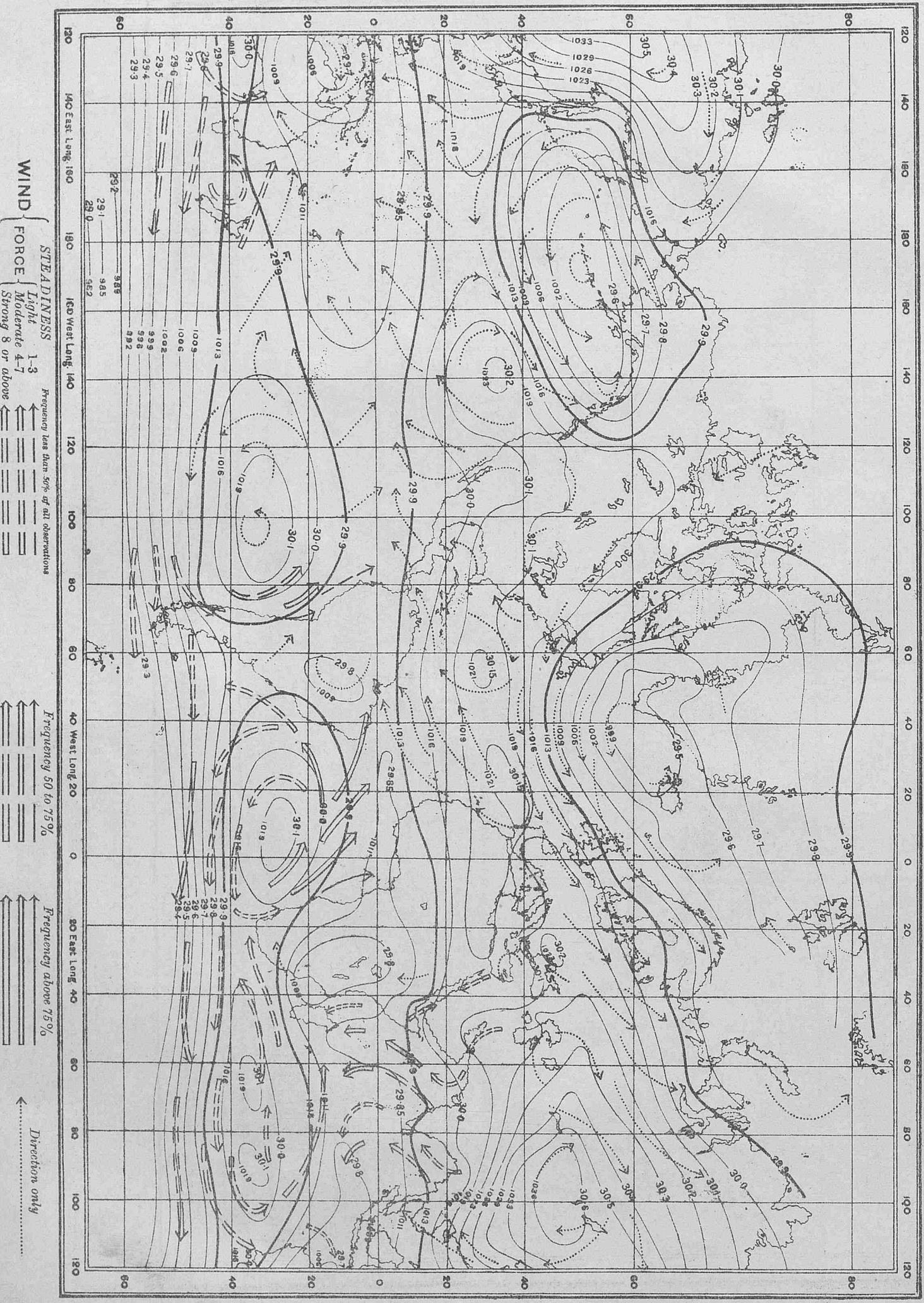
Maximum Drifts reported on the Cape Blanco to Table Bay Track between the Years 1910-14, 1920-22.

EQUATORIAL CURRENT.				GUINEA CURRENT.			
Name of Ship	Date Day/Year	Middle Lat. Long.	Current Set	Name of Ship	Date Day/Year	Middle Lat. Long.	Current Set
Clan Urquhart	11	00°33' S, 09°04' W	N 71° W 38	Clan Macintosh	30	1911 04°36' N, 13°41' W	S 38° E 26
Clan Buchanan	22	01°42' S, 08°55' W	S 90° W 30	Clan Buchanan	20	1913 05°28' N, 14°10' W	S 56° E 25
Edinburgh Castle	18	1922 02°29' S, 07°57' W	S 68° W 35	Durham Castle	21	1912 05°45' N, 13°24' W	N 81° E 20
Waipara	2	1920 00°49' N, 08°07' W	N 70° W 23	Clan Macneil	12	1912 06°07' N, 14°29' W	S 66° E 20
Euripides	14	00°08' N, 07°02' W	S 72° W 33	Matatua	17	1914 05°15' S, 13°47' W	S 43° E 21
Amutaka	10	00°02' S, 07°07' W	N 72° W 36	Euripides	15	1922 04°51' N, 13°29' W	S 35° E 21
Orari	10	00°35' S, 06°32' W	N 66° W 31	Wilcannia	17	1911 03°14' N, 10°57' W	E 22
City of Chester	22	1923 00°37' N, 07°33' W	N 90° W 24				
Surfolk	7	1911 01°16' S, 07°44' W	N 70° W 23				

Chart XXVI—"WIRELESS AND WEATHER."

PRESSURE AND WIND

JANUARY.

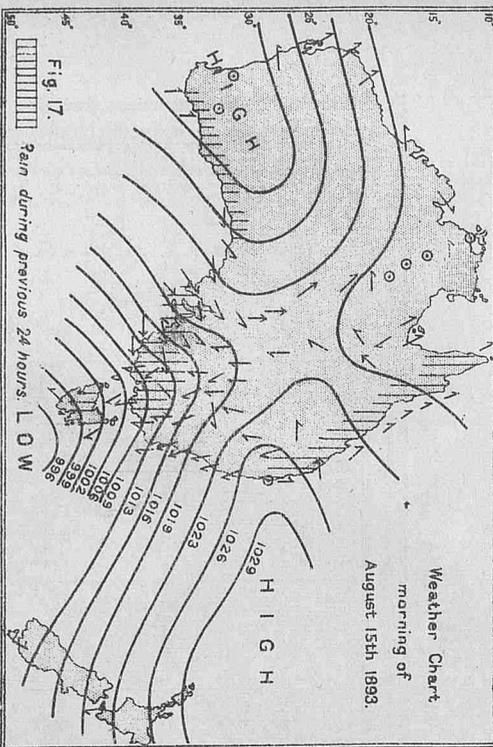


"WIRELESS AND WEATHER."

Rapid East Moving Winter Anti-cyclones.

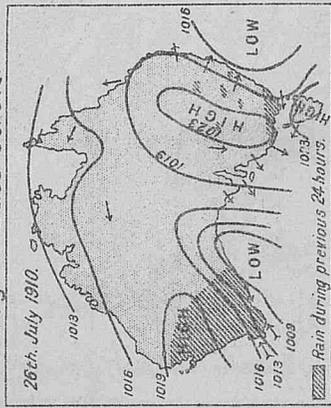
Summer Anti-cyclones and the "Southerly Buster".

Development of Cyclonic storms in the South from tropical depressions.

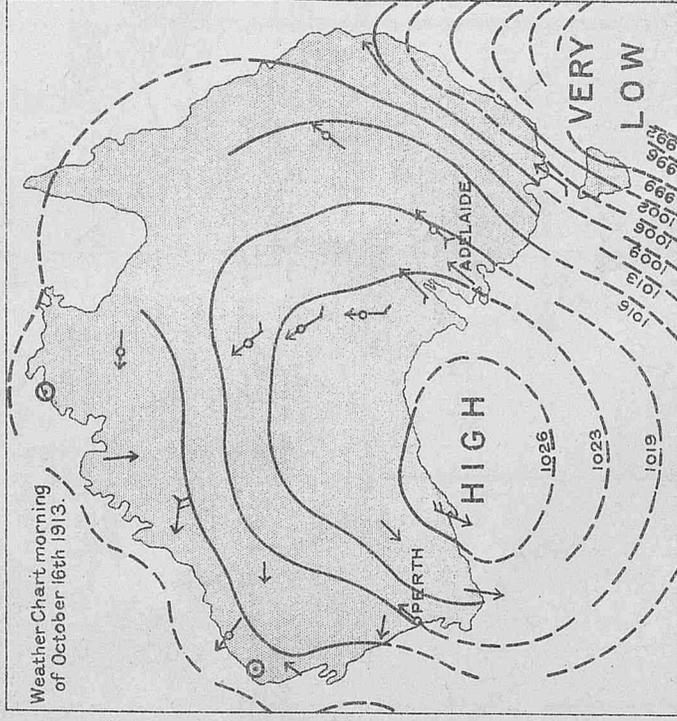
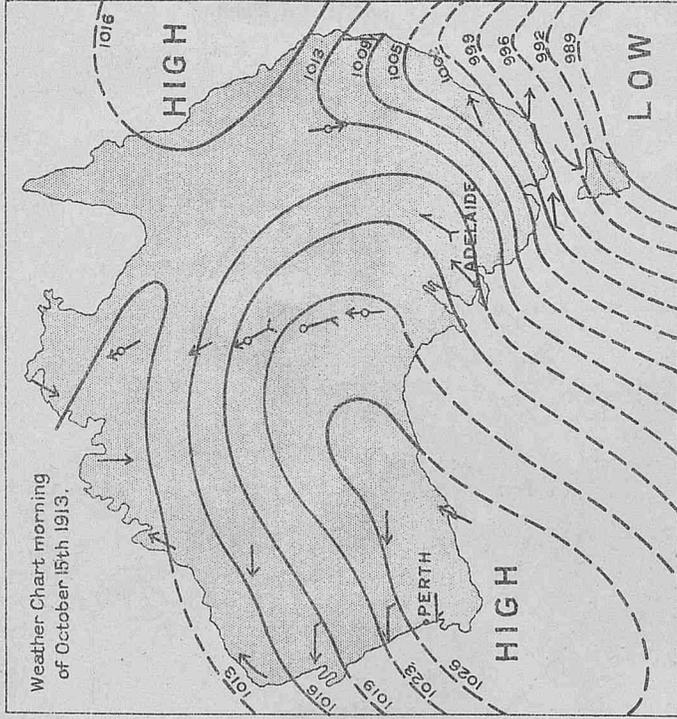


"WIRELESS AND WEATHER."

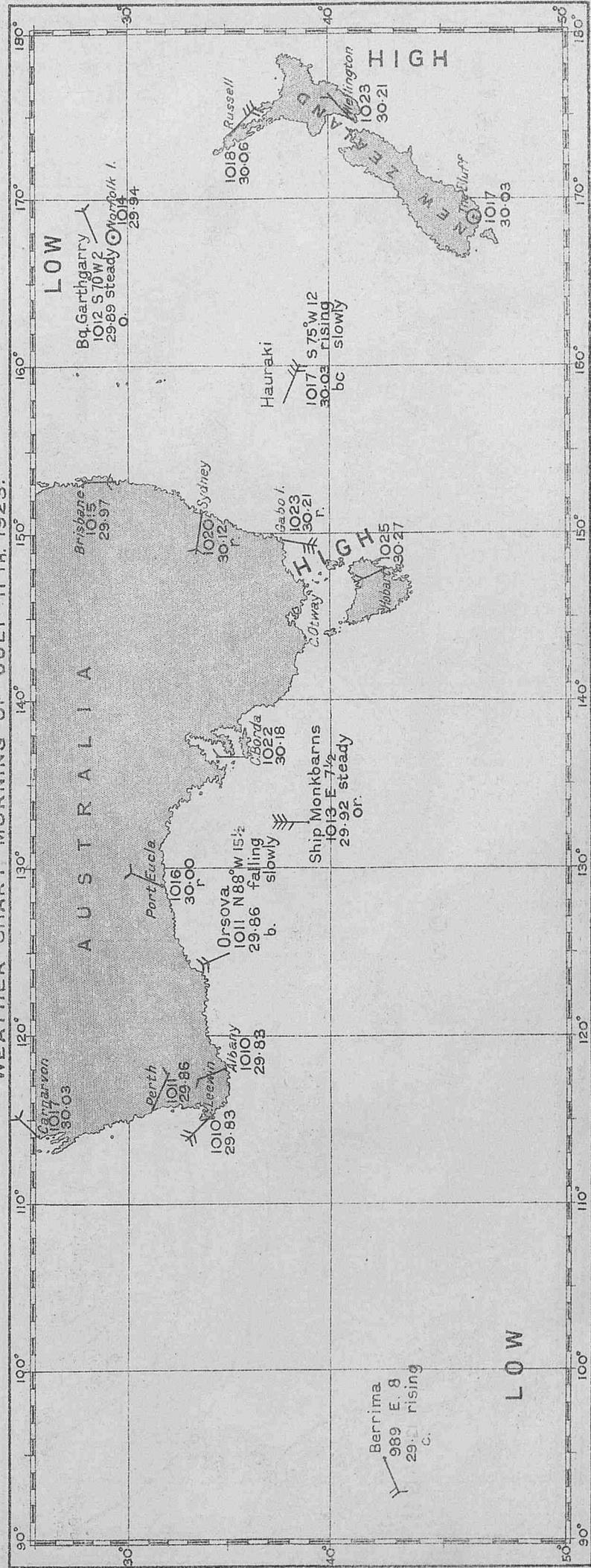
Fog in Bass Strait.



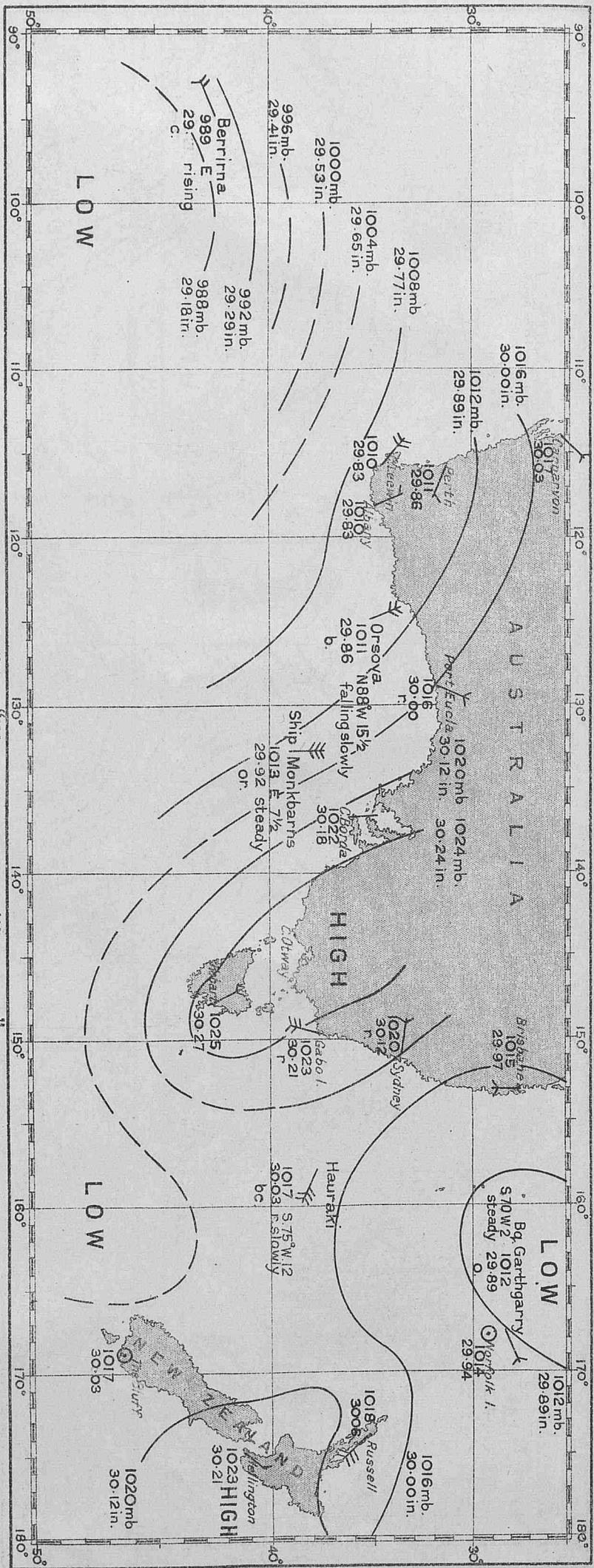
Antarctic Lows and S.W. Gales.



