

**REPORT**  
**OF**  
**THE METEOROLOGIC OFFICE**  
**OF**  
**THE BOARD OF TRADE.**

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**1864.**

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**Presented to both Houses of Parliament by Command of Her Majesty.**

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## DIAGRAMS.

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# REPORT.

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SIR, Board of Trade, Meteorologic Office,  
22d April 1864.

IN my Report last year I said that a considerable advance had been made in the practical applications of Meteorology, especially in forecasting weather.

2. During the time since elapsed, experience has brought the natural result—of improving our recently acquired knowledge of atmospheric changes, and giving more confidence in drawing conclusions.

3. Demands have increased for cautionary notices of strong winds—such as would affect the smaller and less efficiently provided vessels, or, when increased to gales, if not to storms, might delay, injure, or occasion risk even to well-found ships.

4. Not only are such notices sent day by day regularly to Paris for the French coast, but occasionally to Hanover, and to other places near the North Sea,—in consequence of special applications made by Foreign Governments.

5. Italy is adopting the methods of weather warning originated at our Board of Trade; and no less than twenty-six stations are intended to be formed—under the direction of Signor Matteucci, with a committee, at Turin.

6. Extracts from correspondence with him and with other eminent foreigners (one in the Black Sea) will be appended, being interesting as showing what opinions are held by them respecting our recently established system.

7. To show, however, the indisputable state of the case, by recorded facts,—rather than by any appeal to prevalent opinion, either at home or abroad,—an addition to this Report has been prepared by my assistant,\* and others, entirely apart from myself; besides which a *separate* official analysis and digest have been elaborately executed at the Board of Trade, independently of this office. But I cannot quite admit the completeness of this analysis. A comparison of the two documents may perhaps assist in forming a correct judgment.

8. While adverting thus to forecasts and cautions,—it should not be supposed that these new and immediately practical consequences of this Board of Trade branch Office have superseded,

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\* T. Henry Babington, Esq.

or in any degree injured, duties intended to be carried on when first the department was organized (in 1854-5), soon after the Brussels Conference of 1853.

9. In ten years, an accumulation of valuable Log-books, Observatory registers, and miscellaneous records, has been effected here. Many years must elapse before these stores and those of the Admiralty (at Somerset House) can be so *nearly* exhausted, that more supplies of facts than those still continually added, as selected ships arrive, may become requisite.

10. Since 1856, all the logs of Her Majesty's ships have been kept in a uniform and well designed manner; while a supply of good instruments has been available for each ship, and directions have been issued to officers by the Admiralty on the subject of observations;—therefore now an immense amount of good records, in naval logs, in addition to the Remark-books and Surveyors' registers, sent to the Hydrographic Office, is available in London.

11. A very large body of facts, relating to the atmosphere and ocean—valuable in proportion to their number (being alike accurate) are almost ready for publication; but as a few more may yet be advantageously added to each series, I am reluctant to give them the last notes until able to do so more satisfactorily.

12. In my last Report\* I stated how highly the Board of Trade "Fishery" barometers have been valued on the coasts. They are now eighty in all, specially *lent, under due control and care*. Two only of this number have become slightly defective, and have been exchanged. Not one has been injured in carriage, singular to say, between Cornwall and the Shetland Isles, Ireland and Yorkshire. It may be more readily *estimated*, mentally, than accurately proved, to what extent these simple instruments (all reliably made† and tested) have already been the means of saving life and property. Explanatory Manuals and blank forms for diagrams‡ have been extensively circulated among the coasters and fishermen, who are all, now, much influenced by, and very thankful for, the benefits of this act of their Government. Many are the local instances of similar beneficence by individuals—especially the Duke of Northumberland, who has placed no less than fourteen barometers.

13. Reluctant to repeat any of my last report *here*, although means of reference to it may appear to be necessary in the Appendix, only one or two paragraphs shall now be quoted in substance, as being introductory to subsequent views and explanations; and lest it should appear out of place, in a formal Report, to enter into what may be deemed too scientific details, or almost speculative opinions, I at once ask for allowance to be made in so peculiar and exceptional a case as the present. This office, *experimental* in its object, was instituted by Government ten years ago. Certain results have followed. Some of them un-

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\* See Appendix.

† By Messrs. Negretti and Zambra.

‡ Form in Appendix.



expected by nearly all persons, however naturally consequent on the union of practical men with scientific observers, aided by telegraphy. Some of these results, and by far the most important, affect everyone; and to try to explain them clearly, for any body, seems to be now my special duty.

14. Adverting to *forecasts* of weather,—it may be repeated here, before offering a few other considerations (sufficiently popular), that our atmosphere is considered to be like a very light ocean having free passage over all the world, and about 10, or, at the utmost, 20 miles in height. This aeriform envelope (not so deep, proportionally, as the very *thinnest* rind of a good orange),—diminishing rapidly in tension (or pressure) with its distance from earth, has indefinite elasticity—equilibrium as a fluid,—inertia or momentum,—chemical alterations,—currents,—and excessive sensibility to heat or cold—its *chief motors*.

15. By knowing the statical conditions of atmosphere, at several places simultaneously, and again similarly after certain intervals of time, comparisons can be made which show causes of fluent (or dynamic) effects—not unlike those of a head of water acting on a stream,—though complicated by the peculiarities of air; in some qualities so different from any liquid. Such atmospheric currents are our winds, softly gentle, or increasing to a tempest—powerful in places as a discharge from a gigantic air gun; or a great explosion.

16. Instrumental means and telegraphy now enable such changes to be made known for many places, if not for all localities, within a certain limited circle of climate—about five hundred miles in radius—where land and water are intermixed; but probably a thousand miles over uninterrupted ocean.

17. To utilise their indications adequately, a central office should know the natural and general (or normal) atmospheric movements, with their altering or disturbing causes,—even as a pilot knows the varieties and sequences of streams, with their eddies, in a wide estuary. The whole range, or mass, of such a region, many hundred miles across, should be seen mentally, as an estuary is present to the eye of a pilot.

The tendency of atmosphere to move from west toward east (in the temperate zones); the impulsions from south, or from north, periodic and extensive—either simultaneous or alternate in varying sequence; the influences or differences of land, or water, and changes of temperature;—should *all* be duly considered.

18. It may now be asked,—What is our actual degree of acquaintance with atmospheric changes, and their indications? In answer, I submit that our knowledge is already sufficient for practical purposes, and may be communicated to a fairly-educated and able person. Ability and due preparation are of course as indispensable as for other results of study and practice.

19. That we have proved experimentally how winds and weather may be foretold with *general* accuracy for two days, at least,

in advance, our reports since 1861, have showed—if insufficiently at first, certainly to the satisfaction of a large majority at present. That we are acting on true principles our results leave not a doubt on my mind, (and in stating this, I may be pardoned for alluding to unintermitted attention to Meteorology—which special avocations, in all oceans, and at many places on land, have induced, during forty years of observation). But to act judiciously, with sufficient rapidity, on even unerring principles, is and must ever be more or less difficult.

20. Few persons examine the daily newspaper reports in ordinary weather; but, if they would do so occasionally, for some days together, they might be surprised at the close approximation to accuracy now to be found in them—even to the way winds are likely to veer, or shift, often as they do so, in changeable weather, during even one day and night. The negative evidence, or the security against storm during a certain time, which these two-day tables show, will be more appreciated in due time—as they become more criticised and understood.

21. It has been asked—“If you are absent, who carries on the responsible duties of forecasting, and giving cautionary notices when necessary?” My reply has been to the effect that an assistant is fully acquainted with the subject, and has not only executed these very duties often during the last two years, but has done so *generally* since last autumn, occasionally relieved by me, to whom he refers at times, though now but seldom. Besides ourselves, there *ought* to be two or three in training for these special duties—now systematically established.

22. Often a hasty reply, an off-hand opinion, an injudicious or unqualified answer has been given, and incorrectly—without reference to the forecasts elaborately drawn with deliberation,—whence a deserved degree of blame has resulted. But such a discrepancy has been caused by individual error, not by a failure of the system.

23. Sometimes, a *duration* of fine weather may be indicated; but, previous to its beginning, bad weather may *continue* which had been previously predicted: and a *correct* assertion that “fine weather is approaching,” may be immediately contradicted (apparently) by prolonged continuance of that which had been prevailing. Conversely, fine weather may continue, unexpectedly long, after instrumental and other indications have announced approaching bad weather, which may not come on till the barometer *rises*: These and other occasional (apparent) anomalies are of course perplexing, but the *glasses are right*, always, though we may not *interpret* their indications accurately. They *cannot* tell two things at once; their rising or falling is affected by remote or by near causes successively, and in due proportion to the influence felt by each instrument.

24. Polar winds (northerly with westing or easting) have such effect in causing the barometer to rise, perhaps before they are noticed at a place, and even with rain or snow, that errors of

judgment occur oftener from this cause than any other in practical meteorology. The glass rises—yet the wind may *increase*, and rain, or snow, or hail may fall for a time—but only at first. Afterwards—if the rise has not been rapid, but gradual, and the glass remains rather high—fine weather follows.

25. One very ready and extremely useful diagram ought to be mentioned here, being so suitable, practically, for either isolated or combined use—for the farmer, gardener, sailor, or any other observer. The form in the appendix shows that it is simply a sheet of paper ruled, or printed, in small squares of about a tenth of an inch,—on the long side having dates; along one end a barometer scale, and on the other a range of numbers for temperature, two to each division. Daily observations, only once a day, between eight and nine o'clock in the morning, marked by dots, and lines drawn between them, are found to give a degree of insight into coming *local* weather that must be tried, to be fully appreciated as it deserves.

The character of the *preceding* traces, their angles with the square lines, their approaches to almost vertical fall, or equally steep rise, their horizontal, gradual, or irregular tendency, in immediately preceding days, say directly and plainly to the eye and mind what may next be expected.

26. Immediately following this summary is the detailed report by my Assistant, untouched by me; and next to it is a brief account drawn up by a stranger to myself, but officially, at Lynn Regis. Considering the very limited area of the British Islands, as viewed on a globe, such general views seem to be more conclusive than limited, and therefore necessarily partial, tables of statistics, however ably illustrated by diagrams. Extracts from my last Report then follow, for casual reference: and as this present statement is necessarily of a meteorologic character, intended to show reasons for expecting faith in the proceedings of this department of the Board of Trade, selected extracts from recent papers are appended, with a few diagrams illustrating some of our methods of proceeding.