WEATHER CHART MORNING OF JULY 11 TH. 1923.



WEATHER CHART MORNING OF JULY 11TH, 1923.



WEATHER CHART MORNING OF JULY 13TH, 1923.

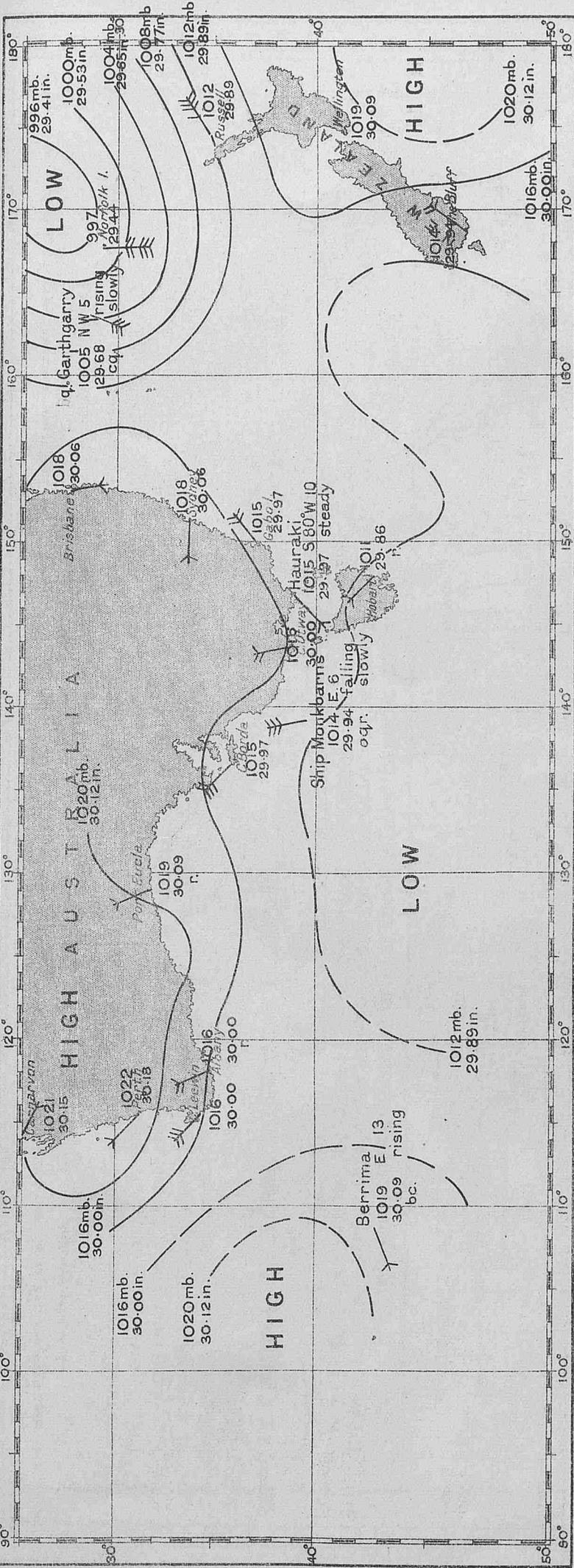


Chart XXXI — "WIRELESS AND WEATHER."

WEATHER CHART MORNING OF JULY 14TH, 1923.

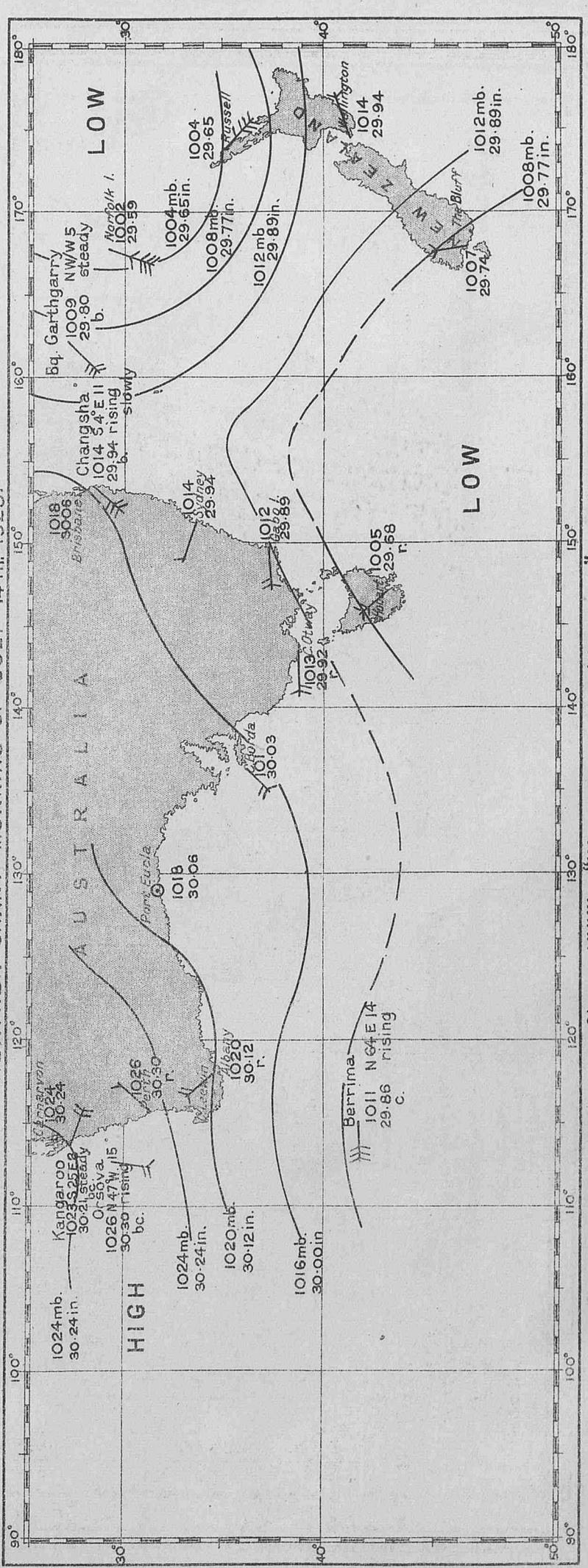
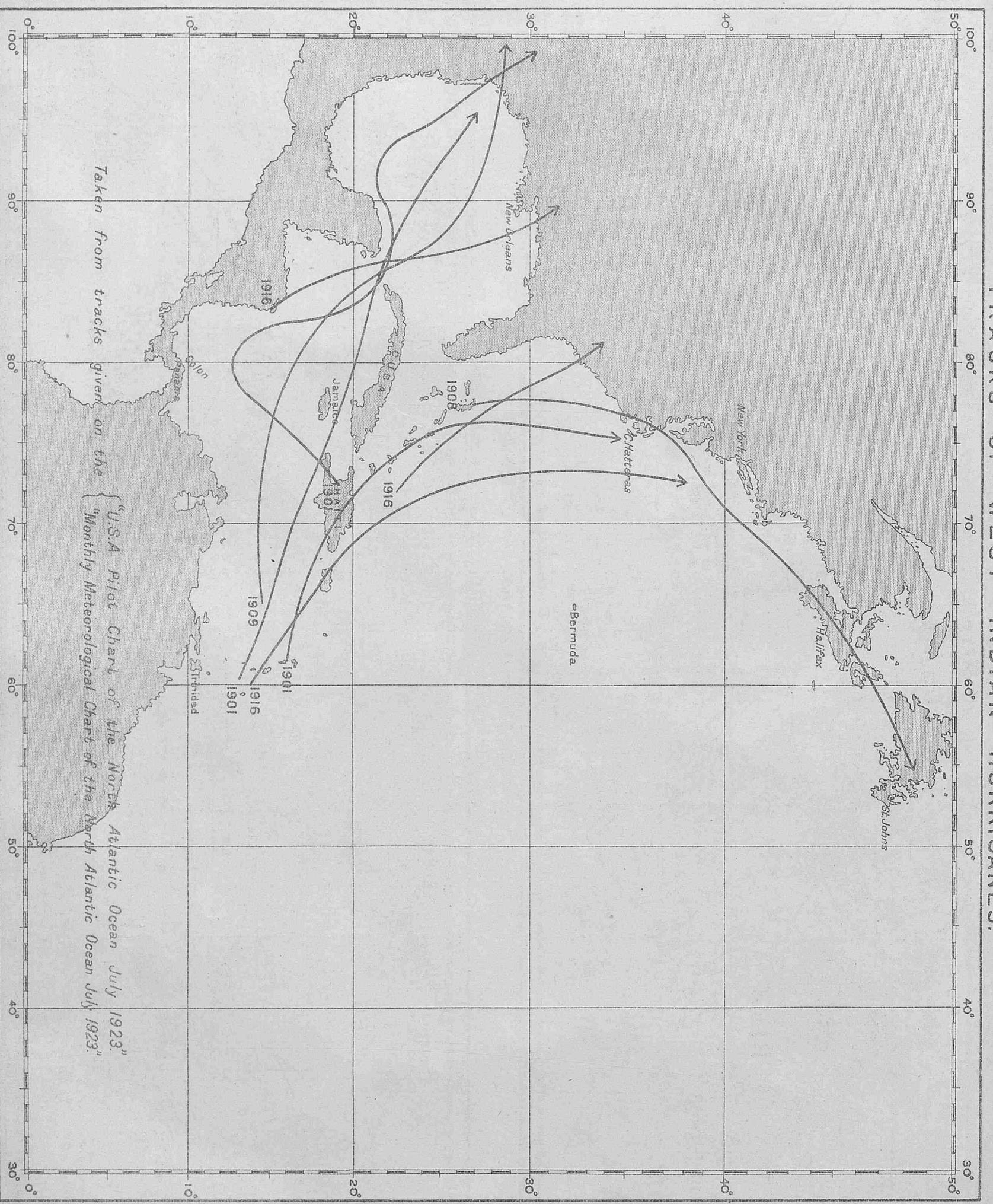


Chart XXXII — "WIRELESS AND WEATHER."

TRACKS OF WEST INDIAN HURRICANES.



Taken from tracks given on the "U.S.A Pilot Chart of the North Atlantic Ocean July 1923." and "Monthly Meteorological Chart of the North Atlantic Ocean July 1923."

Tracks of Hurricanes which have occurred in the West Indies during the month of July. The year is indicated by the figures at the commencement of track.

ICE CHART.

WESTERN NORTH ATLANTIC.

LETTERS OF TRANSATLANTIC TRACKS INDICATE

- (A) Eastbound 25th March to 7th July, inclusive.
- (B) Westbound 1st July to 31st August, inclusive.
- (F) Eastbound 8th July to 31st August, inclusive.
- (G) From 16th May to the opening of Belle Isle route.
- (H) From opening of Straits of Belle Isle to 14th November.

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 front page of Ice Chart published with April Marine Observer.

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 DRIFTS OF ICE.

Date.	Ship or Source of Report.	Position.		Remarks.
		Lat.	Long.	
July —, 1890	S.S. Slavonia ...	48°53' N.	24°11' W.	Last remnants of berg.
" —, 1902	2 reports by Fishermen.	56°30' N.	6°30' W.	40 to 50 ft. long, 15 ft. wide, 2 ft. 6 in. out of water.
" 31, 1909	S.S. Shiraz ...	38°53' N.	80°01' W.	25 ft. long, 3 to 8 ft. wide.
" 10, 1913	S.S. Lothian ...	37°21' N.	38°43' W.	Piece 6 ft. high, 50 ft. in cir.
" 18, 1916	U.S. Hydrographic Bulletin.	32°08' N.	54°26' W.	Piece of berg 3 or 4 ft. out of water.
" 23, 1916	S.S. San Giorgio ...	42°09' N.	63°24' W.	Berg, 60 ft. long.
" 23, 1918	U.S. Hyd. Bulletin ...	44°25' N.	35°01' W.	Large berg.
" 18, 1921	Do.	44°30' N.	35°26' W.	Small berg about 15 ft. sq.
" 21, 1921	Do.	38°09' N.	40°33' W.	Berg.
" 31, 1921	Do.	37°37' N.	27°23' W.	Berg.

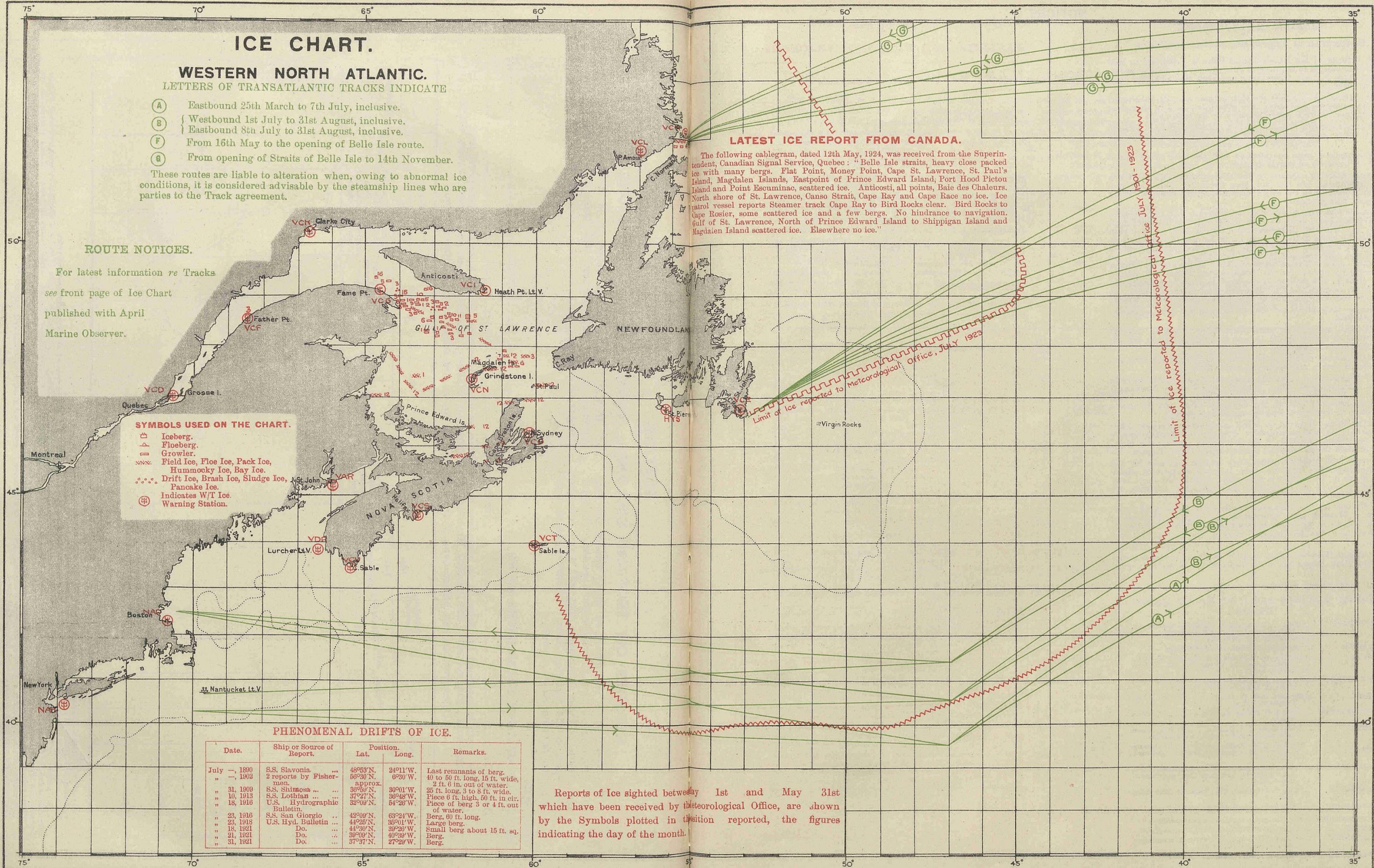
Reports of Ice sighted between May 1st and May 31st which have been received by the Meteorological Office, are shown by the Symbols plotted in the position reported, the figures indicating the day of the month.