27. These very recent papers and diagrams are unlikely to interest any one not particularly concerned by meteorology, therefore they are put into the smallest space,—but with a *conviction* that there are points, if not passages in them, which are quite original, and deserving of such criticism as can be attained only by publication—previous to any permanent value being attached to their expression.

I have the honour to be,

Your obedient servant,

The Right Honourable  
T. MILNER GIBSON, M.P.,  
&c. &c. &c.

R. FITZROY,  
Vice-Admiral, M.I.F.

President of the Board of Trade.

## CAUTIONARY SIGNALS,

## AND FOLLOWING WEATHER,

January 1st 1863 to March 31st 1864.

STATEMENT of *all* the CAUTIONARY SIGNALS shown between January 1st 1863 and March 31st 1864, with the CHARACTER of WIND and WEATHER following.

An attempt has been made to give as *fair* a statement as possible, in a limited space, of the character of weather following the cautionary signals. In a few instances the cautions have been *late* in certain districts, and on a very few other occasions the wind has not blown from the direction indicated, or has scarcely blown with such force as to render a caution necessary : in such cases the fact has been mentioned. Excepting the gales specified, none of an *extensive* character occurred over the British Islands.

Date.	Caution.	Weather following Cautions.
1863. 1st January 11 a.m.	Drum all round the coasts, (except the East coast,) and to N.W. France.	Heavy gales, at intervals, over nearly the whole kingdom during the 1st,* 2nd, and 3rd. The wind, which moderated, generally, on the morning of the 1st, increased again in the course of the day in the North, West, and South, and <i>in the evening</i> on the East coast also blowing, in most cases, from S.W. and shifting to N.W. At Cardiff, on the night of the 1st-2nd, it blew (according to the <i>Shipping Gazette</i> ) "a terrific "gale" from N.W. At Lynn, the same night "a heavy gale, the wind chopped suddenly to N.W. in the morning." At Guernsey "a perfect gale (on the morning of the 2nd) from S.S.E. "caused the brig 'Ann' to drag her "anchors, she having <i>two</i> down." At Killibegs (Ireland) on the 3rd "a continuance of S.W. and N.W. gales." The <i>Shipping Gazette</i> contains similar reports from all parts of the coasts.
3 p.m.	Drum (East coast).	
3rd January, 6 p.m.	North Cone(all round the coasts).	

\* A caution had been sent all round the coasts on the 29th December.

Date.	Caution.	Weather following Cautions.
1863. 5th January, 11 am.	North Cone over Drum (all round the coasts).	wind came chiefly from S. and W. until the 7th, when it blew a northerly and easterly gale in the North. There were, however, exceptions; for instance, at Lerwick, on the 4th at 5 p.m., "it came " on a heavy gale at E., veered round to " N.E. which lasted two hours, and then " backed to South."*— <i>Shipping Gazette</i> . The <i>Shipping Gazette</i> of the 5th, says, "Admiral FitzRoy has despatched " telegrams since Saturday evening " (the 3rd) to the different out-ports, " with notice to hoist warning signals. " Heavy gales prevail this morning at " Scarborough, Jersey, Lorient, Ply- " mouth, Portsmouth and Heligoland." During the night of the 4th-5th a violent gale swept over London.
17th Jan. 2 p.m.	Drum. (Scotland)	There were gales from S.W. to N.W. in Scotland and parts of Ireland on the 18th and 19th. In the early morning of the 19th (Monday) it blew a gale, from about N.W. generally, on many parts of the English coasts also, but not everywhere until later.
19th Jan. 1 p.m.	Drum, with South Cone under, (all round the coasts).	On the 20th, 21st, and 22nd, gales chiefly between S.W. and N.W. were violent and (with intervals) universal. On the 20th the "Shamrock" steamer from Sligo to Liverpool was driven into Belfast by "stress of weather." These gales were particularly violent on the West coast of Scotland and in the Irish Channel.†
23rd Jan. 11 a.m.	Drum (all round the coasts).	The warnings of the 23rd, 26th, and 29th intimated a probability of the <i>continuance</i> of the dangerous gales which had prevailed since the warnings of the 17th and 19th from more than one direction; and on every day until the end of the month (except the 28th) there were successive heavy gales, with intervals of moderate weather, all round the coasts. The wind varied for the most part between S.W. and N.W. but in some instances it shifted to N.E., and then back again.‡
26th Jan. 4 p.m.	Drum (all round the coasts).	
29th Jan. 11 a.m.	South Cone (all round the coasts).	
4 p.m.	" Substitute Drum " for South Cone" (all round the coasts) and Drum next day also.	

\* The New York steamer "Bavaria," which reached England on the night of the 8th-9th, had heavy *north-westerly* and *northerly* gales during the *last* part of her voyage.

† "Caernarvon, Jan. 21st: It is proper to report the surprising correctness of Admiral FitzRoy's signals, in order that the maritime public may justly appreciate them. On Monday last, about noon, the signal for an expected storm was hoisted at the N.W. Club House, and from that night to the present it has been blowing fearful gales."—*Shipping Gazette*.

‡ "Peterhead, January 31st: The last few days strong gales from S.W. This morning a terrific gale from N.E."—*Shipping Gazette*.

Date.	Caution.	Weather following Cautions.
1863.		<p>The newspapers (more particularly the <i>Shipping Gazette</i>) of this period contain numerous reports of the violence of these gales and damage done to shipping by dragging, loss of spars, &amp;c.</p> <p>On the 30th the Staithes fleet of fishing boats ventured to sea for the first time for 14 days, but were compelled to return the same day.</p>
2nd Feb. (Noon.)	North Cone (Scotland, Ireland, and West Central).	<p>There were heavy gales in the North and West on the 3rd, 4th, and 5th, from S.W. to N., but chiefly from about W. and N.W.</p> <p>In the Atlantic, to the Westward of Ireland, heavy N.N.E. gales at this time were reported by the "Sir R. Peel," and other ships.</p> <p>These gales were not felt (to any extent) in South England, where no warning had been sent; but in the North, in Ireland, and on the Welsh coast they were felt severely.</p> <p>A report from the North of Ireland (dated the 7th) says:—"For the past <i>few days</i> "it has been blowing a gale, with snow "showers, from W. to N.N.W."</p> <p>The <i>Times</i> of the 9th says:—"During "<i>last week</i> there were nothing but gales "of wind from the West and N.W.," in the North.</p>
6th March, 11 a.m.	Drum (Scotland and Ireland). South Cone (West Central, South and East coasts).	<p>It blew hard from S.W. on the night of the 5th-6th in Ireland, but became moderate on the morning of the 6th. In the afternoon and evening of that day it again increased, shifting in many places to N.W., and extending to England and part of Scotland during that night and the two following days; the wind blowing from S. and S.W. chiefly, in South and East England, and varying between S. and N.W. elsewhere. The strength of the wind varied greatly in different places.</p>
9th March, 5 p.m.	North Cone (all round the coasts). (North Cone to be hoisted next day also).	<p>Weather on N.E. coast (10th-11th) was "stormy, E. and E.S.E., snow, "strong sea on the coast; all appearance of a <i>continued</i> storm."</p> <p>At Sunderland on the 10th E.S.E. strong squalls, rain and snow; and on the 11th, "N.E. stormy."*</p>
12th March, 11 a.m.	Drum (all round the coasts).	<p>In the South and West it blew a gale on the night of the 11th† chiefly from the</p>

\* On the night of the 11th-12th there were violent gales from N.W. to S. on the South coast and elsewhere.

† N.B.—A caution had been sent to those coasts on the 9th.

Date.	Caution.	Weather following Cautions.
1863.		<p>southward, shifting in many places to N.W. and N. on the 12th, and again going back to S.</p> <p>On the Cornish coast, "a perfect hurricane" between 2 and 4 a.m. on the "12th from S.; it afterwards shifted to "N.W., and at 2 p.m. blew very strong "from S.W." On the East coast it blew a gale from S.E. on the night of the 12th-13th;* and in Scotland the same night there were <i>strong</i> winds from S. to N.E.</p>
20th March, 11 a.m.	South Cone (Scotland, Ireland, West Central, and S.W. England).	Gales commenced on the afternoon of the 20th, increasing at night and extending over the greater part of the coasts warned, but not, with any violence, elsewhere. In the North it blew chiefly from S.W.;† in Ireland and elsewhere from W. and N.W.
6th April, 11 a.m.	Drum (all round the coasts).	Strong, squally, unsettled weather, with gales in places, from the 6th to the 10th; the wind blowing chiefly from S.W., but shifting in many instances to N.W. and back again.‡
21st April, 5 p.m.	South Cone (on Northern, Western, and Southern coasts). To be hoisted next day also.	Strong winds and gales were prevalent generally on the British coasts from the night of the 21st till the morning of the 23rd. The winds veered from S.W. to N.N.W., and were strongest on the night of the 22nd. The <i>Shipping Gazette</i> reports that the "Belfast Lass," which sailed from Milford on the 22nd (when the Warning was hoisted) was so damaged by the heavy sea that she put back next day.§
22nd April, 11 a.m.	Drum (East coast).	

\* "Ipswich, 12th.—Received a telegram to "hoist drum;" the wind has since increased to a gale from S.E."—*Shipping Gazette*.

† "Greenock, March 21st.—This morning the storm cone was hoisted. The wind (S.W.) gradually increased in force until the afternoon, when it veered to W.S.W. and rose to a fierce gale."—*Shipping Gazette*.

‡ The following extracts from the *Shipping Gazette* serve to show that a Cautionary Signal may be justified even though no gale reach the place where the Signal may be hoisted:—

"Deal, April 6th, p.m.—Drum storm signal hoisted at noon, but no appearance of a gale."

Nor did any very bad weather reach *Deal*; but the *Shipping Gazette* of the 10th reports that the "Effort" of Sunderland, for London, was abandoned on the night of the 7th on the Gunfleet, "having missed stays and broken braces during a heavy squall. She has become a total wreck."

§ The following extracts from the *Shipping Gazette* relate to the weather at this period:—

"Dungeness, April 22nd.—About 130 sail riding, all well, but blowing too strong to have any communication with them."

"Staithes, 22nd, a.m., N.W., strong; noon, N.N.W., gale; several light vessels drifting south, with no sails set. Strong swell on the coast." The above are but two out of many similar notices.