LATEST ICE REPORT FROM CANADA.

The following cablegram, dated 12th May, 1924, was received from the Superintendent, Canadian Signal Service, Quebec: "Belle Isle straits, heavy close packed ice with many bergs. Flat Point, Money Point, Cape St. Lawrence, St. Paul's Island, Magdalen Islands, Eastpoint of Prince Edward Island, Port Hood Picton Island and Point Escuminac, scattered ice. Anticosti, all points, Baie des Chaleurs, North shore of St. Lawrence, Canso Strait, Cape Ray and Cape Race no ice. Ice patrol vessel reports Steamer track Cape Ray to Bird Rocks clear. Bird Rocks to Cape Rosier, some scattered ice and a few bergs. No hindrance to navigation. Gulf of St. Lawrence, North of Prince Edward Island to Shippigan Island and Magdalen Island scattered ice. Elsewhere no ice."

Limit of ice reported to Meteorological Office, July 1923

Limit of ice reported to Meteorological Office July 1901-1923



NOTICES.

MARINE METEOROLOGY.

LATE PRESS.

Co-operation of Shipowners, Masters and Mates.

The Director of the Meteorological Office is authorised to lend tested Instruments to Captains of British-owned ships who undertake to make 4 hourly observations and keep Meteorological Logs for the Office.

The instruments supplied for this purpose are one barometer, four thermometers with screen, two hydrometers and in some cases a Barograph and rain gauge is added to the equipment.

Tested instruments are also lent to a number of British Atlantic Liners which make special coded W/T weather reports to the Office.

The number of ships co-operating with the M.O. using official tested instruments on loan is limited.

Vessels observing regularly for the Meteorological Office to which office instruments are not lent, keep Form 911, Ships Meteorological Report, using the ship's instruments, the barometer being compared with Standards.

Captains and Officers who wish to co-operate with the Meteorological Office should apply by letter to The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2; or in person between the hours of 10 a.m. and 4 p.m., to the Marine Superintendent at the same address or to any of the gentlemen whose names and addresses are given below acting as agents at the respective ports. Marine Observers (i.e., Captains and Officers who regularly observe for the Meteorological Office) will greatly assist if they will send in Meteorological Logs immediately on completion through the Port Meteorological Officer or Agent, at the same time notifying him of any possible instrumental defects.

Defective instruments will then be replaced and new Log Books, etc., provided.

In London and at base ports where there is not an Agency, notification of defects should be sent to headquarters on arrival, with the Meteorological Log.

Vessels making voyages of less than two months' duration are requested to retain their logs until nearly filled up.

W/T Registers and Forms 911 should in all cases be sent directly to the Meteorological Office, London. The Port Meteorological Officer at Liverpool and the Visiting Officer in London board vessels co-operating with the Meteorological Office, and the agents visit ships at their ports when circumstances permit.

Postage abroad incurred on behalf of the Meteorological Office in returning logs will be refunded. Postage from British Empire ports need not be prepaid, if the envelope is marked O.H.M.S., and addressed to the Director, Meteorological Office, London.

Captains and Officers whether they observe regularly for the Meteorological Office or not are urged to report exceptional phenomena in air or sea. Reports of weather experienced in or near Tropical Cyclones or hurricanes, also abnormal currents are specially desired.

All Masters who wish to assist in developing the rapid interchange of Meteorological information and Weather Forecasting at sea can do so by using the form of W/T Weather Report suggested in "Weather Signals," given in this Journal, January Number.

The Marine Observer is sent monthly to all ships regularly contributing Logs, Forms and W/T Registers to the Meteorological Office.

Marine Agencies and Port Meteorological Officers.

- LIVERPOOL .. (Port Meteorological Office) Commander G. H. Lloyd, R.D., R.N.R., Dock Office. Telephone No.: Bank 3959.
- CARDIFF Captain T. Johnston, Technical College.
- LEITH.. .. Captains G. Black and C. G. Bonner, V.C., D.S.C., Leith Salvage and Towage Co., Ltd., 2, Commercial Street.
- THE CLYDE .. Captain M. Corrance, Board of Trade Surveyor's Office, 73, Robertson Street, Glasgow.
- HULL Captain Geo. B. Sturdy, c/o Mr. W. Hakes, Commercial Road.
- SOUTHAMPTON .. Captain D. Forbes, Nautical Academy, 1, Albion Place.
- TYNE Commander E. S. Macleod, R.D., R.N.R., Board of Trade Surveyor's Office, North Shields.
- DUBLIN (Captain M. H. Clarke, Chief Surveyor, Ministry of Industry and Commerce, Marine Department, 27, Eden Quay.
- HONG KONG .. Lieut.-Commander P. W. S. Henderson, R.N., Superintendent, Admiralty Chart and Chronometer Depot.
- VANCOUVER .. T. S. H. Shearman, Esq., Room 40, Post Office Building.
- AUSTRALIA .. The Commonwealth Meteorologist.

The Deputy Directors of Navigation act as sub-agents as follows:—

- SYDNEY Captain G. D. Williams, D.S.O., Customs House.
- MELBOURNE .. Captain L. J. Bolger, Electricity Commissioners Building, 22, William Street.
- FREMANTLE .. Captain J. J. Airey, Dalgety's Buildings.

DERELICTS AND FLOATING WRECKAGE.

Date.	Position.		Description.
	Latitude.	Longitude.	
NORTH SEA.			
7.5.24	120 miles E. by N½N. of Spurn.		Floating wreckage—believed to be quarter deck of s.s. <i>Lusby</i> —dangerous to navigation.
9.5.24	52°37'N.	3°—'E.	Buoy, with black and white horizontal stripes.
16.5.24	53°24'N.	4°20'E.	Red painted buoy, with white band and top.
ENGLISH CHANNEL.			
1.5.24	49°36'N.	3°02'W.	Large derelict barge; dangerous to navigation.
1.5.24	49°37'N.	2°54'W.	New iron pontoon, black and red, marked <i>R.9.</i> , adrift.
2.5.24	49°43'N.	2°36'W.	Barge.
18.5.24	2 miles N.W. of Eddystone.		Wreckage—dangerous to navigation—20 ft. long, showing 4 ft. above water—2 iron posts projecting each end about 2 ft.
19.5.24	51°02'N.	1°17'E.	Circular object with long thick crossbar attached.
25.5.24	48°58'N.	5°08'W.	Spherical buoy, painted black and white sectors with small iron tripod on top.
MEDITERRANEAN.			
7.5.24	36°14'N.	14°26'E.	Large mass of wood and canvas marked with letter <i>C</i> , apparently target.
NORTH ATLANTIC.			
2.5.24	40°45'N.	65°46'W.	Vertical spar, resembling vessel's lower-mast, apparently attached to submerged wreckage.
2.5.24	48°02'N.	5°09'W.	Submerged wreckage.
2.5.24	40°24'N.	73°04'W.	Raft, composed of heavy timbers, awash.
2.5.24	40°48'N.	48°24'W.	Spar, covered with marine growth, projecting 6 ft. out of water.
3.5.24	34°13'N.	49°38'W.	Can buoy, painted white on top, marked "3."
3.5.24	30°01'N.	77°23'W.	Large log, about 50 ft. long and 30 ins. diameter, with roots and branches, covered with marine growth.
3.5.24	37°30'N.	71°32'W.	Large spar, awash.
4.5.24	36°11'N.	74°47'W.	Large spar, about 50 ft. long.
4.5.24	45°34'N.	30°17'W.	Derelict schooner, <i>Governor Parr</i> .
5.5.24	44°33'N.	29°06'W.	Derelict awash.
5.5.24	48°29'N.	5°57'W.	Spherical buoy, black and white vertical stripes, <i>No. 451</i> , with broken top mark.
8.5.24	38°20'N.	65°09'W.	Buoy, with staff attached.
8.5.24	43°11'N.	56°22'W.	Schooner, <i>Evelyn</i> .
9.5.24	48°07'N.	20°09'W.	Wreckage, awash, consisting of heavy timbers bolted together, about 20 ft. square.
9.5.24	23°36'N.	74°30'W.	Partly submerged wreck.
9.5.24	38°57'N.	51°16'W.	2 Spars.
10.5.24	35°58'N.	74°12'W.	Spar, apparently attached to submerged wreckage.
10.5.24	41°16'N.	55°51'W.	Derelict.
10.5.24	39°06'N.	67°34'W.	Red conical gas buoy, marked "12" in white, with chain attached, projecting 10 ft. out of water.
11.5.24	44°34'N.	55°06'W.	Wreckage of schooner, bottom up, 60 ft. long, keel showing 3 ft. above water.
12.5.24	49°13'N.	42°46'W.	Gas buoy.
14.5.24	45°15'N.	9°03'W.	Apparently derelict fishing boat, bottom up, bow above water.
14.5.24	49°51'N.	20°40'W.	Red nun buoy.
15.5.24	40°52'N.	52°49'W.	Wreckage.
17.5.24	49°43'N.	19°48'W.	Spherical telegraph buoy, dangerous to navigation.
18.5.24	46°35'N.	27°39'W.	Raft, composed of 2 in. guard beams, 20 ft. long, 10 ft. wide.
20.5.24	49°51'N.	10°46'W.	Spar, and 3 iron drums adrift.
22.5.24	40°37'N.	10°59'W.	Large black spherical buoy, surmounted by lantern or cage.
GULF OF MEXICO.			
7.5.24	24°14'N.	82°27'W.	Log, 18 ft. long, 24 ins. diameter.
9.5.24	24°42'N.	86°50'W.	Ship's mast, attached to submerged wreckage.
NORTH PACIFIC.			
5.5.24	47°11'N.	124°49'W.	Log, about 2½ ft. diameter, floating upright.
6.5.24	47°36'N.	132°55'W.	Tree trunk, about 20 ft. long and 3 ft. diameter.
6.5.24	44°38'N.	124°39'W.	Large log floating upright.
7.5.24	46°10'N.	124°45'W.	Large log.

LIST OF VOLUNTARY OBSERVING SHIPS.

The following is a complete list of ships regularly contributing observations to the Meteorological Office.

The names of the Captains and Officers, as ascertained from logs and reports received, are given with the date and description of last log, register or report received up to the time of going to press.

Marine Observers are requested to take this as complete and grateful acknowledgment for the work they have contributed, as it has been found necessary to reduce as far as possible the correspondence of the Marine Superintendent, which was largely composed of letters acknowledging logs and reports, in order that more time may be devoted to obtaining results from the data received.

Only in special cases will individual letters be sent.

Excellent awards will be made at the end of the financial year. The names of Commanders and Officers gaining these awards will be published in a special list in "The Marine Observer."

Ships not contributing logs or reports within a reasonable period will automatically be removed from

the list and the free issue of the "Marine Observer" discontinued; it is, therefore, earnestly requested that changes of service, probable periods of lay up or transfer of Commanders may be notified whenever possible.

The number of voluntary observing ships is at present limited to a maximum total of 500.

Commanders are requested to point out any errors which may occur in the list.

M.L. = Equipped with tested Instruments for keeping Meteorological Log.

W.T. = Equipped with tested Instruments for making coded W/T reports to the Meteorological Office, London.

No. = Keeps Ship's Meteorological Report Form 911 with ship's instruments.