Date.	Caution.	Weather following Cautions.
1863. 4th May, 5 p.m.	South Cone, to-night and again to-morrow. (Scotland only).	There were heavy gales of wind from S.W., in the neighbourhood of Orkney and Shetland on the 4th and 5th, and in the Baltic on the 7th, but there was no <i>gale</i> at this period over Scotland generally.*
11th May, 4 p.m.	South Cone, now and again to-morrow. (Northern, Western, and South-western coasts).	Heavy S.W. gales commenced on the night of the 11th-12th, in the West and South.† On the Northern and Eastern coasts there was less wind, although it was strong and squally from S.W. chiefly, but shifting in places to N.W.
12th May, 11 a.m.	Drum (on Northern, Eastern, and South- eastern coasts)	At Wicklow there were "heavy gales for "two days," 12th to 14th, from S.W. On the Welsh coast also it blew hard.‡ At Sunderland it was "strong and squally "from N.N.W." on the 13th and 14th. — <i>Shipping Gazette</i> .
6th June, 11 a.m.	North Cone over Drum (on all coasts).	Winds strong and squally, in places, from the 7th to the 10th, chiefly polar in the North and West, but chiefly southerly and westerly in the South. There were numerous thunder storms and much rain, showing much disturbance, but no <i>important</i> gale on the British coasts§ until the 11th. The <i>Shipping Gazette</i> of the 8th reports from Whitby as follows:—
10th June, 11 a.m.	Drum (on all coasts)	"June 6th, p.m.—Shifted to the N.E., "strong, with rain. The storm signals "were hoisted previous to the breeze, "which came shortly afterwards." From the 10th to the 13th the weather was extremely unsettled, with gales successively, in many places, from S.W., from N.W., and N.E. In Scotland the weather continued moderate, but it blew hard in the North Sea and around

\* "The brig 'Victor Emmanuel,' with timber for Iceland, was overtaken in the storm of the 4th (near Shetland), and thrown on her beam-ends and obliged to cut away her masts."—*Shipping Gazette*.

† "Dartmouth, May 12th.—Storm signal has been hoisted since yesterday at 4.30 p.m. All last night and to-day it has blown hard from S.W. to S.S.W., with heavy rain."—*Shipping Gazette*.

‡ "Caernarvon, May 12th.—The South Cone was hoisted yesterday, and it blew a heavy gale throughout the night from S. to S.W."—*Shipping Gazette*.

§ To the Southward there was some very heavy weather. The brig "Diana," between Lisbon and the Channel, experienced a heavy gale on the 9th, beginning at South and ending at North, during which she split topsails, &c.; and on the same day the steamer "Catalonian," from Oporto for Liverpool, *foundered* while crossing the Bay of Biscay during a heavy gale from S.W.

The steamer "Tartar," which arrived at Southampton on the 11th from Lisbon, had experienced "a succession of south-easterly and north-westerly gales" in the Bay of Biscay, blowing from the latter point "with tremendous force" for eight hours, with very high sea.



Date.	Caution.	Weather following Cautions.
1863.		the English coasts generally,* but more particularly on the coasts of Cornwall and Wales.
18th July, 11 a.m.	North Cone (all round the coasts).	Winds chiefly northerly, fresh to strong; but except in the neighbourhood of the Shetland Isles, where a heavy N.W. gale prevailed on the 19th and 20th, there were no <i>gales</i> until the 21st.†
21st July, 5 p.m.	South Cone now and Drum <i>to-morrow</i> . (To Western and Southern coasts). Hoist Drum to-morrow morning. (To the Northern and Eastern coasts).	On the 21st the wind shifted in many places to the southward and westward; and, in the course of the following night and the next day (the 22nd), the weather became very stormy and unsettled, as shown by the following extracts from the <i>Shipping Gazette</i> :— “Bridlington, July 22nd. — A gale the “greater part of the night from the “eastward, torrents of rain, thunder, “and lightning. Received telegram “ <i>previous evening</i> to hoist drum.” The ship “William and Sarah” lost foremast, maintopmast, &c., off the Yorkshire coast on the night of the 21st and 22nd. “Lowestoft, W.S.W. “to N. . . . . squally, thunder, light- “ning, and rain.” In the Southwest “a severe storm” from the southward prevailed generally, while at Waterford “part of the 21st “was very wild, at times blowing near “a gale from N.E.” Off the Mull of Galloway the brigantine “Jessie” “was “struck with a heavy gale at 3 a.m., “22nd, which carried away her foremast “and bowsprit.”
27th Aug., 11 a.m.	South Cone (on Southern and South-Eastern coasts). Drum (on Western and Northern coasts).	Fresh, squally, unsettled weather from the 27th to the 30th. No very extensive gale, but at times blowing very strongly, with much rain and thunder. The winds in the Channel were chiefly southerly, and on the Northern coasts chiefly easterly and northerly.

\* “Staithes, June 11th.—The whole of the fishing cobles put to sea *to-day*. “The wind suddenly shifted to W. by N., a perfect gale. Great fears are entertained for their safety.”—*Shipping Gazette*. The following notices are also from the *Shipping Gazette*: “Bridlington, 11th, E.N.E. to S.W., moderate gale, heavy squalls, with rain. . . . . Put back, the ‘New Friendship.’ Put in, the ‘Henrietta,’ with loss of anchor and chain.”

“Cardiff, June 11th.—The wind last evening backed round to the westward, and during the night blew very heavy.”

“Weymouth, June 13th.—The brig ‘Why Not,’ from Neath, has put into Portland Roads with loss of maintopmast, spars, &c.”

At Dinas Cross (Cornwall) there was a strong gale from N.E. on the 12th, and at St. Ives a heavy gale from N.N.W.

† The ship “Lauderdale,” however, bound home from Canton, reports having experienced heavy gales from N.E. in the chops of the Channel on the 19th and 21st.

Date.	Caution.	Weather following Cautions.
1863.		<p>“ Portsmouth, 27th.—It blew hard all night from S.S.W. to S., with rain, which continued with heavy squalls till noon;” and on the 30th, at Portsmouth, it recommenced “blowing a gale, from S.S.E.,” shifting to S.S.W. and W.N.W.</p> <p>“ Cromarty, 29th. A gale from E. for the last 12 hours.”—<i>Shipping Gazette</i>.</p> <p>Over Scotland generally it blew strongly from N.E. and N.W., and at Falmouth, on the 30th, according to the <i>Shipping Gazette</i>, “a furious gale” prevailed from S. to E.</p>
7th Sept. 11 a.m.	Drum (on all coasts).	<p>This caution was late in many places, especially in the South and West, where it had blown hard the previous night, which was <i>Sunday</i>; but after the caution was sent out on Monday morning (the 7th), the weather became worse, and gales much more general. These gales blew chiefly from S.W. and N.W., and continued at intervals until the 9th or 10th. The night of the 7th and the next day, the 8th, were particularly stormy, and there was much damage to, as well as total loss of, shipping in the North Sea on the 8th.* On the night of the 9th there were numerous hail storms and thunder storms of unusual violence over a great part of the country.</p>
19th Sept. 11 a.m.	Drum (Northern and Western coasts).	<p>Heavy gales on the night of the 19th and on the 20th from S.W., shifting (in North and West) to N.W.</p>
1 p.m.	South Cone (South and South-east coasts).	<p>The barque “St. Lawrence” (791 tons) was driven on shore on the Lancashire coast. In the North Sea ships lost spars, &amp;c., from the “sudden shifts” of wind.</p>
21st Sept. 11 a.m.	Drum (all round the coasts).	<p>There were intervals of moderate weather, but it continued unsettled and stormy (blowing very hard at times and shifting from S.W. to N.W. and N.) until the 24th. The following are a few out of many similar notices in the <i>Shipping Gazette</i>:—“Deal, 20th. The ship “ ‘Western Continent’ for Shanghai, bore up from Dungeness in a heavy gale from the West, with loss of fore-sail.”—“Portland, 20th. Last night a hard gale from S.W.”—“Grimsby, 20th. Last night a heavy gale with violent squalls.”—“Abersoch, 23rd.</p>

\* Amongst others, the following vessels (as reported by the *Shipping Gazette*) foundered, or were abandoned, in consequence of damage received in the North Sea—on the 8th, the barque “Emily,” and the brigs “Clio,” “Monarch,” and “Matilda.” Others reached port, with loss of deck load, &c.

Date.	Caution.	Weather following Cautions.
30th Sept. Noon. 4 p.m. 1st Oct. 2 p.m.	South Cone (on West and South coasts). Drum (on North and East coasts). Drum (on West and South coasts).	<p>"The barometer stood at 28·70 at the height of the gale yesterday."—"Milford Haven, 23rd. N.W. strong gale Put in the 'Jorgen Vlyt' leaky, and two men lost. . . . Put into Studwall's Roads from stress of weather, the ship 'FitzJames,' also a barque, with loss of sails."—"Charente, Sept. 24th. For the last three days it has been blowing heavily from S.W. to N.W."</p> <p>Strong gales commenced on the 30th at night on the South and West coasts from S.S.E. to S.W. There was less wind on the N.E. coast, but it was strong and squally. In the Shetland and Orkney Isles there were heavy gales. The winds generally shifted from S. to W. and N.W., and the weather did not moderate much until the 2nd or 3rd Oct.</p> <p>"Waterford, Oct. 1. Weather very unsettled. It blew a gale of southerly wind here yesterday, with torrents of rain. Wild during night. Wind now from N.N.W. strong."—"Whitehaven, Oct. 1. Last night it blew a heavy gale from W.S.W."—<i>Shipping Gazette</i>.</p> <p>"Portland, Oct. 1. It blew a gale here last night from S.S.E. This morning the wind was S.S.W., strong, with heavy squalls, which continued until 3 p.m., when the wind flew to W.N.W."—<i>Shipping Gazette</i>.</p> <p>"Lerwick, Oct. 2. Gale at S.W., with severe thunder storm and hail."—<i>Shipping Gazette</i>.</p> <p>In the Bay of Scalloway, on the 2nd Oct., vessels drove with two anchors down.</p>
6th Oct. 4 p.m. 7th Oct. 11 a.m.	Drum (on all coasts). Drum (on South and South-east coasts). North Cone over Drum (on Western and North-eastern coasts).	<p>Very heavy gales commenced in the South and West on the night of the 6th-7th. These gales extended over the whole country (the wind blowing from almost all directions),* and continued, with intervals of moderate weather, for several days. At Galway it blew a hurricane from South on the night of the 6th, and a heavy gale from N.E. next morning. At Bridport also it is said to have blown a hurricane on the night of the 9th. All round the coasts shipping sustained considerable damage.</p>
12th Oct.	South Cone under Drum, on West and	The weather had never become settled since the last cautions; but on the 12th

\* Though chiefly from South and East.