C.C. = Equipped with tested Instruments for making Cross Channel Telegraphic Reports to the Meteorological Office, London.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
<i>Aba</i> ...	Hughes, J. ...	W. J. Dodd ...	No.	Elder Dempster ...	Form 911 6.3.24 to 11.4.24 ...	22.4.24.
<i>Abaris</i> ...	Rippon, A. P. ...	R. C. Jones ...	"	L. Walford ...	" 11.8.23 to 21.8.23 ...	24.8.23.
<i>Abinsi</i> ...	Wright, J. B. ...	V. Baddeley ...	"	Elder Dempster ...	" 12.12.23 to 18.1.24 ...	25.1.24.
<i>Actor</i> ...	Haylett, E. ...	G. Kent ...	"	Harrison ...	" 19.1.24 to 7.3.24 ...	1.4.24.
<i>Adda</i> ...	Toft ...	G. R. Langmaid ...	"	Elder Dempster ...	"	"
<i>Adriatic</i> ...	Beadnell, F. E., Commr., R.N.R.	O. V. Lucas, J. Collins, A. W. C. Robinson, J. Farrell.	W.T.	White Star ...	{ W.T. Reg. 24.12.23 to 20.4.24 ... Form 911 12.4.24 to 20.4.24 ...	24.4.24. 24.4.24.
<i>Agapenor</i> ...	Ramsay, J. ...	P. S. Atkins ...	No.	A. Holt ...	" 23.2.24 to 22.3.24 ...	26.3.24.
<i>Alban</i> ...	Whayman, W. R. ...	R. Griffiths ...	"	Booth ...	" 21.2.24 to 15.4.24 ...	22.4.24.
<i>Albania</i> ...	Gibbons, G., R.D., Commr., R.N.R.	C. B. Osborne ...	"	Cunard ...	" 5.4.24 to 5.5.24 ...	9.5.24.
<i>Aleppo</i> ...	Duncan, W. B. ...	H. B. Smith ...	"	Ellerman Wilson ...	" 28.4.23 to 30.6.23 ...	5.7.23.
<i>Algerian Prince</i> ...	Rowlands, D. ...	G. Potts ...	"	Prince ...	" 8.4.24 to 21.4.24 ...	23.4.24.
<i>Alipore</i> ...	Gordon, L. M., R.D., Commr., R.N.R.	H. D. Case ...	"	P. and O. ...	" 17.1.24 to 20.3.24 ...	15.4.24.
<i>Almanzora</i> ...	Mackenzie, G. A. ...	H. Chamberlain ...	"	R.M.S.P. ...	" 15.2.24 to 3.4.24 ...	8.4.24.
<i>Alondra</i> ...	Pope, G. F. ...	H. Peters ...	"	Yeoward ...	" 22.3.24 to 11.5.24 ...	14.5.24.
<i>Ampetco</i> ...	Verstichelen, A. ...	R. Janssen ...	"	American Petroleum ...	" 21.2.24 to 13.4.24 ...	14.5.24.
<i>Anglia</i> ...	Sorge, P. ...	W. H. Hughes ...	C.C.	L.M. & S. Rly.	Telegraphic Report 11.4.24 ...	11.4.24.
<i>Antiochus</i> ...	Sprott, E. J. ...	J. J. Daniel ...	No.	A. Holt ...	Form 911 22.1.24 to 16.4.24 ...	23.4.24.
<i>Appam</i> ...	Yardley, H. A. ...	B. Holt, W. H. Muirhead, E. Kingan.	M.L.	Elder Dempster ...	Met. Log. 9.8.23 to 5.1.24 ...	10.1.24.
<i>Aquitania</i> ...	Charles, Sir J. T. W., K.B.E., C.B., R.D., Commodore, R.N.R.	J. L. Croasdaile, P. O. Davis, J. Locke.	W.T.	Cunard ...	{ W.T. Reg. 6.4.24 to 21.4.24 ... " 27.4.24 to 12.5.24 ...	24.4.24. 16.5.24.
<i>Arafura</i> ...	Gordon, A. S. ...	H. Jeans ...	No.	Eastern and Australian	Form 911 17.11.23 to 1.2.24 ...	24.3.24.
<i>Araguaya</i> ...	Matthews, J. E. P. ...	F. J. Elvy ...	"	R.M.S.P. ...	" 17.12.23 to 1.2.24 ...	8.2.24.
<i>Araua</i> ...	Moir, A. G. ...	R. Jones ...	"	"	"	"
<i>Armada Castle</i> ...	George, J., O.B.E.	L. G. May ...	"	Union Castle ...	Form 911 21.3.24 to 12.5.24 ...	14.5.24.
<i>Arracan</i> ...	Willis, M. ...	R. MacInnes, H. Poole, D. Frame, A. Olding.	M.L.	P. Henderson ...	Met. Log. 26.1.24 to 24.4.24 ...	5.5.24.
<i>Arundel</i> ...	Short, H. ...	Mr. Hill ...	C.C.	Southern Rly.	Telegraphic Report 22.4.24 ...	22.4.24.
<i>Arundel Castle</i> ...	Hague, J. W., Capt., R.N.R.	G. Blaiklock, C. Williams, C. Keen.	M.L.	Union Castle ...	Met. Log. 21.12.23 to 20.4.24 ...	8.5.24.
<i>Assyria</i> ...	Erskine, R. ...	J. Hamilton ...	No.	Anchor ...	Form 911 3.4.24 to 27.4.24 ...	5.5.24.
<i>Astronomer</i> ...	Booth, W. M. ...	W. A. Hall, J. Jackson, S. Leyland.	M.L.	Harrison ...	Met. Log. 20.11.23 to 16.2.24 ...	14.3.24.
<i>Athenic</i> ...	Jones, J. L. ...	A. C. I. Anson ...	No.	White Star ...	Form 911 1.2.24 to 11.2.24 ...	13.3.24.
<i>Atsuta Maru</i> ...	Saito, B. ...	S. Mizozucki ...	"	Nippon Yusen Kaisha	" 15.3.24 to 31.3.24 ...	5.5.24.
<i>Auldmir</i> ...	Ramsay, J. D. ...	P. D. Thompson ...	"	Glen & Co. ...	" 29.3.24 to 9.4.24 ...	16.4.24.
<i>Ausonia</i> ...	Storey, F. B., R. D., Capt., R.N.R.	J. Ashcroft ...	"	Cunard ...	" 6.4.24 to 28.4.24 ...	5.5.24.
<i>Author</i> ...	Kinlock, R. ...	A. Goddard ...	"	Harrison ...	Form 911 29.8.23 to 7.10.23 ...	12.10.23.
<i>Ballena</i> ...	Pape, E. R. ...	W. Webster ...	No.	P.S.N. Co. ...	" 19.9.23 to 11.10.23 ...	15.10.23.
<i>Baltic</i> ...	Roberts, J., C.B.E., D.S.O., R.D., Capt., R.N.R.	E. S. Bell, C. Cochrane, J. Law.	W.T.	White Star ...	{ W.T. Reg. 13.4.24 to 4.5.24 ... Form 911 14.4.24 to 5.5.24 ...	7.5.24. 8.5.24.
<i>Bambra</i> ...	Wyles, W. S. ...	H. W. Norris, F. Humble, J. E. Turner, P. Bolton.	M.L.	State Service, Australia	Met. Log. 8.6.23 to 14.10.23 ...	11.12.23.
<i>Bampton Castle</i> ...	Swiney, W. A. ...	F. Norfolk, L. C. Chapman, H. A. Deller, E. Crocker, C. B. Hoggan.	M.L.	Union Castle ...	{ Met. Log. 21.2.23 to 3.5.23 ... " 2.9.23 to 9.12.23 ...	28.1.24.
<i>Banbury Castle</i> ...	Wynne, R. H. ...	C. C. Page ...	No.	Turnbill Martin ...	Form 911 15.3.24 to 6.4.24 ...	28.4.24.
<i>Banffshire</i> ...	Mayne, W. ...	L. W. Evans ...	"	Commonwealth Govt.	" 4.8.23 to 5.9.23 ...	16.10.23.
<i>Barumbah</i> ...	Baillie, T. ...	T. Swann ...	"	Hogarth & Sons	" 16.1.24 to 28.1.24 ...	11.3.24.
<i>Baron Cawdor</i> ...	Knowles, C. H., D.S.O., Commr., R.N.	A. Campbell ...	"	His Majesty's Ship	Met. Log. 31.7.22 to 3.10.22 ...	10.10.22.
<i>Beaufort</i> ...	Knowles, C. H., D.S.O., Commr., R.N.	H. L. Wheeler ...	M.L.	"	"	"
<i>Belgenland</i> ...	Bradshaw, J. ...	"	M.L.	Red Star ...	"	"
<i>Benalder</i> ...	Cole, J. H., D.S.C. ...	A. K. Watson ...	No.	Ben Line ...	Form 911 20.3.24 to 8.4.24 ...	5.5.24.
<i>Benedict</i> ...	Aspinall, W. ...	H. R. Mackay, K. S. Monro	"	Booth ...	" 17.6.23 to 13.8.23 ...	27.8.23.
<i>Bengloe</i> ...	McCorquodale, A. ...	G. M. Duff ...	"	Ben Line ...	" 28.2.24 to 12.4.24 ...	30.4.24.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
<i>Berengaria</i> ...	Irvine, W. R. D., R.D. Capt., R.N.R.	G. H. Jones, R. F. Bovey, W. C. A. Robson.	W.T.	Cunard ...	W.T. Reg. 13.4.24 to 28.4.24 ...	5.5.24.
<i>Bernini</i> ...	Evans, W. ...	J. C. Dawson ...	No.	Lampart & Holt ...	Form 911 7.10.23 to 10.12.23...	30.12.23.
<i>Berrima</i> ...	Hussey Cooper, E. M., R.D., Commr., R.N.R.	J. S. Wheeler ...	"	P. & O. Branch ...	" 21.11.23 to 5.12.23...	28.12.23.
<i>Bolingbroke</i> ...	Landy, E., Sargent, A. H., Aikman, E.	R. Campbell, R. F. Walker, W. P. Hains.	M.L.	Canadian Pacific ...	Met. Log. 22.2.23 to 18.10.23...	14.11.23.
<i>Borda</i> ...	Holland, R. ...	" " " " " "	No.	P. & O. Branch ...	Form 911 18.10.23 to 24.2.24...	29.2.24.
<i>Bothwell</i> ...	Dott, J. F. ...	K. Hutchings ...	No.	Canadian Pacific ...	Form 911 2.3.24 to 8.4.24 ...	9.4.24.
<i>Brandon</i> ...	Freer, A., R.D., Commr., R.N.R.	J. Mackenzie ...	"	Canadian Pacific ...	" 21.10.23 to 20.11.23	27.11.23.
<i>Brecon</i> ...	McDonald, J. ...	N. B. Glennie, W. W. J. Evans, W. J. P. Roberts.	M.L.	" " " " " "	Met. Log. 20.9.23 to 6.5.24 ...	8.5.24.
<i>Brighton</i> ...	Hill, A. ...	Mr. Munton ...	C.C.	Southern Railway ...	Telegraphic Report 16.5.24 ...	16.5.24.
<i>British Engineer</i> ...	Piper, H. C. ...	A. Campbell ...	"	British Tankers ...	Form 911 10.4.24 to 28.4.24 ...	8.5.24.
<i>British Lantern</i> ...	Taylor, R. J. ...	C. O. Tucker ...	"	" " " " " "	" 28.2.24 to 23.4.24 ...	5.5.24.
<i>Bryere</i> ...	Heasley, W. S. ...	A. C. Kennedy ...	"	Lampart & Holt ...	" 6.4.24 to 24.4.24 ...	14.5.24.
<i>Cabotia</i> ...	Lawson, P. ...	T. G. Menzies ...	No.	Anchor Donaldson ...	Form 911 8.3.24 to 11.4.24 ...	15.4.24.
<i>Cambria C.S.</i> ...	Wightman, H. G. E., D.S.C.	E. N. L. Staples ...	M.L.	Eastern Tel. Co. ...	Met. Log. 1.12.23 to 28.3.24 ...	23.4.24.
<i>Cambria</i> ...	" " " " " "	V. S. Phillips ...	C.C.	L.M. & S. Rly. ...	Telegraphic Report 2.5.24 ...	2.5.24.
<i>Camito</i> ...	Scudamore, J. H. H., D. S. C., R. D., Commr., R.N.R.	D. A. Jack, D. Hay, D. V. Smith.	M.L.	Elders & Fyffes ...	Met. Log. 23.10.23 to 23.2.24...	28.2.24.
<i>Canada</i> ...	Jones, T. ...	F. W. Laws ...	No.	White Star-Dominion ...	Form 911 22.3.24 to 11.5.24 ...	14.5.24.
<i>Canadian Inventor</i> ...	Roberts, R. P. ...	S. M. Holinden ...	"	Canadian Govt. Merch- ant Marine.	" 16.12.23 to 6.2.24 ...	24.3.24.
<i>Canadian Scottish</i> ...	Millar, W. H. ...	S. Fieldhouse ...	"	" " " " " "	" 19.8.23 to 1.12.23 ...	7.1.24.
<i>Canadian Skir- misher.</i> ...	Millar, W. H. ...	G. B. Price ...	"	" " " " " "	" 28.5.23 to 5.8.23 ...	5.9.23.
<i>Carlow Castle</i> ...	McNeil, S. G. S., R.D., Capt., R.N.R.	R. C. Longman ...	W.T.	Union Castle ...	W.T. Reg. 20.4.24 to 7.5.24 ...	14.5.24.
<i>Carmania</i> ...	" " " " " "	A. T. Hamer, L. R. Allen, P. J. Robinson.	"	Cunard ...	Form 911 20.4.24 to 8.5.24 ...	14.5.24.
<i>Caronia</i> ...	Diggle, E. G., R.D., Capt., R.N.R.	J. H. Wood, R. Allen, G. H. Morris.	W.T.	" " " " " "	W.T. Reg. 7.10.23 to 27.10.23...	30.10.23.
<i>Carpentaria</i> ...	Rowe, S. N. ...	" " " " " "	M.L.	British India ...	Form 911 7.10.23 to 27.10.23...	31.10.23.
<i>Cassandra</i> ...	Mitchell, W. E. ...	A. Murray ...	No.	Anchor Donaldson ...	Met. Log. 22.4.23 to 16.10.23...	27.11.23.
<i>Cedric</i> ...	Marshall, W., D.S.O., R.D., Capt., R.N.R.	T. F. P. Pratt, J. A. Heenan, A. E. Harvey.	W.T.	White Star ...	Form 911 15.3.24 to 9.4.24 ...	14.4.24.
<i>Celtic</i> ...	Holme, A. ...	R. S. Walker, G. T. Kavanagh, D. W. Chamberlain.	W.T.	" " " " " "	W.T. Reg. 7.4.24 to 26.4.24 ...	29.4.24.
<i>Ceramic</i> ...	Summers, A. H. ...	H. A. Billiard ...	No.	" " " " " "	Form 911 6.4.24 to 27.4.24 ...	29.4.24.
<i>Changsha</i> ...	Freme, A. M. ...	" " " " " "	M.L.	Yull & Co. ...	W.T. Reg. 21.4.24 to 10.5.24 ...	14.5.24.
<i>Chignecto</i> ...	King, A. M., D.S.C.	A. F. Walker ...	No.	R.M.S.P. Co. ...	Form 911 20.4.24 to 11.5.24 ...	14.5.24.
<i>China</i> ...	" " " " " "	E. Cox Walker ...	"	" " " " " "	" 27.8.23 to 18.11.23...	18.12.23.
<i>Chindwara</i> ...	Jones, W. H. ...	C. E. Cara ...	"	P. & O. ...	" 26.5.23 to 30.9.23 ...	23.1.24.
<i>Chindwin</i> ...	Esslemont, C. ...	J. Walker, J. Summers, W. Wilson, A. McCallum.	M.L.	British India ...	" 19.1.24 to 26.2.24 ...	7.4.24.
<i>Chinhua</i> ...	Byers, G. ...	Mr. Cook, Mr. Wherry ...	No.	P. & O. ...	" 23.2.24 to 14.3.24 ...	22.4.24.
<i>City of Alexandria</i> ...	Bedford, G. B. ...	T. C. Higgins ...	No.	British India ...	Met. Log. 28.12.23 to 8.3.24 ...	8.4.24.
<i>City of Baroda</i> ...	" " " " " "	A. V. Radcliffe, R. J. Witton, A. B. Carson.	M.L.	P. Henderson ...	" 12.1.24 to 27.3.24 ...	4.4.24.
<i>City of Batavia</i> ...	Spencer, H. ...	B. Moloney ...	No.	China Nav. Co. ...	" 26.7.23 to 8.12.23 ...	24.4.24.
<i>City of Benares</i> ...	Macdonald, K., O.B.E.	A. A. Fullerton ...	"	Ellerman ...	Met. Log. 20.6.23 to 15.9.23 ...	4.10.23.
<i>City of Brisbane</i> ...	Pine, R. ...	W. Robinson ...	"	" " " " " "	Form 911 23.1.24 to 22.2.24 ...	26.2.24.
<i>City of Canterbury</i> ...	Brenner, D. M. ...	A. M. Hamilton ...	"	" " " " " "	" 6.2.24 to 7.3.24 ...	14.3.24.
<i>City of Chester</i> ...	Teague, R. E. ...	F. C. Wilson ...	M.L.	" " " " " "	" 23.11.23 to 14.12.23	12.2.24.
<i>City of Dunkirk</i> ...	Seaborne, F. O. ...	W. Leadbeater ...	No.	" " " " " "	" 3.12.23 to 12.3.24 ...	7.4.24.
<i>City of London</i> ...	Martin, D. ...	C. Inglis ...	"	" " " " " "	Met. Log. 22.12.23 to 4.4.24 ...	8.4.24.
<i>City of Marseilles</i> ...	Brown, G. ...	G. M. Womersley ...	"	" " " " " "	Form 911 21.9.23 to 4.10.23 ...	17.10.23.
<i>City of Newcastle</i> ...	Oliver, R. E., D.S.C.	C. Paton ...	"	" " " " " "	" 3.4.24 to 29.4.24 ...	8.5.24.
<i>City of Rangoon</i> ...	Williams, T. L. ...	W. Ibbotson, S. L. Hoare, T. A. Dexter.	M.L.	" " " " " "	" 23.2.24 to 12.3.24 ...	17.3.24.
<i>City of Valencia</i> ...	Williamson, W. A., R.D., Lieut- Commr. R.N.R.	J. J. McTigue ...	No.	" " " " " "	Met. Log. 25.4.23 to 9.8.23 ...	16.8.23.
<i>City of Yokohama</i> ...	Jinks, J. W. ...	J. C. McWhirter ...	"	" " " " " "	Form 911 27.1.24 to 3.4.24 ...	7.4.24.
<i>Clan Buchanan</i> ...	George, L. S. ...	P. G. de Gruchy ...	"	Clan ...	" 23.10.23 to 12.11.23	24.11.23.
<i>Clan Lindsay</i> ...	Baker, C. W. ...	S. J. Shennan ...	"	" " " " " "	" 11.10.23 to 10.1.24...	14.1.24.
<i>Clan Macbeth</i> ...	Young, A. H. ...	D. S. Rae ...	"	" " " " " "	" 29.3.24 to 28.4.24 ...	8.5.24.
<i>Clan Macgillivray</i> ...	West, W. F. ...	P. G. de Gruchy ...	"	" " " " " "	" 4.1.24 to 29.1.24 ...	13.3.24.
<i>Clan Macindoe</i> ...	Miller, W. ...	G. H. Johnson ...	"	" " " " " "	" 13.3.24 to 5.4.24 ...	14.5.24.
<i>Clan Mackay</i> ...	Rayner East, H. ...	J. A. Forster, J. Steven, J. E. Gordon.	M.L.	" " " " " "	" 26.1.24 to 20.2.24 ...	22.4.24.
<i>Clan Mackellar</i> ...	Cowie, J. G. ...	C. W. Banbury, W. S. Simpson	No.	" " " " " "	Met. Log. 30.6.23 to 25.10.23...	30.10.23.
<i>Clan Mackenzie</i> ...	Young, G. ...	W. G. Arthur, J. M. Lorimer	"	" " " " " "	Form 911 1.4.24 to 13.4.24 ...	5.5.24.
<i>Clan Mackinnon</i> ...	Thomson, W. ...	V. Wilson, W. S. Holden, T. Kay.	M.L.	" " " " " "	" 18.2.24 to 15.3.24 ...	8.4.24.
<i>Clan Macmillan</i> ...	Mackinnon, D. ...	S. M. Werrey Easterbrook ...	No.	" " " " " "	Met. Log. 6.9.23 to 24.2.24 ...	27.2.24.
<i>Clan Macnaughton</i> ...	Gray, J. N. ...	A. G. Storkey, F. Burnes ...	"	" " " " " "	Form 911 25.4.24 to 7.5.24 ...	14.5.24.
<i>Clan Macphee</i> ...	Gourlay, J. B. ...	P. H. Aydon, J. H. Mellor, J. Macdougall.	M.L.	" " " " " "	" 19.1.24 to 24.2.24 ...	26.2.24.
<i>Clan Macvicar</i> ...	Phillips, G. P. ...	L. S. Murrin ...	No.	" " " " " "	Met. Log. 26.5.23 to 21.11.23...	17.1.24.
<i>Clan Malcolm</i> ...	Higgins, C. J. ...	T. G. Young, A. Cameron ...	M.L.	" " " " " "	Form 911 12.3.24 to 6.4.24 ...	28.4.24.
<i>Clan Morrison</i> ...	Porterfield, W. M. ...	D. A. Evans ...	No.	" " " " " "	Met. Log. 22.12.24 to 31.3.24...	3.4.24.
<i>Clan Murdoch</i> ...	Pagan, J. C. ...	R. E. Owen ...	"	" " " " " "	Form 911 16.3.24 to 14.4.24 ...	30.4.24.
<i>Clan Ramsay</i> ...	Henderson, C. W. ...	P. J. Green ...	"	" " " " " "	" 18.3.24 to 7.4.24 ...	5.5.24.
<i>Clan Ross</i> ...	Christian, W. G. M. ...	S. M. Werrey Easterbrook ...	"	" " " " " "	" 8.12.23 to 22.1.24 ...	28.1.24.
<i>Clan Sinclair</i> ...	Neill, G. A. ...	F. B. Parker ...	"	" " " " " "	" 3.8.23 to 8.10.23 ...	19.10.23.
<i>Clan Urquhart</i> ...	Sharpland, C. C. ...	R. H. Law ...	"	" " " " " "	" 23.2.24 to 11.4.24 ...	14.4.24.
<i>Colonia, C.S.</i> ...	Campos, V., O.B.E., Lt.-Commr. R.N.R.	S. A. Garnham, A. S. Muir, W. E. Allen, S. Hall.	M.L.	Telegraph Construction & Maintenance.	Met. Log. 27.10.23 to 22.11.23	26.11.23.
<i>Colonia</i> ...	Barrow, R. K. ...	A. V. Jones ...	No.	Harrison ...	Form 911 15.9.23 to 29.11.23...	20.12.23.
<i>Colonian</i> ...	Gittins, R. P. ...	J. Crangle ...	"	Leyland ...	" 8.4.24 to 19.4.24 ...	25.4.24.

LIST OF VOLUNTARY OBSERVING SHIPS

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
<i>Columbia</i> ...	Gemmell, W. ...	S. G. Taylor ...	No.	Anchor ...	Form 911 13.4.24 to 4.5.24 ...	15.5.24.
<i>Comino</i> ...	Nuttall, E. L. ...	A. McVicar ...	"	Furness Withy ...	" 7.3.24 to 13.4.24 ...	5.5.24.
<i>Cooes</i> ...	Festa, M. ...	C. Keen, D. C. Rees ...	"	Commonwealth Govt. ...	" 29.6.23 to 16.8.23 ...	8.10.23.
<i>Copenhagen</i> ...	Kerr, J. J. ...	W. G. Rees ...	"	Glen & Co. ...	" 27.4.23 to 6.6.23 ...	23.7.23.
<i>Corinthic</i> ...	Hart, F. ...	W. T. Fitzgerald, M. Bennett, F. G. Rogers. ...	M.L.	White Star ...	Met. Log. 29.12.23 to 8.4.24 ...	12.5.24.
<i>Cornish City</i> ...	Bowen, T. S. ...	G. S. Dawes ...	No.	Reardon Smith ...	Form 911 8.1.24 to 16.2.24 ...	7.4.24.
<i>Cornwall</i> ...	Robertson, H. W. ...	W. W. Glover ...	"	Dowie, J., & Co. ...	" 5.3.24 to 12.4.24 ...	22.4.24.
<i>Crawford Castle</i> ...	Sinclair, G. ...	J. C. Brown ...	"	Union Castle ...	"	"
<i>Cyclops</i> ...	Cosker, W. ...	J. P. Makepeace ...	"	A. Holt ...	Form 911 13.2.24 to 17.3.24 ...	7.4.24.
<i>Dardanus</i> ...	Shaw, A. T. ...	A. Morton ...	No.	A. Holt ...	Form 911 23.11.23 to 6.2.24 ...	8.2.24.
<i>Darian</i> ...	Masters, W. ...	G. F. Parkinson ...	"	Leyland ...	" 30.3.24 to 8.5.24 ...	14.5.24.
<i>Darro</i> ...	Smith, W. E., D.S.O., R.D., Capt., R.N.R. ...	E. H. Giller ...	"	R.M.S.P. Co. ...	" 27.1.24 to 21.2.24 ...	24.3.24.
<i>Daytonian</i> ...	Walker, C. J., D.S.O. ...	W. T. Godwin ...	"	Leyland ...	" 29.3.24 to 10.4.24 ...	23.4.24.
<i>Delta</i> ...	Brooks, C., D.S.O., R.D., Commr., R.N.R. ...	J. O. V. Young ...	"	P. & O. ...	" 29.3.24 to 19.4.24 ...	14.5.24.
<i>Demerara</i> ...	Hill, T. A. ...	A. Hamby ...	"	R.M.S.P. Co. ...	" 8.3.24 to 4.5.24 ...	8.5.24.
<i>Demosthenes</i> ...	Williams, W. J. ...	R. A. Alcock, A. Alexander ...	"	Aberdeen ...	" 22.2.24 to 1.4.24 ...	15.4.24.
<i>Deseado</i> ...	Wakeman, E. C. ...	C. R. Brown, F. Collinson ...	"	R.M.S.P. Co. ...	Form 911 11.2.24 to 3.4.24 ...	9.4.24.
<i>Desna</i> ...	Adam, C., R.D., Commr., R.N.R. ...	H. D. Jackman ...	"	" ...	" 23.2.24 to 19.4.24 ...	25.4.24.
<i>Deucalion</i> ...	Batt, A. E. ...	W. G. Smith ...	"	A. Holt ...	" 5.2.24 to 19.2.24 ...	22.2.24.
<i>Devon</i> ...	Gardner, H. W. ...	" ...	"	New Zealand S.S. Co. ...	" 23.8.23 to 13.10.23 ...	19.10.23.
<i>Dieppe</i> ...	Marmery, S. ...	Mr. Parsons ...	C.C.	Southern Railway ...	Telegraphic Report. 15.5.24 ...	15.5.24.
<i>Digby</i> ...	Chambers, F. W., D.S.C. ...	J. Pascoe, J. W. Murphy, W. P. Paterson. ...	M.L.	Furness Withy ...	Met. Log. 2.10.23 to 8.4.24 ...	22.4.24.
<i>Discoverer</i> ...	King, J. T. ...	J. Stanhope ...	No.	Harrison ...	Form 911 8.1.24 to 8.4.24 ...	14.4.24.
<i>Dogra</i> ...	Bhance, T. ...	H. Hardwick ...	"	Asiatic S.N. Co. ...	" 6.12.23 to 17.2.24 ...	11.3.24.
<i>Domala, M.V.</i> ...	Whittingham, W. E., O.B.E., R.D., Commr. R.N.R. ...	C. E. Merchant ...	"	British India ...	" 12.1.24 to 6.2.24 ...	18.3.24.
<i>Doric</i> ...	Davies, J. ...	A. Thompson ...	"	White Star ...	" 29.3.24 to 20.4.24 ...	23.4.24.
<i>Dorington Court</i> ...	Barcham, H. C. ...	H. Tulloch ...	"	Haldin & Co. ...	" 23.5.23 to 12.6.23 ...	19.6.23.
<i>Dorset</i> ...	Kettlewell, C. R. ...	" ...	M.L.	New Zealand S.S. Co. ...	"	"
<i>Dramatist</i> ...	Gibbins, W. H. ...	R. W. Roberts ...	No.	Harrison ...	Form 911 7.12.23 to 14.3.24 ...	18.3.24.
<i>Dromore Castle</i> ...	Linklater, H. ...	S. S. Smith ...	"	Union Castle ...	" 20.3.24 to 9.4.24 ...	6.5.24.
<i>Dryden</i> ...	Knight, R. A. ...	G. D. Oldfield ...	"	Lampert & Holt ...	" 28.10.23 to 2.1.24 ...	18.2.24.
<i>Dundrum Castle</i> ...	Mumford, C. E. ...	H. Bunn ...	"	Union Castle ...	"	"
<i>Duendes</i> ...	Pape, E. R. ...	" ...	"	Pacific S.N. Co. ...	Form 911 10.2.24 to 4.3.24 ...	6.3.24.
<i>Duquesa</i> ...	Melville, A. ...	W. Schofield ...	"	Furness Withy ...	" 9.3.24 to 5.5.24 ...	14.5.24.
<i>Durenda</i> ...	Wilson, W. ...	W. Cruse, C. McFarlane ...	"	British India ...	" 17.2.24 to 11.3.24 ...	14.3.24.
<i>Eastern</i> ...	Laing, J. D. ...	J. W. Kavanagh, F. R. Miller, H. H. Litchfield. ...	M.L.	Eastern and Australian ...	Met. Log. 14.2.23 to 16.8.23 ...	8.10.23.
<i>Ebani</i> ...	Fail, — ...	W. McKeown ...	No.	Elder Dempster ...	"	"
<i>Edinburgh Castle</i> ...	Strong, H., R.D., Commr., R.N.R. ...	" ...	M.L.	Union Castle ...	Met. Log. 30.11.23 to 24.3.24 ...	14.4.24.
<i>Eemland</i> ...	Van Noppen, C. D. ...	G. W. Yonwen ...	No.	Holland Lloyd ...	Form 911 18.12.23 to 16.3.24 ...	14.4.24.
<i>Egori</i> ...	McDowall, J. ...	K. Redmore ...	"	Elder Dempster ...	" 25.11.23 to 10.12.23 ...	12.12.23.
<i>El Cordobes</i> ...	Noton, F. G. ...	N. H. Oldham ...	"	British & Argentine S.N. Co. ...	" 6.3.24 to 3.4.24 ...	14.5.24.
<i>Elmina</i> ...	Millson, H. E. ...	" ...	M.L.	Elder Dempster ...	Met. Log. 20.9.23 to 13.12.23 ...	4.3.24.
<i>El Paraguay</i> ...	Ellis, F., D.C.M. ...	W. E. Williams ...	No.	Houlder Bros. ...	Form 911 16.3.24 to 9.5.24 ...	14.5.24.
<i>Elpenor</i> ...	Evans, D. L. ...	P. E. Wright, C. Mock ...	M.L.	A. Holt ...	Met. Log. 31.12.23 to 19.4.24 ...	24.4.24.
<i>Elysia</i> ...	Kinnaird, J. ...	A. Grant ...	No.	Anchor ...	Form 911 16.2.24 to 8.3.24 ...	1.4.24.
<i>Empress of Asia</i> ...	Douglas, L. D., R.D., Lt. - Commr., R.N.R. ...	F. C. Stratford ...	M.L.	Canadian Pacific ...	Met. Log. 4.10.23 to 28.1.24 ...	5.3.24.
<i>Empress of Australia</i> ...	Robinson, S., C.B.E., R.D., Commr., R.N.R. ...	" ...	M.L.	" ...	" 1.6.23 to 9.3.24 ...	7.4.24.
<i>Empress of Canada</i> ...	Hopcraft, D. ...	" ...	"	" ...	"	"
<i>Empress of France</i> ...	Halley, A. J. ...	" ...	"	" ...	"	"
<i>Empress of Russia</i> ...	Halley, A. J. ...	" ...	M.L.	" ...	Met. Log. 29.6.23 to 6.12.23 ...	8.1.24.
<i>Empress of Scotland</i> ...	Robinson, S., C.B.E., R.D., Commr., R.N.R. ...	" ...	"	" ...	"	"
<i>Empress of Russia</i> ...	Griffiths, E. ...	R. V. Everett, A. S. Phillips, B. Grant. ...	M.L.	" ...	" 13.6.23 to 17.11.23 ...	21.11.23.
<i>Empress of Russia</i> ...	Hosken, A. J. ...	A. B. Smith, J. D. Vosper, J. P. Napier, C. S. Morris, J. M. H. Twibill, R. H. Graham. ...	M.L.	" ...	" 12.7.23 to 17.12.23 ...	29.1.24.
<i>Empress of Scotland</i> ...	Gillies, J., C.B.E. ...	" ...	M.L.	" ...	"	"
<i>Empress of Scotland</i> ...	Geary Hill, S. A., D.S.O., Commr., R.N. ...	" ...	"	" ...	"	"
<i>Empress of Scotland</i> ...	Nares, J. D., D.S.O., Capt., R.N. ...	H. Exton Turner ...	M.L.	His Majesty's Ship ...	Met. Log. 3.7.22 to 8.6.23 ...	18.6.23.
<i>Empress of Scotland</i> ...	Pearce, A. W. ...	G. Pattison ...	No.	R.M.S.P. Co. ...	Form 911 2.2.24 to 20.3.24 ...	7.4.24.
<i>Empress of Scotland</i> ...	Read, J. W. ...	E. R. Pritchard ...	"	A. Holt ...	" 28.2.24 to 13.3.24 ...	7.4.24.
<i>Empress of Scotland</i> ...	Collins, P. J., O.B.E. ...	H. S. Cox, A. R. Payne, F. Fuller. ...	M.L.	Aberdeen ...	Met. Log. 4.1.24 to 27.4.24 ...	12.5.24.
<i>Empress of Scotland</i> ...	Lloyd, R. ...	J. A. Havard ...	No.	A. Holt ...	Form 911 27.3.24 to 18.4.24 ...	6.5.24.
<i>Empress of Scotland</i> ...	Lamont, A. ...	Scientific Staff ...	M.L.	Scottish Fishery Board ...	Met. Log. 9.4.23 to 30.11.23 ...	8.1.24.
<i>Empress of Scotland</i> ...	Woodhouse, A. F. B., Lt.-Commr., R.N. ...	C. W. Sabine ...	M.L.	His Majesty's Ship ...	" 25.7.23 to 1.11.23 ...	10.11.23.
<i>Empress of Scotland</i> ...	Veldkamp, G. J. ...	W. G. Ton ...	No.	Holland Lloyd ...	Form 911 14.3.24 to 3.5.24 ...	5.5.24.
<i>Empress of Scotland</i> ...	Henderson, D. A., Lt.-Commr., R.N. ...	A. B. Fouleston ...	M.L.	His Majesty's Ship ...	Met. Log. 25.7.23 to 1.11.23 ...	10.11.23.
<i>Empress of Scotland</i> ...	Wilkins, J., O.B.E. ...	J. A. Vickers ...	No.	Ellerman Wilson ...	Form 911 16.12.23 to 22.1.24 ...	26.1.24.
<i>Empress of Scotland</i> ...	Gatley, E. ...	H. J. Prout ...	"	Royal Fleet Auxiliary ...	" 20.6.23 to 15.9.23 ...	27.11.23.
<i>Empress of Scotland</i> ...	Cartmer, G. E., O.B.E. ...	J. W. Allingham, J. H. A. Mackie, J. Garmory. ...	M.L.	India Office Shipping ...	Met. Log. 23.1.24 to 2.5.24 ...	8.5.24.
<i>Empress of Scotland</i> ...	Cleugh, J. W. ...	C. F. Bennett, H. Wilson, R. Soper. ...	"	" ...	" 10.11.23 to 29.2.24 ...	10.3.24.
<i>Empress of Scotland</i> ...	Summers, F. F., R.D., Commr. R.N.R. ...	W. G. O. Jones ...	No.	White Star ...	" 14.1.24 to 23.2.24 ...	7.4.24.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log Register, or Report Contributed.	Date Received.
<i>Gulymore</i> ...	Ledsome, J. S. ...	D. Wilson ...	No.	Furness Withy ...	Form 911 9.3.24 to 22.3.24 ...	26.3.24.
<i>Garret</i> ...	Visser, C. W. ...	S. de Boo ...	No.	Rotterdam Lloyd ...	" 26.2.24 to 18.3.24 ...	24.3.24.