Date.	Caution.	Weather following Cautions.
1863.	South coasts. Drum only, elsewhere.	and 13th the wind again much increased, and blew with great violence from S. and from E.*
28th Oct., 4 p.m.	Drum (on North and West coasts).	The gales which prevailed on the 29th,† 30th, and 31st, were among the most violent of the year. On the Southern coasts very heavy S. to W. gales prevailed chiefly; elsewhere there were shifts to N.W., and in some cases to S.E. These gales extended over the whole country, and occasioned much damage, inland as well as round the coasts. The newspapers contain numerous reports of the damage caused by the great violence of the wind‡ at various times between the 29th of Oct. and the 2nd of Nov., on which day another caution was sent round to indicate the probability of <i>more</i> wind, and from a more northerly direction. On
29th Oct., 11 a.m.	Drum (on all coasts).	
30th Oct., 1 p.m.	South Cone under Drum (on South and South-east coasts).	
2nd Nov., 11 a.m.	North Cone over Drum (on all coasts).	

\* The *Shipping Gazette*s about this period contain many notices similar to the following :—

"Penzance. On the 12th instant we were visited by one of the heaviest gales from S. by E. we have witnessed for many years. The signal drum had been hoisted."

The screw steam corvette "*Scylla*," 21, left Plymouth on the 6th for China. She put back to Plymouth on the 16th, having "experienced a continuance of very heavy weather. On the 8th, during a heavy swell, she sprung her fore and maintopmasts. At midnight, on the 9th, it blew so hard from the west and south-west, that she was placed under close-reefed topsails. On the 10th her mizentopmasts crosstrees were carried away; it was found that the jibboom had sprung. On the 12th inst., in Lat. 46 N., Long. 8.30. W., it was blowing hard from the south-west, when she shipped a heavy sea, which increased the water in the hold to a depth of seven inches; the ship then gave a lurch to leeward, which filled her starboard cutter and jolly boat, and carried them off. In the afternoon the wind moderated, with a heavy swell from the westward. On the 13th, during a fresh gale from the south-west, Charles O'Niele, first-class boy, fell overboard. Lieut. Pringle, and a boat's crew of eight men, rescued him."

The following remarks, respecting the cautionary signals at Morecambe, are from a local paper :—

"The Storm Signals at Morecambe.—The storm signal recently erected at Morecambe, has already been of considerable benefit to the seafaring community of that place. Several times have the warnings of approaching storms been exhibited, and we believe the signals in every case have been followed by the gales they predicted."—*Cumberland Pacquet*.

† It was on the 29th that the iron-clad "*Prince Consort*" suffered so much damage in the Irish Sea. She had, unfortunately, left Plymouth shortly *before* the cautionary signals were sent.

‡ The Dublin correspondent of the *Times* writes, under date October 31st.—"We have had a succession of tremendous gales all through this country since Tuesday (the 29th). In Belfast, Cork, and Limerick it blew a perfect hurricane, hurling slates off the roofs of houses, throwing down chimneys, demolishing glass windows, lifting little children off their feet and dashing them about fearfully. The storm swept with all its force across the Channel, &c. &c."

From Scotland also reports came of houses having been unroofed, trees, as well as walls, blown down.

At Greenwich on the 30th, during the afternoon, "there was a heavy squall of wind, which recorded a pressure of 29½ lbs. on the square foot, which is greater than any other recorded within the last 20 years. The temperature fell 10° at that time, and the wind suddenly changed from S. by W. to W. by N." (Mr. Glaisher.)

Date.	Caution.	Weather following Cautions.
1863.		the 2nd and 3rd the wind shifted in most places to N.W., N., or N.E., and blew as hard as before. The following is one out of <i>many</i> instances:— “Grimsby, Nov. 3rd. A sudden hurricane from N. to N.W. broke over this place about 7 p.m. yesterday.”— <i>Shipping Gazette</i> .*
11th Nov., 11 a.m.	Drum (on all coasts).	There was a heavy gale on the morning of the 11th from W. and N. to N.E. on the Southern and Western coasts; and subsequently the winds were strong and squally; but except on the South and West coasts a caution was <i>scarcely</i> needed, and to have been of much service on <i>those</i> coasts the caution should have been sent on the 10th. On the French coasts there were violent gales on the 11th and 12th.†
18th Nov., 3 p.m.	South Cone (on all Western coasts).	Gales from S.E. to S.W. on the night of the 18th–19th. The West coasts <i>only</i> felt these gales. No caution had been sent except to the West coasts.
21st Nov., 11 a.m.	South Cone (on West and South coasts).	Gales commenced on the afternoon and evening of the 21st on the Western coasts, and extended during the night and following day to the South, East, and North coasts. The wind blew first from S.W., and, in most instances afterwards shifted to N.W. The following are a few extracts from the <i>Shipping Gazette</i> :—“Swansea, Nov. 21. “After the storm signals were hoisted “it came on to blow a violent gale “from S.S.W. Several vessels in the “dock parted from their moorings.”—“Portsmouth, 21st. A telegram was “received at noon to hoist South Cone. “ . . . . About 4 p.m. a most terrific “squall passed over the port.”—“Harwich, 22nd. South Cone hoisted “yesterday. In the evening it blew a “gale from S.W.”—“Staithes, 22nd. It “blew a hurricane the whole of last “night.”—“Dundee, 23rd. On the “night of the 21st it blew very strong. “The ‘Ideen’ and ‘Anna Kimball’ “dragged their anchors in the Roads.” “—Whitby, 21st. The storm signals “were hoisted indicating a gale from “the southward, which came on shortly “afterwards, and blew very hard all “night.”
2 p.m.	South Cone now, and Drum to-morrow (on North and East coasts).	
4 p.m.	Hoist Drum to-morrow (West and South coasts).	

\* Portsmouth, 3rd November. “Admiral Fitzroy’s storm signal yesterday afternoon was followed by another violent gale during the night.”—*Times*.

The weather generally did not moderate until the 4th.

† These gales seem to have reached the French coasts rather later than our coasts. Accounts from Brest speak of “the hurricane of the 11th and 12th.”

Date.	Caution.	Weather following Cautions.
1863. 1st Dec. 11 a.m.	Drum on West and N. E. coasts. South Cone on South and S.E coasts.	An entire week of stormy weather followed these cautions. The wind blew <i>chiefly</i> from S.S.W. to N.N.W., and from the 2nd to the 5th its violence is generally described as " <i>fearful</i> ."
2nd Dec. 11 a.m.	Drum (on South and South-east coasts).	These gales were the principal gales of the winter, and the list of casualties all round the coasts is a very long one. Reports from many places describe the gale as a hurricane, and there was scarcely a locality in the Kingdom unvisited by the storm. It extended also along the French, Belgian, and Dutch coasts.*
5th Dec. 11 a.m.	South Cone (on all coasts).	The weather continued stormy until the 8th, the wind blowing with great violence, from West and South, at times. The <i>Shipping Gazette</i> contains numerous notices similar to the following:— "Shields, 7th. A gale from W. all last night; several roofs of houses have suffered."—"Glasgow, 7th. It is again blowing a gale here from the South; fearful weather outside." —"Granton, 7th. It has blown a gale from S. to W. since the 1st."—"Portsmouth. The warning signal was followed, in due course, by a violent gale."
16th Dec. 11 a.m.	South Cone under Drum, on N.E. coast. South Cone only, elsewhere.	Gales on the 16th and 17th; blowing from W. to N.E. on the North-east coast; and from S.W. to N.N.W. elsewhere. At Cork it blew "a severe gale" from N. on the night of the 16th and 17th. In the Orkneys on the same night "a most terrific gale."

\* A reference to the newspapers of the period will sufficiently show the character of the weather, and the great use of the cautions in many places.

*Note.*—One the 4th and 8th of December, telegrams were sent to Copenhagen, from the Meteorologic Office, to the effect that stormy weather might be expected over Denmark. With respect to the weather that followed the receipt of those cautions, Professor Forchhammer wrote to Admiral FitzRoy, as follows:—

"Copenhagen, 14th Dec., 1863.

" . . . . . I cannot show you my gratitude for the two storm telegrams . . . . . Your telegram of the 4th did not reach me, I do not know for what reason, before the 6th, but it was immediately telegraphed to all stations in the country; and in the night between the 7th and 8th, we had a violent storm on the peninsula of Jutland . . . . . Your telegram of the 8th reached us the same day, and in the night between the 10th and 11th, we had a most violent storm, with thunder and lightning, and a very violent hailfall. It was all over the country. . . . . All our provincial papers acknowledge the importance of these communications, and one of the few towns that are situated in the interior of the country, has complained of not having received the important news, and entreated to be favoured for the future with similar communications . . . . . The newspapers from Jutland describe the storm of the 11th and 12th December as a complete hurricane."

"F. G. FORCHHAMMER."

Date.	Caution.	Weather following Cautions,
1863.		Whitby, Dec. 16th (weather moderate). "The storm signals hoisted." 17th, 9 a.m., "It is blowing a gale from N." —Staithes, 17th. "N.N.E. a perfect hurricane, sea mountains high."— <i>Shipping Gazette</i> .
26th Dec. 5 p.m.	South Cone (to be hoisted next day, on all coasts).	S.W. to N.W. and N.E. strong winds to moderate gales. In a few cases, but not generally, gales of remarkable violence. Cardiff, Dec. 29. "Yesterday morn- ing the wind shifted to S.E. with rain. "The wind this morning blew a gale "from W.S.W."—Staithes, 27th. "The wind suddenly shifted from W. N.E." Such weather, however, was not <i>general</i> , the prevailing winds being north-westerly, strong, and squally.
31st Dec. 11 am.	Drum (on all coasts).	From the 1st of Jan. to the 4th, the wind was strong to a gale from N.E. to S.S.W.; the ship "Coronet," from Li- verpool for Bombay, reports that it blew a S.S.W. gale on the 4th, and the brig "Circassian" that it blew a N.E. gale on the same day, near the Longships (Land's End).*
1864. 9th Jan. 1 p.m. 11th Jan. 5 p.m.	South Cone (West- ern coasts). Drum (on all coasts).	A gale from S.S.E. to S.S.W. on the 11th, on the West coasts of England and Ireland. On the 12th the wind blew generally from S.E. to S.W., strong to a gale, but moderated as it changed to N.W. and N.E. The gale was more severe on the Western and Southern than on the Eastern coasts.
16th Jan. 5 p.m.	South Cone (on Southern and West- ern coasts).	A strong southerly gale continued from the night of the 16th till the evening of the 17 on the Western and Southern coasts; and was felt as a strong wind on the Eastern coasts on the 17th.†

\* Ilfracombe, Jan. 1.—"Wind E. by N., strong gale."