<i>Gartharry, Ship</i> ...	Roberts, D. ...	W. Wylie, J. Pearce, H. Bento ...	M.L.	Marine Nav. Co. ...	Met. Log. 15.7.22 to 27.7.23 ...	4.10.23.
<i>Gascoyne</i> ...	Mills, A. ...	P. G. Collins ...	No.	Dalgaty & Co. ...	Form 911 20.1.24 to 29.2.24 ...	7.4.24.
<i>Gelria</i> ...	Kolkman, J. M. ...	D. H. Bryant, W. E. Shotton ...	"	Holland Lloyd ...	" 25.1.24 to 14.3.24 ...	17.3.24.
<i>Gladiator</i> ...	Ruffell, ...	L. C. Riggs ...	"	Harrison ...	" 7.1.24 to 8.3.24 ...	12.3.24.
<i>Glenamoy, M.V.</i> ...	Angier, J. ...	F. Poate ...	"	Glen Line ...	Form 911 6.11.23 to 25.1.24 ...	11.2.24.
<i>Glenapp, M.V.</i> ...	Griffiths, J. E. ...	A. Hodd ...	"	" ...	" 8.1.24 to 27.1.24 ...	4.2.24.
<i>Glenluce, M.V.</i> ...	Kenneth, W. H. ...	T. E. Field ...	"	Bibby ...	" 24.1.24 to 12.2.24 ...	27.3.24.
<i>Gloucestershire</i> ...	Robin, E. ...	A. R. H. Barton ...	"	British India ...	" 8.12.23 to 17.2.24 ...	19.2.24.
<i>Gorala</i> ...	D'Cruz, A. B. ...	J. E. Cooper ...	"	Dalgaty & Co. ...	" 13.1.24 to 23.2.24 ...	7.4.24.
<i>Gorvon</i> ...	Hughes, J. W. ...	C. B. Odman, E. W. Hughes ...	M.L.	Ellerman Wilson ...	" ...	"
<i>Gourko</i> ...	Montgomery, H. ...	" ...	No.	Commonwealth Light-house Service.	Form 911 20.7.23 to 11.10.23 ...	5.12.23.
<i>Governor Musgrave</i> ...	Coalstead, C. ...	" ...	"	Furness Withy ...	Met. Log. 15.12.22 to 31.8.23 ...	1.4.24.
<i>Graciana</i> ...	Clark, J. ...	" ...	"	" ...	" ...	"
<i>Haliartus</i> ...	Marsh, L. V. ...	W. H. Upton ...	No.	R. P. Houston ...	" 16.8.23 to 3.10.23 ...	20.11.23.
<i>Harmonides</i> ...	Hughes, W. J. ...	A. W. Bush ...	"	" ...	" 31.1.24 to 6.2.24 ...	25.2.24.
<i>Harmony, Auxy.</i> ...	Jackson, J. C. ...	D. R. S. Webster ...	C.C.	Moravian Mission ...	" 15.11.23 to 3.12.23 ...	19.12.23.
<i>Hatarana</i> ...	Mardon, T. T. ...	J. L. Durkee, F. Wells, E. B. Heath, E. C. McGuinness.	M.L.	British India ...	Met. Log. 12.9.23 to 26.3.24 ...	22.4.24.
<i>Hauraki, M.V.</i> ...	Woodget, H. T. ...	" ...	"	" ...	" ...	"
<i>Hazel Branch</i> ...	Showman, A. C. ...	D. McLeish ...	No.	Union S.S. Co., N.Z. ...	Form 911 27.10.23 to 4.1.24 ...	11.2.24.
<i>Henry Holmes, C.S.</i> ...	Barnet, P. K. ...	R. S. Young ...	"	Nautilus ...	" 16.3.23 to 18.6.23 ...	23.6.23.
<i>Herald</i> ...	Bicker-Caarten, A. ...	E. Hislop Tucker ...	"	W. I. & Panama Telegraph Co.	" 16.3.24 to 5.4.24 ...	30.4.24.
<i>Herald</i> ...	Harvey, J. R., Commr., R.N.	" ...	M.L.	His Majesty's Ship ...	" ...	"
<i>Herefordshire</i> ...	Stanley, W. ...	P. Flood, G. Whitworth, P. S. Cooper, H. Moore.	"	Bibby ...	Met. Log. 18.8.23 to 30.1.24 ...	22.2.24.
<i>Herschel</i> ...	Carey, W. J. ...	S. C. Smith ...	No.	Lampart & Holt ...	Form 911 8.3.24 to 12.5.24 ...	14.5.24.
<i>Hibernia</i> ...	Tanner ...	R. Woodall ...	C.C.	L.M. & S. Rly. ...	Telegraphic Report. 16.5.24 ...	16.5.24.
<i>Highland Enterprise</i> ...	Pond, R. H. ...	H. H. Thomas ...	No.	Nelson ...	Form 911 22.12.23 to 5.3.24 ...	11.3.24.
<i>Glen</i> ...	Jones, T. J. ...	G. Watson, R. Sinclair Davies, J. C. Morton.	M.L.	" ...	Met. Log. 17.12.23 to 9.2.24 ...	25.2.24.
<i>Heather</i> ...	Powell, G. A. ...	" ...	"	" ...	Met. Log. 23.12.22 to 22.3.23 ...	28.3.23.
<i>Laddie</i> ...	Alford, C. ...	S. E. Jackson ...	No.	" ...	Form 911 1.1.24 to 24.2.24 ...	28.2.24.
<i>Laird</i> ...	Davis, G. O. ...	A. S. Jones, J. S. Collins, J. H. Cables.	M.L.	" ...	Met. Log. 1.9.23 to 14.1.24 ...	16.1.24.
<i>Piper</i> ...	Collings, D. ...	H. McKinnon, H. Devlin, R. R. Soanes.	"	" ...	" 18.1.24 to 19.3.24 ...	8.4.24.
<i>Pride</i> ...	Robinson, R. H. ...	F. W. Harvey, S. G. King, F. Abbott.	"	" ...	" 30.11.23 to 15.4.24 ...	30.4.24.
<i>Rover</i> ...	Ashby Graves, F. ...	W. T. Breen ...	No.	" ...	Form 911 12.3.24 to 2.5.24 ...	8.5.24.
<i>Warrior</i> ...	Brooke, W. ...	H. Welsh ...	"	" ...	" 19.3.24 to 1.5.24 ...	5.5.24.
<i>Hildebrand</i> ...	Maddrell, J. ...	J. E. Williams, E. Bailie, Mr. Edwards.	M.L.	Booth ...	Met. Log. 27.11.23 to 29.2.24 ...	12.3.24.
<i>Hobsons Bay</i> ...	Oslyvie, F. J. ...	G. P. Kitto ...	No.	Lampart & Holt ...	Form 911 12.1.24 to 10.3.24 ...	17.3.24.
<i>Holbein</i> ...	Kydd, O. J. ...	W. Hill, F. Patchett ...	W.T.	White Star ...	W.T. Reg. 27.9.23 to 13.10.23 ...	16.10.23.
<i>Homer</i> ...	Gough, W. A. ...	" ...	"	" ...	Form 911 27.9.23 to 13.10.23 ...	16.10.23.
<i>Homer</i> ...	Howarth, F. B., Commr., R.N.R.	J. E. Martin ...	No.	R. P. Houston ...	" 14.2.24 to 11.3.24 ...	8.4.24.
<i>Honorius</i> ...	Samuels ...	H. G. Cruickshank, J. Aldhouse.	"	Pacific S.N. Co. ...	Form 911 4.11.23 to 16.2.24 ...	5.3.24.
<i>Huanchaco</i> ...	Redyard, A. ...	C. C. Beal ...	"	" ...	" 26.3.24 to 7.4.24 ...	28.4.24.
<i>Hubert</i> ...	Evans, T. G. ...	Mr. Oxnard, J. Carpenter, Mr. Newington.	M.L.	Booth ...	Met. Log. 31.8.23 to 8.3.24 ...	15.3.24.
<i>Hurunui</i> ...	Burton Davies, J. ...	" ...	"	" ...	" ...	"
<i>Ibez</i> ...	Langdon, C. ...	B. Lightfoot ...	C.C.	G. W. Railway ...	Telegraphic Report. 15.4.24 ...	15.4.24.
<i>Ikala</i> ...	Meeham, J. T. ...	J. Richardson ...	No.	Welsford, J. H. ...	Form 911 9.6.23 to 19.6.23 ...	26.7.23.
<i>Intombi</i> ...	Worthington, B. ...	J. Sinclair ...	"	Harrison ...	" 22.2.24 to 23.3.24 ...	26.3.24.
<i>Ionic Star</i> ...	Wilson, G. ...	R. H. Lucy, C. R. Brent, G. A. R. J. Leslie, E. E. Addis, G. A. Gould	M.L.	Blue Star ...	" 29.1.24 to 26.3.24 ...	29.3.24.
<i>Iroquois</i> ...	Tinson, C. W., O.B.E., Commr., R.N.	" ...	"	His Majesty's Ship ...	Met. Log. 29.11.23 to 16.3.24 ...	28.4.24.
<i>Izion</i> ...	Baetens, F. ...	A. K. Sanderson ...	No.	A. Holt ...	Form 911 4.3.24 to 4.4.24 ...	14.4.24.
<i>John Pender, C.S.</i> ...	Smythe, T. W., O.B.E.	B. C. Farrow, A. T. Horton ...	No.	Eastern Tel. Co. ...	" 6.3.24 to 10.5.24 ...	14.5.24.
<i>Junin</i> ...	Gibson, L., M.B.E.	" ...	"	" ...	" ...	"
<i>Junin</i> ...	Benson, C. W. ...	R. D. Eckford ...	"	Pacific S.N. Co. ...	" 22.11.23 to 30.12.23 ...	4.1.24.
<i>Kaikoura</i> ...	Downton, M. ...	H. Emmett, C. Pilcher, N. Anderson, J. Hopkins.	M.L.	New Zealand S.S. Co. ...	Met. Log. 19.12.22 to 23.6.23 ...	26.6.23.
<i>Kaisar-i-Hind</i> ...	Manley, G. ...	H. J. M. Perry ...	No.	P. & O. ...	Form 911 6.3.24 to 5.4.24 ...	28.4.24.
<i>Kano Maru</i> ...	Okano, Y. ...	S. Matsumura ...	"	Nippon Yusen Kaisha ...	" 4.2.24 to 4.3.24 ...	7.4.24.
<i>Kangaroo</i> ...	Norris, H. C. ...	C. M. C. Clayton, R. J. Sinclair F. Humble.	M.L.	State Service Australia ...	Met. Log. 6.11.23 to 19.2.24 ...	23.4.24.
<i>Karoo</i> ...	Robinson, T. ...	S. J. Nash ...	No.	Ellerman Bucknall ...	Form 911 30.6.23 to 11.7.23 ...	27.7.23.
<i>Kashima Maru</i> ...	Shinomiyama, T. ...	M. Takada ...	"	Nippon Yusen Kaisha ...	" 2.1.24 to 9.2.24 ...	14.3.24.
<i>Kashmir</i> ...	Bartlett, E. B., O.B.E.	F. Hopkins ...	"	P. & O. ...	" 12.3.24 to 1.4.24 ...	14.5.24.
<i>Kellett</i> ...	Haselfoot, F. E. B., D.S.O., Commr., R.N.	E. H. B. Baker, W. C. Jenks ...	M.L.	His Majesty's Ship ...	Met. Log. 28.10.23 to 15.11.23 ...	5.12.23.
<i>Kenilworth Castle</i> ...	Millard, L. A. ...	A. E. Denn, W. M. Tomkins ...	M.L.	Union Castle ...	Met. Log. 28.12.23 to 28.4.24 ...	8.5.24.
<i>Khiva</i> ...	Redhead, C. M., D.S.O., R.D., Capt., R.N.R.	J. Maxwell, L. Fraser, A. L. Hill ...	M.L.	P. & O. ...	" 26.10.23 to 19.2.24 ...	22.2.24.
<i>Khyber</i> ...	Pinckney, L. D., O.B.E.	N. B. S. Hewett ...	No.	" ...	Form 911 6.4.24 to 11.5.24 ...	14.5.24.
<i>Kia Ora</i> ...	Thurston, H. P. ...	A. E. Lockhart ...	"	Shaw Savill & Albion ...	" 18.3.24 to 2.5.24 ...	9.5.24.
<i>Kinderdijk</i> ...	Jochems, A. B. ...	A. Stenger ...	"	Holland America ...	" 27.3.24 to 3.5.24 ...	8.5.24.
<i>Kitano Maru</i> ...	Kamada, N. ...	G. Chihara ...	"	Nippon Yusen Kaisha ...	" 6.1.24 to 31.1.24 ...	11.3.24.
<i>Knight Companion</i> ...	Beale, H. E. ...	J. H. Brown, H. C. Skins ...	"	A. Holt ...	" 15.11.23 to 21.4.24 ...	30.4.24.
<i>Korvo</i> ...	Casson, D. H., R.D., Commr., R.N.R.	E. R. Massam, G. H. Duncan, L. Griffiths	M.L.	Ellerman Wilson ...	Met. Log. 5.5.23 to 27.11.23 ...	3.12.23.
<i>Lady Brenda</i> ...	Young, W. J. ...	B. L. Brind ...	No.	Dawson ...	Form 911 25.9.23 to 4.10.23 ...	13.10.23.
<i>Lady Denison Pender C.S.</i> ...	West, G. W. ...	A. G. Watts ...	"	Eastern Tel. Co. ...	" 3.3.24 to 13.4.24 ...	16.5.24.
<i>Laguna</i> ...	Mander, F. ...	F. W. Parker ...	"	Pacific S.N. Co. ...	Form 911 22.3.24 to 14.4.24 ...	28.4.24.
<i>Lalande</i> ...	Bambra, W. A. ...	N. Webster ...	"	Lampart & Holt ...	" 26.12.23 to 19.1.24 ...	4.2.24.
<i>Lancashire</i> ...	Beckett, F. W. ...	T. L. Owen ...	"	Bibby ...	" 5.1.24 to 14.3.24 ...	24.3.24.
<i>Laomedon</i> ...	Smith, A. H. ...	A. J. Barclay ...	"	" ...	" 18.11.23 to 27.2.24 ...	4.3.24.
<i>La Paz, M.V.</i> ...	Ross, J. ...	R. Collister ...	"	Pacific S.N. Co. ...	" 6.4.24 to 8.5.24 ...	14.5.24.