Dundalk, Jan. 2.—"Wind S., a gale."

Stornoway, Jan. 4.—"We have had a strong gale at S. for the last three days,  
with a high barometer."

Cork, Jan. 5.—"Captain Morris, of the 'William Owen,' reports that on the 3rd  
inst. signalled the brigantine 'Sarah Maria.' . . . Took crew  
on board, in a very exhausted state, at the time blowing a whole gale from S.S.E.,  
Scilly bearing S. by E., 20 miles."—*Shipping Gazette*.

† The "Craigs" reports:—"On January 13th, lat. 48° N., long. 34 W., encountered  
a gale from S.S.W. At 8 a.m. wind shifted westerly, and at 10 a.m. came N.W. in  
a terrific squall; the sails being immediately blown away in ribbons such was the  
violence of the gale."—*Shipping Gazette*.

"The brig 'Ianthe' from New York reports having experienced a succession of  
southerly and westerly gales the entire passage, and that on the night of the 13th, in  
lat. 49° 10' N., long 24° 20' W., encountered a hurricane, commencing from S.S.W.  
round to W.N.W. At midnight, while lying to under close-reefed maintopsail and  
reefed stormstaysail, a heavy squall blew them to shreds, throwing the ship on her  
beam ends and shifting the cargo."—*Shipping Gazette*.

Date.	Caution.	Weather following Cautions.
1864. 21st Jan. 11 a.m.	South Cone (on all coasts).	On the 22nd a strong south-westerly gale prevailed, (heaviest on the South and West coasts,) followed by strong westerly winds on the 23rd. The "Lucinde" of Lynn encountered this gale about 6 miles S.E. of Coquet Island and was disabled; the captain speaks of the storm as a hurricane.
1st Feb. 1 p.m.	South Cone (on all coasts).	A strong south-westerly gale on all coasts from the 2nd to the 3rd. The gale decreased as the wind drew round to W. and N.W. The weather was squally and unsettled, in the north, previous to the receipt of the caution; but there was subsequently a gale from S.W. On some parts of the East coast the gale was severely felt; from Staithes it is reported that it blew a hurricane at that place throughout the night of the 2nd, with showers of hail and rain.
8th Feb. 1 p.m.	Drum (on Northern, Western, and Southern coasts).	On the 10th a gale on the South and West coasts (the direction of the wind is variously given from all points between N.E. and S.) and strong north-easterly winds on the North coast. Snow fell very generally all over the country between the 9th and 11th. At Wick, "a gale raged from the night of the 9th to the morning of the 10th, doing serious damage to the fleet of fishing smacks assembled there; one of which was lost with all hands."— <i>Shipping Gazette and John O'Groat Journal</i> .
10th Feb. 4 p.m.	Drum (on Eastern coasts).	On the 12th and 13th a gale on the Eastern coast; the wind at first blew from between S.S.E. and S.W. and then changed to N.N.W. and N.W.*
12th Feb. 11 a.m.	South Cone (on Northern and Western coasts).	Strong gale from S.W. to W. on the North and West coasts on the 13th.†

\* Grimsby, Feb. 14.—"Yesterday it blew a heavy gale from S.W. About 2.30 p.m. the wind suddenly flew to the W.N.W., blowing a complete hurricane with heavy rain."—*Shipping Gazette*.

Filey Feb. 14.—"Yesterday afternoon a most violent storm of wind and rain came on suddenly, making the sea almost instantaneously one complete drift:—Observed at about a distance of four miles a large brig and a small schooner in company. Just at this moment a terrific gust struck the schooner and laid her on her beam ends; in another instant she appeared bottom up, and the next, every vestige seemed to disappear."—*Shipping Gazette*.

† Falmouth, Feb. 15th.—"Capt. John Swain, of the brig 'Peep o'Day,' from Pembroke for Nantes, reports:—On the 13th bore up, in a heavy gale from S.W. from lat 49° N., long. 5° 50' W., and arrived in Falmouth on Sunday (13th) at 1 p.m. Made another attempt to get to the southward on the night of 13th., but found it impossible to do so on account of the heavy sea running in the Channel."—*Shipping Gazette*.



Date.	Caution.	Weather following Cautions.
1864. 4th March, 11 a.m.	South Cone (West- ern coast).	The weather continued stormy and unsettled everywhere, with heavy falls of rain and snow (in the Midland Counties there] were great floods— <i>Times</i> ), from the 5th to the 8th.* On the 6th it blew a gale from S.W. on the South coast; and on the East coast from the 6th to the 7th the wind blew at first strong from N.E. and afterwards increased to a gale from S.W. These gales were also severely felt in Paris and in the south of France. On the Southern and Western coasts a heavy south-westerly gale on the 11th, which decreased in violence as the wind veered to N.W.† The Northern and Eastern coasts experienced the gale from the morning of the 12th to the 14th; the wind blowing from S.W. to W.N.W. This gale was accompanied by thunder and lightning, in many places. On the 29th a strong gale from S.W. to N. on the Southern and Western coasts, and from W. to N.E. on the Eastern coast; strong winds were generally prevalent for a day or two afterwards. This gale appears to have been felt only as a strong S.W. wind in Scotland generally, although in a few places it is said to have blown hard.‡
5th March, 2 p.m.	Drum (on Northern and Eastern coasts); and South Cone (on Southern coasts)	
7th March, 11 a.m.	Drum (on Western and Southern coasts).	
10th March, 1 p.m.	South Cone (on Southern and Western coasts).	
11th March, 11 a.m.	(On Northern and Eastern coasts).	
28th March, 11 a.m.	Drum (on all coasts).	

\* Kirkwall, March 8th.—“Until Sunday (6th) we had no wind for five days and on that night and yesterday it blew strong from E.N.E. to N.N.E. with snow.”

Dundalk, March 7th.—“It rained nearly the entire day yesterday and blew a gale from S. to S.E.”

Falmouth.—“A strong gale up to five in the morning of the 7th.”

Portsmouth, 7th.—“It blew a gale all last night from S.W. to S.S.W.”

Portland, 8th.—“A.m. E.N.E.; p.m. W.S.W. strong—squally.”—*Shipping Gazette*.

† Cardiff, March 12.—“All day yesterday it blew a gale from S.W., during which three vessels got on the Cardiff Sands.”—*Shipping Gazette*.

‡ Port William, April 1.—“We have had nothing but gales for the last three days from S. veering to N. with very heavy snow showers.”—*Shipping Gazette*.



## A P P E N D I X.

### STORM SIGNALS.

To the Editor of the *Lynn Advertiser*.

SIR,—Twelve months having elapsed since the first weather forecast sent to my office from the Board of Trade, and knowing that there are some few sceptics as to their truthfulness and utility, I beg to subjoin a statement of telegrams received from January 23rd, 1863; and if you think them of sufficient public interest please to give them space in your valuable journal. I find that the forecasts which have not affected us to the extent of a gale have more or less been felt in other localities not far distant, with only one exception. Our island was not affected on November 11th, although a gale was blowing in the Bay of Biscay and on the South coast of France. Such facts must appeal to all, and, as a philanthropist, too much praise cannot be given to the author of the great boon bestowed upon the seamen and fishermen of the United Kingdom, and to all nations using our coast and harbours, for, glancing over the wrecks and casualties, numbering nearly 3,000 for the year, they must strike with sorrow every one who thinks of the many happy homes made desolate. And there is no question but greater numbers would have been added, but for the timely warning given by Admiral Fitzroy.

TELEGRAM.	FOLLOWING WEATHER.
Jan. 23rd. Hoist Drum.	A heavy gale, which continued throughout the 24th moderating towards midnight.
Jan. 26th. Hoist Drum.	Gale commenced at noon at S.W., ending in a perfect hurricane throughout the night at S.S.W.
Jan. 29th. 1 p.m.—Hoist South Cone.	A heavy gale which continued throughout the night and all day and night of the 30th, moderating from a perfect hurricane at South. Barometer rapidly falling at eight at night in continuation.
6 p.m.—Haul down South Cone and hoist Drum. Lights.	
Jan. 30th. Continue Drum.	
March 6th. South Cone again. 6.30 p.m. — Hoist Drum. Lights.	This did not affect our locality but partially. Wind S.S.W., half a gale. Bar. very low, 29.40. This warning was of great service on the South coast of England and the Bristol and St. George's, Channels.
March 9th. 6.30 p.m.—North Cone by three Lights now, and North Cone tomorrow.	A continuation of rain and sleet, and gale, northern parts of Scotland.
March 12th. Hoist Drum.	A gale at S.S.W., with rain. Bar. 29.23.
April 6th. Hoist Drum.	This telegram was true, but late, the gale having spent its greatest force the day previous (Sunday), when no telegrams were sent.
April 22nd. Hoist Drum.	A gale at W.S.W., with rain.
May 22nd. Hoist Drum.	A heavy gale at S.S.W.

TELEGRAM.	FOLLOWING WEATHER.
June 6th. North Cone over Drum.	Gale on the west of Scotland.
June 10th. Hoist Drum.	A hard gale on the 11th at S.S.W.
July 18th. Hoist Drum.	Hard squally weather.
July 21st. 6.15 p.m.—To-morrow hoist Drum.	A gale from S.S.W. to N.E. Rain.
Aug. 7th. Hoist Drum.	Heavy squalls, with rain.
Sept. 7th. Hoist Drum.	Gale at W.N.W. Bar. 29.45. Rain.
Sept. 19th. Hoist Drum.	Gale at W.S.W., with heavy rain.
Sept. 21st. Hoist Drum.	This gale had blown its greatest force on the 20th (Sunday) when no telegrams were sent. Bar. low and rapidly falling.
Sept. 30th. Hoist Drum.	This telegram came late. A gale from S.S.W. to S.W., with heavy rain.
Oct. 6th. Hoist Drum.	A hard gale throughout the night, with rain. Bar. low.
Oct. 7th. Continue Drum.	Continuance of the above gale at East. Bar. falling.
Oct. 12th. Hoist Drum.	The gale had spent its greatest force on the previous night (Sunday).
Oct. 29th. Hoist Drum.	This gale continued throughout 30th, 31st, from S.S.E. to N.W., backing to S.W. Bar. low and falling.
Nov. 1st. Hoist North Cone over Drum.	This gale commenced 5.30 p.m., and continued until the morning of the 3rd, it having blown a hurricane on the 2nd at N.W., with rain, having backed round from the South. Bar. 28.90.
Nov. 2nd. Continue Drum.	
Nov. 11th. Hoist Drum.	This forecast was not felt upon our islands, although it blew heavy in the Bay of Biscay and other parts of France.
Nov. 21st. South Cone now, and Drum to-morrow (Sunday).	This gale commenced at S.E. (true), back to S.S.W. greatest force.
Dec. 2nd. Hoist Drum.	Upon the arrival of this telegram, bar. 29.5, and falling; wind, S.E., fresh; at 3.30 p.m. wore round to the N.W., a gale with rain. This gale wore round on the night of the 2nd to a hard gale at South, and before 10 a.m. on the morning of the 3rd it had again wore round to W.N.W. to a hurricane, and but for this timely forecast some hundreds of ships would have left the north ports, which at the time were filled with loaded ships.
Dec. 5th. Hoist South Cone.	This telegram did not affect us beyond a strong gale, although it was severely felt in other parts of England.
Dec. 7th. Hoist South Cone.	This telegram did not severely affect us, although it blew a gale on the South of Ireland, Wales, South Coast of England and the Bay of Biscay.
Dec. 16th. Hoist South Cone.	This telegram did not affect us southerly, but settled into a gale at N.W. on the 17th, with rain.
Dec. 26th. South Cone to-morrow (Sunday).	This telegram did not affect us as to a south gale, but settled into a gale at N.W., with frost.

I think, Sir, after reading the above striking facts few but can be convinced of the value of Admiral FitzRoy's labours, and feel that he is one of the great living benefactors of our age. Apologising for the length of my communication,

I am, Sir, your obedient servant,

ROBERT EGGETT,

Harbour Master.

King's Lynn, Dec. 31st, 1863.

## B.

STATEMENT of all the CAUTIONARY SIGNALS shown between March 1st 1862 and January 1st 1863, with the CHARACTER of WIND and WEATHER following, by T. HENRY BABINGTON.

N.B.—This statement is printed verbatim from Mr. Babington's manuscript. No other cautionary signals were directed to be shown, and, excepting the gales specified by him, none of an extensive or important character occurred over the British Islands.—R. F.

CAUTIONARY SIGNALS, March 1st 1862 to January 1st 1863.

Warnings sent—and following weather.

Date.	Warning.	Weather following Warnings.
1862. 7th March, Noon.	Drum (all round the coasts).	The weather all the 7th was strong and squally, with gales in places, which increased and became more general towards night. The winds in the north blew chiefly from E. and N. and elsewhere from S. and W.
8th March, 3 p.m.	South Cone under Drum (on the South and West coasts).	The weather on the 8th was quieter, but it still blew a strong gale in many places from S.E. to S.W. (ships at sea report losing sails, &c.), and <i>at night and during the 9th</i> it blew a <i>severe gale</i> , very generally, from S. to W., more particularly on the <i>S. and W. coasts</i> .
20th March, 1.30 a.m.	Drum (Ireland, West Central, and South coasts).	It blew heavily during part of the 20th and on the 21st in the West Central district, and on the South and East coasts, from N.E. to S.E., and in places from N.W. In Scotland (where no warning was sent) and in Ireland, the winds were not generally so strong.
22nd March, 5 p.m.	South Cone (Ireland, West Central, and South coasts).	It blew a gale from S.W. to S.E. on the night of the 22nd, on the 23rd, and on the 24th, at many places on the coasts warned. In Ireland the wind had more easting.

Date.	Warning.	Weather following Warnings.
1862. 26th March, 1 p.m.	South Cone (West Scotland, Ireland, West Central, and S.W. England).	Strong winds prevailed at many places on the 27th, 28th, 29th, and 30th, blowing from various directions, and with a force of 6 and 7 (Beaufort notation), but there is no report of any important <i>gale</i> on our coasts. Gales were heard of, however, all round; in the Shetland Isles, to the Westward and Southward of Ireland, and at Lisbon.
28th March, 11 a.m.	Drum (all round the coasts).	
21st May, Noon.	South Cone on S.E. coast, (Deal to Weymouth).	It blew heavily, with hard squalls, from S. to W. all along the South coast, on the night of the 21st, and during a great part of the 22nd and 23rd. Several ships which sailed from the southern ports on the 22nd were compelled to put back.
6th June, 2 p.m.	Drum (to Scotland, Ireland and West Central). South Cone (to East coast and South England).	Heavy gales from S. to W. set in generally about sunset on the 6th, shifting to N.W. and to S.E. in some parts of Ireland and Scotland. The weather continued very stormy and unsettled all the 7th, and moderated on the 8th.*
11th June, 11 a.m.	Drum (all round the coasts).	Violent gales on the 12th and 13th, chiefly from S.W. and W., but shifting to N. in places.
12th June, 4 p.m.	South Cone under Drum (South coast).	The wind was strongest on the South coast, especially on the night of the 12th and during part of the 13th, when it is said to have blown a hurricane in places. It was blowing a gale <i>in parts</i> of Ireland and North Britain <i>before</i> the warning of the 11th was received, but the gale was not <i>general</i> till afterwards.
5th July, 11 a.m.	South Cone (Ireland, West Central and South coasts).	The weather <i>generally</i> along the South and West coasts on the 6th and 7th was "strong" and "stormy" from southward. In <i>Ireland</i> the wind was more northerly and moderate. At Deal there was an extraordinary hurricane for about 20 minutes on the <i>evening</i> of the 5th (see extract below†). A boat was blown off the beach, across the carriage way, to a distance of 150 yards.

\* "Shields, June 8th.—Soon after the storm signal was hoisted here on Friday (6th), the wind, as indicated, rose to a gale from the South, and all yesterday, at intervals, it blew hard from the S. and S.W., as also during the night."—*Shipping Gazette*.

† "Deal, July 6th.—Yesterday, about 5.30 p.m., we experienced a terrific storm of hail, thunder, and lightning from the S.E. For about 20 minutes it blew a perfect hurricane, taking four boats from off the beach, drove them against the fence of a field. The hail, or rather large pieces of ice, was driven with such fury as to break many windows."—*Shipping Gazette*.

Date.	Warning.	Weather following Warnings.
1862. 24th July, 5 p.m.	Drum (Scotland, Ireland, and West Central).	A strong gale set in <i>at night</i> (on the 24th) in the West Central district, and it blew a very hard gale during the greater part of the 25th, in North Britain and the North of Ireland; the wind shifting from S.W. to N.W.
4th August, Noon.  5 p.m.	South Cone (Ireland, Scotland, and West Central). South Cone (South England).	The gale commenced in some parts of Ireland before the warning was received, blowing from about S.S.E. to S.W., but it did not generally commence elsewhere till the <i>night</i> of the 4th, blowing from the same direction and increasing on the 5th, on which day a schooner off the Lizard rolled both her masts away, and another vessel, in the Bay of Biscay, was thrown on her beam ends. There was not so much wind in Scotland (although it was strong and the weather unsettled) as elsewhere, until the 7th or 8th.
5th August	Drum (East coast and Jersey).	It blew a gale at Bridlington, Staithes, Berwick, and various other parts of the East Coast <i>at intervals</i> , on the 5th, 6th, and 7th, the wind varying from S.E. to N.W. In the Channel the southerly gale continued more or less all the 6th and 7th, extending to London on the 7th and doing much damage.
7th Aug., 11 a.m.	Drum (Scotland, Ireland, and West Central).	In North Britain and the West Central district the weather was stormy and unsettled, with gales at intervals, on the night of the 7th, on the 8th, and on the 9th.* In North Britain more particularly, on the night of the 7th and on the 8th, the wind varying between N.E. and W. Much damage was done to the fishing boats at Wick by the surf, and off Stonehaven there was a strong N.E. gale with heavy sea.

\* On the morning of the 8th, the day after the cautionary drum had been, or ought to have been, hoisted in Kingstown harbour, a small schooner yacht left that place for the Isle of Man. The *Mona's Herald* thus describes the voyage :—

“They were becalmed for several hours about mid-day on Friday, the 8th, but in the evening a strong breeze sprung up, which by midnight increased to a heavy gale. They sighted the lights on the Calf of Man about 1 a.m., when nearly a whole gale was blowing out of the north-east. . . . In shortening sail a heavy sea washed Mr. Casey, one of the party, overboard.”

The *Mona's Herald* goes on to say that the boat was put about, and “nearly foundered in going about;” but that owing to the heavy sea no assistance could be rendered. The yacht got into Douglas harbour with her crew “in a very exhausted condition.”

Date.	Warning.	Weather following Warnings.
1862.		Ships reaching Ireland (Crookhaven) on the 10th from the Westward report "heavy northerly gales, the latter part "of the voyage," with loss of spars, &c.
19th Aug., 11 a.m.	South Cone (Scotland, Ireland, and West Central).	Winds strong, 6-9 (Beaufort notation), from S.W. on the 19th and 20th, particularly in Ireland and West Central;* but no very <i>important</i> gale on our coasts. In the Atlantic, far west, there were furious southerly gales and "hurricanes" on the 19th and 20th.
3rd Sept., 11 a.m.	Drum (Scotland, Ireland, West Central, and East coasts).	Strong winds and squalls S.W. to N. on the 3rd (night especially) and 4th. There were intervals of fine and moderate weather, as well as places which the stormy weather did not reach; but near the Clyde, about midnight on the 3rd-4th a smack was sunk in a N.W. gale; near Belfast a vessel carried away her topmast, and at Yarmouth a Dutch schooner parted her anchors.
25th Sept., 5 p.m.	South Cone (Ireland, West Central, and S.W. England).	Southerly winds, strong in places, but no gale of importance on the coasts warned until the 29th.†
29th Sept., 4 p.m.	Drum; and next day South Cone under Drum (all round the coasts).	A very heavy gale commenced in Ireland and the South-west of England on the night of the 29th, which extended more or less over the whole of Great Britain in the course of the two following days. The wind continued chiefly between S. and W.
12th Oct., 3 p.m.	Drum (all round the coasts).	Strong winds from S.S.E. to S.W., with squalls and much rain over the greater part of the kingdom nearly all the 12th, increasing towards evening to heavy gales from S.W. and N.W.
13th Oct., 4 p.m.	South Cone under Drum (all round the coasts).	On the 13th the weather was still much disturbed, and on the 14th, 15th, and 16th there was a succession of heavy gales, chiefly from S. to W. The following extracts are from the <i>Shipping Gazette</i> :— "The steamer 'Hercules,' from Dantzic for London.—At 1 a.m. October 13th blowing a gale from S.E., the ship "being in the Cattegat. At 8 a.m. the "wind suddenly shifted to N.W., which "compelled us to seek shelter. . . . "Proceeded on the 14th, the weather "having moderated. On the 15th the "weather again became worse," &c.