LIST OF VOLUNTARY OBSERVING SHIPS

v

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
Laplace	Davies, G. W.	A. Hughes I. O. Jones	No.	Lampport & Holt	Form 911 20.1.24 to 27.3.24	7.4.24.
Lapland	Howell, T.	B. T. Harris, C. K. Knapp, G. H. Bowyer.	W.T.	Red Star	W.T. Reg. 29.4.24 to 1.5.24	5.5.24.
Lassell, M.V.	Turner, J. E.	A. T. Crilly	No.	Lampport & Holt	Form 911 10.4.24 to 2.5.24	5.5.24.
Leicestershire	De Legh, P.	J. W. Hodgson, P. H. Potter, R. Arkieson, R. Cuming.	M.L.	Bibby	" 5.8.23 to 24.10.23	27.11.23.
Leitrim	Robertson, A.	H. C. Roberts	No.	Dowie, J. & Co.	" 8.12.23 to 17.1.24	26.1.24.
Levant C.S.	West, G. W.	"	"	Eastern Tel. Co.	" 26.11.23 to 16.12.23	30.12.23.
Ling Nam	Waterson, W. H. V.	"	No.	Chungghwa Nav. Co.	Form 911 27.10.23 to 12.1.24	22.4.24.
Llanstephan Castle	Wilford, T. H.	W. F. Malden	"	Union Castle	" 19.3.24 to 10.4.24	22.4.24.
Loch Katrine	Mathews, G. P.	A. E. Jones	"	R.M.S.P. Co.	" 22.2.24 to 23.3.24	1.4.24.
London Commerce	Young, H. J., D.S.C.	E. A. Bennett	"	Furness Withy	" 19.3.24 to 21.4.24	25.4.24.
Loreto, M.V.	Barkley, E.	F. Binnion	"	Pacific S.N. Co.	" 17.2.24 to 8.3.24	14.4.24.
Losada M.V.	Meldrum, G. W.	A. H. Turner	"	"	" 21.2.24 to 10.3.24	1.4.24.
Macedonia	Potter, H. W., R.D., Commr., R.N.R.	G. Readman	No.	P. & O.	"	"
Macharda	Cochran, G.	W. Moore	"	Brocklebank	Form 911 12.12.23 to 8.3.24	14.3.24.
Mahana	Kershaw, W. A. R.	F. M. Smith, R. Batley	"	Shaw Savill & Albion	" 25.2.24 to 16.3.24	5.5.24.
Maharaja	Hartock, L.	C. B. Miller	"	Asiatic S.N. Co.	" 16.1.24 to 5.3.24	1.4.24.
Mahopac	Putt, T. M.	"	"	Atlantic Transport	" 23.4.23 to 3.8.23	27.8.23.
Maihar	Puttick, J.	F. J. Mummery	"	Brocklebank	Met. Log. 22.9.23 to 10.12.23	26.1.24.
Maimyo	Hamilton, G.	R. A. L. Williams	No.	"	Form 911 4.4.24 to 23.4.24	5.5.24.
Maine	Hutchison, J. G.	A. L. Mather	"	Atlantic Transport	" 24.3.24 to 1.5.24	8.5.24.
Majestic	Hayes, Sir B. F., K.C.M.G., D.S.O., R.D., Commodore R.N.R.	A. F. Butcher, W. W. Pearson	W.T.	White Star	W.T. Reg. 11.4.24 to 1.5.24	5.5.24.
Makambo	Williams, G. E.	A. Brown, W. R. Robertson, F. C. Ree, D. Wilson.	M.L.	Burns Philp	Met. Log. 28.3.23 to 10.9.23	4.12.23.
Makura	Brown, T. M.	"	"	"	"	"
Malancha	Griffiths, G. I.	"	"	"	"	"
Malda	Crawford, R.	H. Knaggs	M.L.	Canadian-Australasian	" 3.11.23 to 1.3.24	25.3.24.
Manchester Corporation.	Barlow, A. E.	"	"	"	"	"
Manchester Mariner	Whitham, F.	J. Robertson	No.	Brocklebank	Form 911 7.3.24 to 1.4.24	14.5.24.
Manchester Merchant.	Gray, T. N.	L. H. Cornish	"	British India	" 17.2.24 to 9.5.24	14.5.24.
Mandasor	Everest J. E.	F. H. Moorhouse	"	Manchester Liners	" 29.3.24 to 1.5.24	8.5.24.
Manipur	Riley, J. E.	C. E. Stocker, J. F. Fisher, F. Stockton.	M.L.	"	Met. Log. 28.7.23 to 29.2.24	19.3.24.
Manistee	Barclay J.	A. H. Boyd, A. E. Ricketts...	No.	"	Form 911 6.4.24 to 17.4.24	5.5.24.
Marburn	Kershaw, R. W.	W. Baxter	"	Brocklebank	" 1.12.23 to 7.1.24	28.1.24.
Marella	Scurr, T. W.	G. W. Barker	"	"	" 3.10.23 to 25.12.23	28.12.23.
Marengo	Isaacson, J. M.	F. McColm, A. M. Houghton, L. C. Bach, H. C. Slater.	M.L.	Elders & Fyfes	Met. Log. 10.11.23 to 16.3.24	24.3.24.
Margha	Clews, A. H.	A. M. Watt, W. R. Reid, S. Keay.	M.L.	Canadian Pacific	" 27.10.23 to 2.3.24	4.4.24.
Margha	Hamilton, G.	"	"	"	"	"
Marylen	Hall, J.	"	"	"	"	"
Maryland	Mortimer S.	Burdis, Pemberton, Thompson	M.L.	Burns Philp	" 12.7.23 to 22.11.23	3.3.24.
Mashobra	Bean, A.	"	"	Ellerman Wilson	"	"
Masirah	Milne, R. A., R.D., Commr., R.N.R.	J. Strachan, P. Wright, R. E. Tarran, D. Johnstone.	M.L.	British India	Met. Log. 17.2.24 to 7.5.24	15.5.24.
Massilia	Griffiths, J. N.	A. Pennington	No.	Canadian Pacific	Form 911 16.2.24 to 7.3.24	11.3.24.
Matakana	Pollard, F. W., D.S.O., R.D., Commr., R.N.R.	F. T. Good	"	Atlantic Transport	" 19.3.24 to 23.4.24	8.5.24.
Matheran	Gallie	M. W. K. Bishop	"	British India	"	"
Mathura	Thowless, E.	R. C. Baker	"	Brocklebank	Form 911 24.11.23 to 3.4.24	14.4.24.
Matiana	Caithness, J. B.	E. Richardson	"	Anchor	" 29.3.24 to 23.4.24	14.5.24.
Matina	Bosdet, V. J.	J. J. Finn, J. W. Hart	"	Shaw, Savill & Albion	" 31.12.23 to 24.4.24	29.4.24.
Mauretania	Cornish, N. P.	H. H. Armstrong	M.L.	Brocklebank	Met. Log. 14.10.23 to 9.1.24	5.2.24.
Megantic	Hanna, R. G.	"	"	"	Form 911 6.4.24 to 16.4.24	24.4.24.
Melita	Langlands, D. H.	W. G. E. D. Rawlingson	No.	British India	" 28.12.23 to 21.1.24	1.2.24.
Memnon	Henderson, J.	J. W. Parsons, H. Carden, N. A. Moore.	M.L.	Elders & Fyfes	Met. Log. 9.9.22 to 24.3.23	26.4.23.
Menominee	Rostron, A. H., C.B.E., A.-d.-C., R.N.R., Capt.	G. H. Jones, P. O. Davis, W. C. A. Robson.	W.T.	Cunard	W.T. Reg. 21.10.23 to 4.11.23	8.11.23.
Mercian	Berry, G.	L. Thompson, H. J. C. Day, R. Conway.	W.T.	"	Form 911 29.9.23 to 14.10.23	23.10.23.
Mesaba	Clews, A. H.	C. Draper, A. K. Benham	W.T.	White Star	W.T. Reg. 14.1.24 to 5.4.24	9.4.24.
Metagama	Salter, G. H.	P. L. Pallot	No.	Canadian Pacific	" 5.4.24 to 23.4.24	28.4.24.
Miami	Finch, E.	H. E. McCartney	"	A. Holt	Form 911 19.8.23 to 6.3.24	14.5.24.
Michigan	Carnon, J. R.	A. T. Holloway	"	Atlantic Transport	" 19.8.23 to 17.9.23	21.9.23.
Minderoo	Claret, F. H.	L. A. Williams	"	Leyland	" 11.2.24 to 15.3.24	21.3.24.
Minnedosa	Henderson, W.	B. Leslie, R. Fegan, R. Jackson, A. Mansey.	W.T.	Canadian Pacific	" 2.7.23 to 11.7.23	27.8.23.
Minnetonka	Maxwell Brown, W. E.	E. Lowndes	No.	"	W.T. Reg. 20.4.24 to 9.5.24	12.5.24.
Minnewaska	Tribe, A. E.	L. A. Williams	"	"	" 22.3.24 to 13.4.24	15.4.24.
Mirror, C.S.	Richardson, E.	B. J. Bennie, W. J. McPhedron, J. H. Oxtan.	M.L.	Elders & Fyfes	Form 911 10.4.24 to 10.5.24	14.5.24.
Mississippi, M.V.	Sibbons, H.	E. V. Glennie, J. B. Marriott, D. I. C. Robertson, E. Lawrence.	W.T.	Atlantic Transport	" 25.3.24 to 1.5.24	9.5.24.
Missouri	Gates, T. F.	N. Mills	No.	West Australia Nav. Co.	Met. Log. 11.7.23 to 13.12.23	14.4.24.
Moana	Claret, F.	W. S. Mackie	"	"	W.T. Reg. 19.4.24 to 7.5.24	12.5.24.
Moklavina	Sherwood, C. A.	C. E. F. St. John	No.	"	Form 911 18.4.24 to 7.5.24	14.5.24.
Mongolian Prince	Wylie, J. T. J.	G. Batchelor	"	"	" 4.5.24 to 10.5.24	14.5.24.
Monkbarns Ship	Hutchison, J. G.	W. W. Howard	"	"	" 25.2.24 to 5.4.24	16.4.24.
Montcalm	Morzer Bruyns, M. F.	J. H. Nieboer	"	"	" 6.4.24 to 18.4.24	22.4.24.
Montclare	Burleigh, C. W., D.S.O., R.D., Capt., R.N.R.	F. T. Ferraby	"	"	" 30.7.23 to 2.9.23	6.9.23.
Montclair	Chilvers, J.	H. A. Shaw	No.	Nederland	" 17.3.24 to 31.3.24	29.4.24.
Montlaurier	Davies, W.	M. B. Glasier	"	P. & O.	" 11.4.24 to 23.4.24	30.4.24.
Montcalm	Rennie, A., O.B.E.	H. McFadyen, S. W. Keay	W.T.	"	"	"
Montclare	Webster, G. S., R.D., Commr., R.N.R.	E. J. Jones, A. R. E. Coleman, G. F. Hutchings, G. Mowatt, F. McIlroy.	W.T.	"	W.T. Reg. 13.4.24 to 1.5.24	6.5.24.
Montlaurier	Turnbull, J., C.B.E., R.D., Capt., R.N.R.	H. H. Davies	No.	"	Form 911 4.4.24 to 26.4.24	29.4.24.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
Montrose ...	Landy, E. ...	A. M. Watt, D. Loram, J. Soame.	W.T.	Canadian Pacific ...	W.T. Reg. 30.3.24 to 17.4.24 ...	22.4.24.
Montroyal ...	Latta, R. G. ...	R. W. Jones, C. E. Duggan, E. V. Glennie, G. Marriott.	"	" " "	Form 911 29.3.24 to 17.4.24 ...	23.4.24.
Morvada ...	Mills, T. L., O.B.E., R.D., Commr., R.N.R.	J. Norris, D. Lonie, F. Dyson	M.L.	British India ...	Met. Log. 5.1.24 to 8.5.24 ...	14.5.24.
Mulbera ...	Steadman, W. R. ...	F. G. Tizzard, C. Cox ...	No.	British India ...	W.T. Reg. 20.4.24 to 8.5.24 ...	14.5.24.
Musician ...	Egerton, J. J. ...	O. Stanhope ...	"	Harrison ...	Met. Log. 15.9.23 to 27.11.23...	29.11.23.
Nagara ...	Turner, E. A. ...	C. K. Brown ...	"	R.M.S.P. Co. ...	Form 911 13.4.24 to 23.4.24 ...	30.4.24.
Napierian ...	Kerruish, W. ...	T. Griffiths ...	"	Leyland ...	" 5.4.23 to 17.6.23 ...	2.8.23.
Nardana ...	Brown, H. ...	K. C. Le Breton ...	"	British India ...	" 17.2.24 to 16.4.24 ...	24.4.24.
Nariva... ...	Buret, T. J. C. ...	J. E. Atkins, B. C. Dodds, S. H. Butler.	M.L.	R.M.S.P. Co. ...	" 14.2.24 to 26.2.24 ...	14.3.24.
Nascopie ...	Smellie, T. F. ...	P. Lloyd, R. J. Summers, R. S. Mott.	M.L.	Hudson's Bay Co. ...	" 15.9.23 to 18.2.24 ...	28.2.24.
Navarino ...	Crichton, J. S. ...	J. Annan ...	No.	Glen & Co. ...	Met. Log. 23.1.24 to 13.3.24 ...	18.3.24.
Navasota ...	Willan, F. G. L., R.D., Commr., R.N.R.	W. A. Delap ...	"	R.M.S.P. Co. ...	Form 911 13.12.23 to 12.1.24...	22.1.24.
Navigator ...	Mowat, J. ...	" " " " " " " "	"	Harrison ...	" 19.1.24 to 9.3.24 ...	17.3.24.
Navab... ...	Smith, J. F. ...	" " " " " " " "	"	Asiatic S.N. Co. ...	" 29.4.23 to 26.6.23 ...	11.7.23.
Nebraska ...	Collins, A. R. D., O.B.E., R.D., Lt.-Commr., R.N.R.	A. F. Walker ...	"	R.M.S.P. Co. ...	" 7.12.23 to 4.2.24 ...	25.2.24.
Nellore... ...	Murray, F. S., R.D., Lt.-Commr., R.N.R.	G. Aspinall ...	"	P. & O. ...	" 15.3.24 to 21.4.24 ...	5.5.24.
Nestor ...	Owen, R. D., O.B.E.	W. J. Eyson ...	"	A. Holt ...	" 1.2.24 to 15.3.24 ...	5.5.24.
Nevasa ...	Swanson, C. J. ...	E. C. T. West ...	"	British India ...	" 1.2.24 to 13.3.24 ...	17.3.24.
Newby Hall ...	Kendall, J. W. ...	E. J. Myles, C. H. Webb, T. A. Dexter.	M.L.	Ellerman ...	Met. Log. 12.10.23 to 21.12.23 ...	4.1.24.
Niagara ...	Rolls, J. T. ...	R. M. Scott, N. G. Buxton, O. C. Bray, R. B. Denniston.	M.L.	Canadian-Australian... ..	Met. Log. 4.7.23 to 24.1.24 ...	4.3.24.
Ningchow ...	Wilson, C. A. ...	R. A. Hannay ...	No.	A. Holt ...	" 6.10.23 to 28.2.24 ...	30.4.24.
Nore ...	Randall, H. W., R.D., Capt., R.N.R.	J. C. Ablewhite, R. W. Mackie, H. C. Shinn.	M.L.	P. & O. ...	Form 911 7.1.24 to 15.2.24 ...	20.2.24.
Norman ...	Morton Betts, W. ...	D. A. Hodgson ...	No.	Union Castle ...	Met. Log. 3.11.23 to 22.1.24 ...	26.1.24.
Norseman, C.S. ...	Barter, H. O., R.D., Commr., R.N.R.	S. M. Hammond, E. R. Duffey, L. M. Cooper.	M.L.	Western Tel. Co. ...	Form 911 24.12.23 to 11.1.24...	11.3.24.
Northumberland ...	Haines, F. P. ...	C. R. Stevens ...	No.	Federal ...	Met. Log. 12.2.23 to 21.8.23 ...	24.9.23.
Nortonian ...	McCormick, J. ...	W. J. Wright ...	"	Leyland ...	Form 911 16.6.23 to 28.7.23 ...	31.7.23.
Nubian ...	Watmough, T. M. ...	F. Aheir, C. H. Hand, F. Ardern.	M.L.	P. & O. ...	" 20.2.24 to 31.3.24 ...	7.4.24.
Nyanza ...	Carpendale, F. W. J.	" " " " " " " "	"	" " " " " " " "	" 25.4.24 to 11.5.24 ...	14.5.24.
Oaklands Grange... ..	Routledge, R. ...	E. A. Insley ...	No.	Houlder Bros. ...	Met. Log. 11.2.24 to 6.5.24 ...	12.5.24.
Oakland I. ...	Villiamsen ...	H. Svendgaard ...	"	Hannevig Bros. ...	Form 911 15.2.24 to 3.5.24 ...	16.5.24.
Ohio ...	Lainson, W. H. ...	W. Paine, C. K. Brown, G. C. Clairmonte.	M.L.	R.M.S.P. Co. ...	Form 911 19.12.23 to 2.1.24 ...	4.1.24.
Olympia ...	Duncan, A. R. ...	D. R. Urquhart, G. Lynas, F. McIntyre.	M.L.	Anchor ...	Met. Log. 18.5.23 to 2.12.23 ...	13.12.23.
Olympic ...	Howarth, F. B., Commr., R.N.R.	J. C. M. Boyce, C. W. Couch, C. J. Warltire.	W.T.	White Star ...	" 12.1.24 to 23.3.24 ...	2.4.24.
Omar ...	Simner, G. L., R.D., Commr., R.N.R.	W. M. McRitchie, C. V. Dodgson, L. E. Fordham, H. S. Schofield, T. J. Jones.	M.L.	Orient ...	W.T. Reg. 3.4.24 to 8.5.24 ...	12.5.24.
Onitsha ...	Williams, T. E. ...	D. Rollo ...	No.	Elder Dempster ...	Form 911 3.4.24 to 9.5.24 ...	14.5.24.
Oranian ...	Hoskins, W. ...	T. Miller ...	"	Leyland ...	Met. Log. 22.9.23 to 6.1.24 ...	16.1.24.
Orari ...	Robinson, F. W. ...	R. Newman, T. Breen, F. Longheed, G. Lant, H. Farrant.	M.L.	New Zealand S.S. Co. ...	Form 911 1.9.23 to 21.9.23 ...	20.11.23.
Orator ...	Flynn, D. ...	J. C. Sinclair ...	No.	Harrison ...	" 4.2.24 to 29.3.24 ...	2.4.24.
Orbita ...	Parker, W. H., C.B.E., R.D., Capt., R.N.R.	D. R. Lee, O. S. Thomas, K. P. Alliston.	W.T.	R.M.S.P. Co. ...	Met. Log. 22.11.23 to 11.5.24...	16.5.24.
Orcoma ...	Pleignier, H. T. S....	G. B. Wardale, J. J. Buckley, C. H. Denton.	M.L.	Pacific S.N. Co. ...	Form 911 2.7.23 to 22.7.23 ...	22.8.23.
Orduna ...	Warner, G. E., R.D., Commr., R.N.R.	J. W. Carr, J. Vivian, A. A. Martin.	W.T.	R.M.S.P. Co. ...	W.T. Reg. 19.4.24 to 12.5.24 ...	14.5.24.
Oriana... ..	Christian, G. H. ...	G. Pattison, Mason, G. F. Nicholson, Cruikshank.	M.L.	Pacific S.N. Co. ...	Form 911 18.4.24 to 12.5.24 ...	14.5.24.
Orila ...	Dominy, R. H., C.B.E., Commr., R.N.R.	F. W. Hockey, H. S. Roberts, —, Gale.	M.L.	" " " " " " " "	Met. Log. 21.2.24 to 4.5.24 ...	8.5.24.
Ormonde ...	Douglas, H. P., C.M.G., Capt., R.N.	R. A. Stephens ...	M.L.	His Majesty's Ship ...	W.T. Reg. 12.4.24 to 4.5.24 ...	8.5.24.
Ormonde ...	Staunton, H. G., C.B.E., R.D., Commr., R.N.R.	T. G. McGregor, H. MacLean, F. J. L. Butler.	M.L.	Orient ...	Form 911 11.4.24 to 5.5.24 ...	8.5.24.
Ormuz ...	James, L. V., D.S.C.	J. S. Metcalf, I. E. G. Goldsworthy, L. A. Keeble.	M.L.	" " " " " " " "	Met. Log. 26.1.23 to 14.8.23 ...	18.8.23.
Oroya ...	Chittenden, A. ...	S. Lewis ...	No.	Pacific S.N. Co. ...	Met. Log. 15.8.23 to 9.12.23 ...	12.12.23.
Orsova ...	Matheson, C. G., D.S.O., R.D., Commr., R.N.R.	C. Fox, J. C. K. Dowding, N. Whinfield, J. C. Jackson.	M.L.	Orient ...	Met. Log. 8.8.23 to 20.9.23 ...	30.4.24.
Ortega ...	Christian, C. H. ...	D. W. Hutchinson... ..	No.	Pacific S.N. Co. ...	Met. Log. 14.10.23 to 29.1.24	5.2.24.
Orvieto... ..	Shelford, W. S., Lt.-Commr., R.N.R.	G. H. Wylie, A. J. Baxter, G. E. Martin, A. O. H. O'Brien, M. C. Lester.	M.L.	Orient ...	Met. Log. 6.1.24 to 24.4.24 ...	30.4.24.
Osterley ...	Coad, A. J., R.D., Commr., R.N.R.	A. E. Nicholls, F. G. Goodman, T. B. Grainger-Grieve, E. Hatch.	M.L.	" " " " " " " "	Met. Log. 30.1.24 to 10.4.24 ...	16.4.24.
Othello ...	Pearson, Z. C. ...	A. J. Walker ...	No.	Ellerman Wilson ...	Met. Log. 20.9.23 to 3.1.24 ...	31.1.24.
Otira ...	Elford, H. E. ...	V. R. Bowling ...	"	Shaw, Savill & Albion ...	Form 911 14.12.23 to 14.2.24...	28.2.24.
Oxfordshire ...	Adamson, B. W. ...	W. L. Whiteside, C. J. Blyten-Beesley, H. J. Jarrett.	M.L.	Bibby ...	Met. Log. 11.11.23 to 26.2.24...	3.3.24.
Pakeha ...	Hartman, W. H. ...	W. L. P. Cox ...	No.	Shaw, Savill & Albion ...	" 9.12.23 to 26.3.24 ...	7.4.24.
Paparoa ...	Ashworth, F. ...	E. H. Hopkins ...	No.	New Zealand S.S. Co. ...	Form 911 31.1.24 to 6.3.24 ...	13.3.24.
Paris ...	Cook, C. L. ...	Mr. Biles... ..	C.C.	Southern Ry. ...	" 24.11.23 to 13.12.23 ...	1.1.24.
Patia ...	Bostock, R. J. ...	W. McIlwain ...	No.	Elders & Fyffes ...	Met. Log. 22.12.23 to 1.3.24 ...	5.3.24.
Patrol, C.S. ...	Bredenberg, F. ...	Gardiner, Albrecht, Morrell... ..	M.L.	Eastern Extension (A. & C.) Telegraph Co. ...	Met. Log. 1.7.23 to 14.9.23 ...	25.2.24.
Persic ...	Davies, E. ...	N. E. Banks ...	No.	White Star ...	Form 911 17.2.24 to 24.3.24 ...	28.4.24.
Peshawur ...	Hester, C. W., R.D., Commr., R.N.R.	B. W. Snow, T. C. Fairburn, J. Tickell, J. D. Parker.	M.L.	P. & O. ...	Met. Log. 30.8.23 to 9.2.24 ...	18.2.24.
Philadelphum ...	Baker, J. A. ...	G. W. B. Lloyd ...	No.	Leyland ...	Form 911 7.2.24 to 22.4.24 ...	24.4.24.