\* Whitehaven, 19th.—"South cone hoisted this morning. 5.30 p.m., S.W.  $\frac{1}{2}$  blowing heavily; dull, with heavy rain."—*Shipping Gazette*.

† In the Baltic there were strong *northerly* gales on the 25th and 26th.



Date.	Warning.	Weather following Warnings.
1862.		<p>The "Trio" "left Queenstown on the 13th at 8 a.m., the wind being W.S.W. "strong; from that experienced a continuation of gales from nearly all "quarters."</p> <p>At Greenock, "early on the 14th a "gale arose from the southward, and "about 3 p.m. increased to a hurricane."</p>
17th Oct., 11 a.m.	North Cone over Drum (all round the coasts).	Strong gales, chiefly westerly, continued on the 17th, but in the afternoon and on the following day the wind shifted in many places to N.W. and N.N.E.
18th Oct., 1 p.m.	South Cone under Drum (all round the coasts).	A succession of violent gales continued to blow on the 18th, 19th, 20th, 21st, and 22nd, the wind varying from N.E. to S.W.
22nd Oct., 11 a.m.	South Cone under Drum (all round the coasts).	"Terrific gales," "hurricanes," and "fearful squalls" were reported from nearly all parts of the coasts on the 23rd and 24th, wind varying from S.W. to N.; and the weather was still stormy and unsettled on the 25th, though somewhat more moderate than it had been.
25th Oct., 6 p.m.	South Cone (all round the coasts). To be hoisted <i>also</i> on the following day.	There were very heavy S.W. gales all round the coasts on the 26th and 27th, but more particularly on the 27th. At Dover, on the 26th and 27th, "a succession of strong gales. . . Since "the wreck of the 'Violet' such weather "cannot be remembered." At Newhaven, "shortly after the storm signals "were hoisted, it blew very heavily."— <i>Shipping Gazette</i> .
8th Nov., 5 p.m.	Drum Lights (to Scotland and North and East Ireland).	Strong and squally on the night of the 8th–9th, with heavy gales in places, especially in North Britain and on the East coast of Ireland. Wind <i>chiefly</i> from S. to W., but shifting in some places.*
9th Nov., 9 a.m.	South Cone under Drum (West Central, South England, East coast, and South Ireland).	On the 9th, 10th, and 11th there were gales or strong winds from S. to N.W., with generally unsettled weather. At sea, to the Westward of Ireland, there were "severe gales" from W.N.W. on the 10th;† and at Londonderry, Porthcawl, Cardiff, Greenock, Shields, &c., there were westerly gales.
18th Dec., 4 p.m.	Drum Lights (Scotland).	A severe gale (S.W. to N.), began on the evening (or night) of the 18th, and during the night and following days (the 19th and 20th) extended over the whole of North Britain and Ireland and

\* Whitehaven, "November 9th.—N.W., strong, stormy. A heavy gale began to blow from S.W. last evening, and raged over the night, shifting from S.W. to N.W. The drum storm signal was hoisted last evening."—*Shipping Gazette*.

† Near the Scilly Isles the barque "Mata" had a "terrific gale" on the 9th from S.W.; and in the afternoon of the same day there was a severe S.W. gale in the North Sea.

Date.	Warning.	Weather following Warnings.
1862.		the north of England, as well as, in a few instances, to the southern ports. At Kirkwall "on the night of the 18th and " 19th we had a dreadful hurricane from " W. to W.N.W., heavier than has been " experienced for many years." At Greenock there had "not been such a " storm for years" as on the 19th.— <i>Shipping Gazette.</i>
20th Dec., 3 p.m.	Drum Lights, and Drum on following day. (All round.)	Violent northerly (N.N.E. to W.) gales swept over the greater part of the kingdom on the 21st and 22nd, causing serious damage to shipping both on the eastern* and western coasts. These gales were severely felt in London also. There were also north-westerly gales in the Atlantic to the westward of Ireland at this time.
27th Dec., 5 p.m.	South Cone, and again next day. (Scotland, Ireland, and West Central.)	Heavy gales and squalls, at intervals, or strong winds, from S.W. to N.W. prevailed all round the coasts on the 28th, 29th, and 30th. On the French coast also to which a warning was sent on the morning of the 29th, there was a heavy gale on the night of the 29th and 30th. The following is from the <i>Shipping Gazette</i> : Caernarvon, December 29th. "Yesterday morning the cone, indicating " a gale from the southward was " hoisted . . . . as the morning was " fine and threatened no storm it " was laughed at by many sailors " . . . . a terrific gale blew through- " out the night from S.W."
29th Dec., 9 a.m.	Drum (all round the coasts, and to N.W. France.)	"The 'Zeester' brigantine, which " arrived at Cuxhaven on the 30th en- " countered a heavy gale in the North " Sea, during which she lost sails, bul- " warks, &c., and was compelled to " throw part of her cargo overboard." On the night of the 31st Dec. to Jan. 1st, it blew very hard from N.W. and from S.W. in Scotland and Ireland.
1863.		
1st January, 11 a.m.	Drum (all round the coasts, except the East coast, and to N.W. France.)	Heavy gales, at intervals, over nearly the whole kingdom during the 1st, 2nd, and 3rd. The wind, which moderated, generally, on the morning of the 1st, increased again in the course of the day in the North, West, and South, and in the evening on the East coast also, blowing in most cases from S.W. and shifting to N.W.
3 p.m.	Drum (East coast).	

\* The steamer "Life-guard" is supposed to have foundered in the North Sea on the 21st.

## C.

## REPORT.

SIR,

April 1863.

1. In my Reports last year to yourself, with those of 1857 and 1858, information was given respecting all details of this department.

2. Since April 1862 continued progress has been made in the principal subjects, for which this office was originally instituted in 1854, and a considerable advance has been effected in the practical application of meteorology to every day use.

3. The results of such utilisation of facts observed can scarcely be more clearly and briefly shown than by the two papers appended to this report, which give statements of wind and weather following every instance of making our cautionary signals; and the opinions of practical men respecting Fishery barometers lent to them by the Board of Trade. The statement of weather was drawn up by my assistant, from our office records, and has not been the least altered. The barometer paper is also printed verbatim from the original returns.

4. Applications of a pressing nature have been made for the cautionary signals sent from this office from no less than fifty-four of the places on our coasts, which are specified in the third paper of the Appendix; and as some of these have been preferred but *recently*, they are evidences of deliberate consideration, and of the value attached to the fact that by means of our regular reporting stations, (offices of the telegraph companies,) and the Coast Guard, aided by the liberal organization effected locally, in some districts; all the coasts of Great Britain and Ireland to which the telegraph extends, (including the Isles of Man, Jersey, and Heligoland,) can now be warned in less than one hour.

5. More than this, however, has *already* been effected, and more is in prospect. From France we receive telegrams twice a day. In the early morning from Rochefort, L'Orient, and Brest, which reach London as soon as our own from Ireland or Scotland; and in the afternoon, through Paris, from Lisbon, Bayonne, Brest, Helder, and Copenhagen. In exchange for which we give daily reports to Paris Observatory from seven places: and to Calais—for the French coast specially—at eleven; besides such occasional warnings as may be useful to the French north-west coasts, including our Channel Islands.

6. How the British notices are appreciated in France may be shown by the following extracts of letters received by myself from two officers in the French navy, who have been charged with the organization of a central office at Paris (similar to this), with corresponding or reporting stations on the north, the west, and the south coasts of France.

Captain Moulac wrote on the 20th of January last:—

“ Bien que les prévisions du temps faites par l'Amiral FitzRoy ne soient que des *probabilités*, et nullement des *prophéties*, il serait facile d'opposer à l'exemple cité, que l'on prétend avoir été pris entre mille, un très-grand nombre de circonstances dans lesquelles l'évènement a justifié les prévisions.

“ Depuis le peu de temps, moins de deux mois, que ces avertissements parviennent en France, les trois coups de vent qui se sont fait sentir sur nos côtes ont été annoncés LA VEILLE.”

And Captain Mouchez, now officiating at Paris, said, on the 19th ultimo:—

“ Je n'ai pas besoin, sans doute, de vous dire, que pendant tout le mois écoulé vos télégrammes se sont vérifiés d'une manière très remarquable. Les journaux de divers ports de nos côtes du Nord signalent très fréquemment l'accord parfait des prévisions et des temps observés. Aussi nous avons grande impatience de voir notre service bien établi. J'espère que cela ne tardera pas.”

And on the 26th the same officer wrote,—

“ Je reçois continuellement de nouvelles demandes des ports qui réclament la communication de vos télégrammes.”

He also requested additional information from a few other British ports.

7. Last autumn several cautionary notices of impending bad weather were sent through Heligoland to Hamburg, and even to Rostock, at the special request of Professor Dove; and lately inquiries about *ice* and probable cold weather telegraphed from Hamburg were answered so satisfactorily that a cargo of 800 tons was countermanded.

8. During 1862 many foreigners examined the arrangements at this office, and four of those gentlemen (who were accredited to high positions at the Exhibition) expressed intentions of establishing similar arrangements (on a smaller scale) in their respective countries, namely, France, Italy, Hanover, and Russia.

9. In the last autumn France commenced arrangements for a system of coast telegraphy for ordinary weather as well as for storms, and within the last few weeks I have heard from the officer at Paris, appointed to conduct this service, that he has organized 18 stations on the French coasts, and will soon ask for the further reports from hence, which are desired by them. His immediate superior is the Minister of Marine, who takes much personal interest in the subject.