Name of Vessel.	Captain.	Observing Officers.	Official Meteorological Equipment.	Line.	Last Log, Register, or Report Contributed.	Date Received.
<i>Teucer</i> ...	Hanney, T. W. ...	J. C. Norton ...	No.	A. Holt ...	Form 911 20.9.23 to 18.1.24 ...	4.2.24.
<i>Themistocles</i> ...	Jernyn, W. M. ...	R. H. Harrison ...	"	Aberdeen ...	" 8.11.23 to 5.3.24 ...	11.3.24.
<i>Theseus</i> ...	Williams, D. T. ...	W. Cowperthwaite ...	"	A. Holt ...	" 1.12.23 to 8.2.24 ...	15.2.24.
<i>Titan</i> ...	Ireland, T. R. ...	J. P. Williams, A. C. H. Jones, D. J. Davies, C. Taylor.	M.L.	" ...	Met. Log. 2.11.23 to 8.3.24 ...	12.3.24.
<i>Tottori Maru</i> ...	Mataukura, B. ...	K. H. Kubota ...	No.	Nippon Yusen Kaisha	Form 911 18.4.24 to 30.4.24 ...	8.5.24.
<i>Transmitter, C.S.</i> ...	Jones, L. T., M.B.E.	S. P. Sheldon ...	"	Eastern Tel. Co. ...	" 7.12.23 to 2.2.24 ...	18.2.24.
<i>Traveller</i> ...	Jones, E. W. ...	" ...	"	Harrison ...	" 4.8.23 to 8.10.23 ...	18.10.23.
<i>Tredenham</i> ...	Evans, J. O. ...	C. Warren ...	"	Hain S.S. Co. ...	" 9.3.24 to 25.3.24 ...	5.5.24.
<i>Trematon</i> ...	Hicks, F. H. ...	J. Christopher, D. Thomas, F. J. Webb.	M.L.	" ...	Met. Log. 28.8.22 to 30.3.23 ...	18.4.23.
<i>Tuscania</i> ...	Bone, D. W. ...	J. McGill Brown ...	No.	Anchor ...	Form 911 16.2.24 to 9.3.24 ...	24.3.24.
<i>Tuscanstar</i> ...	Thomas, R. J. ...	W. H. Webster ...	"	Blue Star ...	" 29.5.23 to 3.7.23 ...	11.7.23.
<i>Tyndareus</i> ...	Adcock, F. ...	F. Robinson ...	"	A. Holt ...	" 14.12.23 to 21.2.24 ...	17.3.24.
<i>Ulysses</i> ...	Hazeland, J. H. D. ...	W. J. Peard ...	No.	A. Holt ...	Form 911 2.11.23 to 17.11.23 ...	11.12.23.
<i>Umtali</i> ...	Rogers, W. G. ...	W. H. Foster ...	"	Bullard King ...	" ...	"
<i>Valacia</i> ...	Doyle, M. ...	J. W. Counce ...	"	Cunard ...	" 19.4.24 to 30.4.24 ...	5.5.24.
<i>Valdura</i> ...	Mitchell, A. ...	J. Campbell, J. Anderson, A. M. S. Well.	M.L.	Gow Harrison ...	Met. Log. 21.9.23 to 10.12.23 ...	6.5.24.
<i>Valemore</i> ...	Griffiths, J. ...	H. Miller ...	No.	Furness Withy ...	Form 911 22.11.23 to 29.12.23	30.12.23.
<i>Vardulia</i> ...	Townley, J. C. ...	W. L. Hughes ...	"	Cunard ...	" 19.2.24 to 23.3.24 ...	2.4.24.
<i>Vasconia</i> ...	Inch, F. ...	W. P. Armour ...	"	" ...	" 13.3.24 to 13.4.24 ...	22.4.24.
<i>Vellavia</i> ...	Fear, E. T. C. ...	H. H. Kidwell ...	"	" ...	" 30.3.24 to 11.4.24 ...	22.4.24.
<i>Ventura de Larrinaga.</i> ...	Keay, W. S. ...	H. J. Kay ...	"	Larrinaga ...	" 2.3.24 to 4.4.24 ...	10.4.24.
<i>Verbania</i> ...	Gronow, S. ...	J. G. Wiseman ...	"	Cunard ...	" 30.3.24 to 8.5.24 ...	14.5.24.
<i>Verentia</i> ...	Stafford, W., D.S.C., R.D., Lt.-Commr., R.N.R.	D. E. Sibson ...	"	" ...	" 8.2.24 to 14.3.24 ...	18.3.24.
<i>Victoria</i> ...	Fisher, F. T. ...	J. Males, E. Peacock, J. Archer	M.L.	China-Australia ...	Met. Log. 29.3.23 to 29.8.23 ...	6.10.23.
<i>Vittoria</i> ...	Jackson, G. W. ...	F. Galbraith ...	No.	Vittoria S.S. Co. ...	Form 911 10.5.23 to 20.6.23 ...	26.6.23.
<i>Waihemu</i> ...	Showman, A. C. ...	G. Atwood ...	No.	Union S.S. Co., N.Z. ...	Form 911 23.2.23 to 16.5.23 ...	20.6.23.
<i>Waiotapu</i> ...	Brown, T. F. S. ...	B. S. Cave ...	"	Canadian-Australasian	" 3.2.24 to 21.3.24 ...	6.5.24.
<i>Walmer Castle</i> ...	Chave, Sir B., K.B.E.	C. Aylen ...	"	Union Castle ...	" 8.2.24 to 30.3.24 ...	4.4.24.
<i>Wangaratta</i> ...	O'Connor, E. W., D.S.C.	T. W. Wordingham, M. Chant, W. Hunt.	M.L.	British India ...	Met. Log. 1.6.23 to 10.11.23 ...	1.12.23.
<i>Warfela</i> ...	Steel, R. ...	W. A. Hughes ...	No.	" ...	Form 911 1.3.24 to 25.3.24 ...	8.4.24.
<i>War Nizam</i> ...	Putt, R. O. ...	E. R. Clark ...	"	British Tankers ...	" 31.1.24 to 23.3.24 ...	26.3.24.
<i>Welshman</i> ...	Rollerson, W. ...	J. F. Spears ...	"	White Star-Dominion	" 17.2.24 to 20.3.24 ...	26.3.24.
<i>Winfredian</i> ...	Harrocks, W. ...	W. R. C. Baker ...	"	Leyland ...	" 5.1.24 to 4.2.24 ...	11.2.24.
<i>Woodarra</i> ...	Reilly, J. V. ...	L. D. Graham, A. V. Fisher, L. C. Comber, J. Wallace.	M.L.	British India ...	Met. Log. 7.10.23 to 9.3.24 ...	26.3.24.
<i>Yorkshire</i> ...	Millson, G. C. ...	E. Jones ...	No.	Bibby ...	Form 911 19.1.24 to 27.3.24 ...	1.4.24.
<i>Zealand</i> ...	Thomas, A. J. ...	W. Jackman ...	No.	Red Star ...	Form 911 31.1.24 to 24.2.24 ...	26.2.24.
		Unless otherwise stated,	vessels on t	he above list are S.S.		
<i>Conway, H.M.S.</i>	Broadbent, H. W., R.D. Capt., R.N.R.	The Senior Cadets ...	Cadets' M.L.	"	Cadets' Met. Log. 20.1.24 to 29.3.24	5.4.24.
<i>Pangbourne Nautical College.</i>	Tracy, A. F. G., Commr., R.N.	" " " "	"	"	Cadets' Met. Log. 21.1.24 to 5.4.24	10.4.24.
<i>Worcester, H.M.S.</i>	Sayer, M. B., O.B.E., R.D., Capt., R.N.R.	" " " "	"	"	Cadets' Met. Log. 25.1.24 to 12.4.24	17.4.24.
<i>Abaco</i> ...	"	The Keepers ...	Lighthouse Register.	"	Lighthouse Register 1.7.23 to 1.1.24	3.3.24.
<i>Cay Lobos</i> ...	"	"	"	"	Lighthouse Register 1.7.23 to 31.12.23	3.3.24.
<i>Double Headed Shot</i> ...	"	"	"	"	Lighthouse Register 1.7.23 to 31.12.23	3.3.24.
<i>Inagua</i> ...	"	"	"	"	Lighthouse Register 1.7.23 to 31.12.23	3.3.24.
<i>Sombbrero</i> ...	"	"	"	"	Lighthouse Register 1.7.23 to 31.12.23	25.2.24.
<i>Walling Island</i> ...	"	"	"	"	Lighthouse Register 1.7.23 to 31.12.23	3.3.24.
<i>Cape Pembroke (Falkland Is.)</i>	"	"	"	"	Lighthouse Register 1.8.23 to 31.12.23	3.3.24.

LIST OF SHIPS CO-OPERATING THROUGH THE METEOROLOGICAL OFFICE WITH THE MINISTRY OF AGRICULTURE AND FISHERIES (FISHERIES LABORATORY, LOWESTOFT) IN THE COLLECTION OF WATER SAMPLES, ETC.

Name of Vessel.	Captain.	Observing Officer.	Line.	Last Case of Water Samples, Reports, etc., Received.	Date Received.
<i>Alban</i> ...	Whayman, W. R. ...	R. Griffiths ...	Booth ...	Water Samples ...	23.4.24.
<i>Hildebrand</i> ...	Maddrell, J. ...	Mr. Allan ...	" ...	" ...	9.1.24.
<i>Patia</i> ...	Bostock, R. J. ...	S. A. Sapsworth ...	Elder & Fyffes ...	" ...	7.3.24.
<i>Tortugero</i> ...	Martin ...	H. H. Dunning ...	" ...	" ...	16.4.24.