10. Commissioners from the Hanoverian Government have just obtained authority from the Foreign Office and Board of Trade to inspect our meteorologic arrangements, having in view an organization of a similar kind.

11. It is unnecessary to say how willingly any desired information has been invariably given, not only to foreigners, but to all persons entitled to time and attention in a public office; but it may be right to repeat here that the meteorologic publications of the Board of Trade have been extensively though carefully circulated, and that a large scientific as well as ordinary correspondence has grown out of their dissemination.

12. These facts seem to show so conclusively, not only the opinions of foreigners, and those by whom they have been gradually informed, chiefly concerned in maritime interests, but of a large number of other persons, that many words here in allusion to different views may seem hardly necessary; and yet for enabling a fair conclusion to be drawn by high authorities, some degree of further explanation may seem to be desirable besides what has been already published.

13. Many may ask—"Is this system of weather telegraphy sound and advantageous?"—If so, why is it opposed?

There are no less than four distinct classes of interested opponents, and they should be known. First—Certain persons who were opposed to the system theoretically at its origin, and having openly expressed, if not published, their objections, are naturally reluctant to adopt other ideas until converted.

Secondly—A numerous body who cannot have had time and opportunity to look fully into the rationale, but do not realise any want of special information, undervalue the subject, assert it to be a "burlesque," and misquote really great authorities.

Thirdly—A small but active party which failed in establishing a daily weather newspaper indirectly opposed to the Board of Trade reports, and have since endeavoured, by conversation, by letters, and by elaborate criticisms in newspapers or periodicals, to exaggerate deficiencies, while ignoring merit in the works of this office, however beneficial their intended objects.

And fourthly—Those pecuniarily interested individuals or bodies, who would leave the coasters and the fishermen to pursue their precarious occupation heedlessly—without regard to risk—lest occasionally a day's demurrage should be caused unnecessarily, or a catch of fish missed for the London market.

14. Especially referring now to persons who would have the warning signals, but not the "forecasts" (results of considerations on which the *signals depend*), may I quote the following words?—"Frequently, remarks in favour of the "cautionary signals, but in depreciation of the forecasts, have been made. "Their author now begs to say that it is *only* by closely forecasting the "coming weather, and by keeping atmospheric condition continuously present to mind, that *judicious storm warnings can be given*. Forecasts grow "out of statical facts, and signals are their fruit."—Weather Book, p. 193. Second edition.

15. To show some of the concordant opinions of such forecasts entertained

in France and Scotland, in Ireland and England, I might quote numerous printed or written passages. In this Report, however, I will only observe that the views and expressions of seafaring men, of the maritime population in general, of the Coast Guard, and of Her Majesty's officers in command, are remarkably favourable.

16. Perhaps it may be asked, "On what meteorologic conditions or changes are the forecasts based?" They depend (may be briefly replied) on considering the atmosphere as a lighter ocean, having currents, elastic expansibility, equilibrium, momentum or inertia, chemical alterations, and extreme sensibility to heat or cold, its *chief motors*; and on knowing the statical conditions of air in this oceanic envelope at many places simultaneously, likewise again similarly after certain intervals of time, by which means intercomparisons are made, showing the relative conditions and causations whence dynamic effects originate. These dynamic motions are proportional to disturbances of level, like those caused by a head of water, to inequalities of temperature and consequent *chemical* changes, with more or less electric action. They are our winds, and may be softly gentle, or as heavily boisterous as in a *tempest*, of which differences, through all degrees, instrumental means and telegraphy now give available information. To utilise their indications adequately, a central office should know the natural and general atmospheric movements, with their disturbing causes, even as a pilot knows the varieties of streams and eddies in a wide estuary.

The whole map of a region (say the British Islands) should be outlined in the mind, as the estuary with its shoals is mentally visible to the pilot. The normal tendency of the *whole* atmosphere (in our latitudes) to *move eastward* while crossed or variously interfered with by polar or tropical currents, that in course of seasons cause every variety of wind and weather, should be *always* considered, and then, with due allowances made for gradual advances from westward, for effects of land and differences of temperature—good forecasts may be generally drawn.

17. Reverting to Fishery barometers, I would ask for perusal of the replies sent in from places on our coasts to which instruments have been lent by the Board of Trade, gradually increasing in number since 1857. By these instruments, and by the directions (Manuals) that have been so liberally circulated by Government, an extensive amount of good has been done in a manner little known to the public, but not eventually to be the less appreciated. The example thus set has been largely followed, not only on our own sea-coasts, but on those of the French, where their Government has placed similar barometers at all coast stations, and has supplied them with translations of the Board of Trade Manual.

18. While thus endeavouring to realise a few practical results from some of the voluminous accumulations of facts hitherto usually remaining bound up on the shelves of many a library, or stored in observatories, it may be that some insight has been obtained of the manner in which atmospheric changes are occasioned, and air-currents or winds set in motion, around our world, chiefly by the sun and moon. The luni-solar theory to which I refer appears to be so much in accordance with the observed facts, that each month adds to my own impression of its truth; but it would be wrong not to say here distinctly, that it is not yet admitted by the highest scientific judges.

19. In order to estimate fairly the nature and practical value of these *later* results arising out of the Meteorologic Office it may be stated summarily that, as the *objects* are to save life and property; to enable small vessels and boats to avoid or prepare for dangerous winds, and to take full advantage of favourable weather: to inform ships about to leave port, or approaching land; and, generally, to inform, if not to caution, the maritime community,—their importance is self-evident.

20. The daily forecasts so extensively, yet without public cost, sent everywhere by the newspapers (whether the full tables are published by them or not), together with the regular tabulation of facts observed in numerous and widely separated places, afford general information now highly appreciated by a very large and increasing majority, although they are at present only tentative, and liable to errors of judgment, in drawing conclusions, however reliable the facts.

21. Lastly, Sir, I would request that you will notice a few other papers appended to this Report, with a view of showing that while a new and extensive utilisation of meteorology has been pressed forward, for the advantage of all classes, a continuous advance has been made in carrying on the original purposes for which this Office was established.

I have the honour to be, Sir,

Your obedient servant,

To the Right Honourable  
T. Milner Gibson, M.P.,  
President of the Board of Trade.

R. FITZROY,  
Rear-Admiral.

## D.

1863-4.

### NOTES ON FORECASTS AND CAUTIONARY SIGNALS.

Estimates are now under consideration for the expenses said to be requisite in order to maintain the present system of daily publication, with such occasional telegraphic warnings of bad weather as may be advisable, in *addition* to all previously established duties; and as a small increase has been asked for, which should be explained satisfactorily, the following notes are submitted—previous to stating the probable expense.

#### FORECASTS OF WEATHER.

Many persons have asked questions about forecasts of weather and their principles. Some have impugned their accuracy, and a few have demurred to their having any claim to a really scientific basis. No doubt that very different views of atmospheric commotions or changes are taken by able men, and such subjects may scarcely seem worth their earnest attention, because as yet they have not been brought to the verification of a rigid mathematical analysis. But to metaphysical inquiries, and to other researches or avocations, indispensably useful, one might take objection and decline their study on similar grounds. Meteorology not only abounds in physical facts excessively useful as well as interesting, but it demands an extensive range of intellectual and extremely comprehensive considerations. One cannot take it into full use without due study; yet who is there without an independent opinion of the weather, and perhaps too little understood barometric indications.

Having ventured to express these thoughts, I now will attempt to show in as few words as possible, what are the practical objects and the scientific conditions of the forecasts for which I am responsible.

Having ascertained that the principal atmospheric currents are incessantly in more or less circuitous but mutually opposed progress, sometimes side by side, but in contrary directions—sometimes superposed, one or other being nearest earth's surface temporarily, and always having lateral as well as direct progression—we have a clue to their dynametry by observations at distant stations and by telegraphy to a centre somewhat like that which might be given in a tidal estuary, by ships swinging in advancing or receding tide-streams, to an observer at a fixed station.

By the tension, or barometric pressure, the temperature and other characteristics of the air at each station, by the approximate knowledge now possessed of the set, turn, or progression of atmospheric currents—of their relative breadth, horizontally, and of the circuitous eddies usually, or often, between their edges or boundaries—one may tell what conditions of air exist within some hundred miles around (say, a sweep of 500 miles from London as a centre), and, which is of far more value, what changes or movements are impending.

The capability of doing this for about two days in advance rests on the proved fact of a general lateral translation toward the east in the temperate zone, while northerly, southerly, or other (mixed) currents of air are in very various movement: the practical results, on earth's surface, being usually composite motions.

By thus estimating the atmospheric area above, around, and within some hundred miles of us—by statical observations at the same hour, and by summary calculations of a dynamic character—all the principal motions and changes are brought within the grasp of forecast.

But this applies only to general and principal averages, not to local peculiarities or special disturbances, so limited in nature that they do not affect more than a few score miles expanse of atmosphere.

It ought to be kept in mind that broad shallow currents are the chief aerial features,—below, or between, or among which there can be no vacancy (unless momentarily, as when a violent blast of wind is caused by a sudden approximate vacuum)—and that when currents act against each other (gravily restraining upward motion) their tendency is to cause more or less rotation.

The lamented Espy said that wind always set from the place of higher barometer toward that of lower; but he also said (which some writers seem to have overlooked) that the meeting of such winds causes a circuitous effect. Espy's views accord with those of the authoritative Dove and our own illustrious Herschel. The words cyclone and cyclonic have been so associated with storm, that few persons attach to them now the simple original sense of circuit or circuitous. Without duly following the progress, and ultimate destination of material fluid air, having great bulk, infinite elasticity, and more or less vis inertiae, (or rather momentum), according to mechanical laws, some persons have imagined that air currents intermix, (as if unresistingly,) instead of opposing each other; for a time, especially if in rapid motion, just like the currents of water, in a river, or in the sea. Air streams, in opposition, must deflect or turn each other; or go upwards (against gravitation). Without a general lateral or transmeridional movement, or translation of atmosphere—toward the east in temperate zones, but westward in the intertropical regions—in addition to meridional movements from and toward the poles, (of which full explanations are given elsewhere,) it would not be possible to forecast the character of wind and weather beyond one day's interval. It is the prescience of dynamic consequences, arising out of statical facts, that enables a really scientific calculation of *probabilities* to be made. Certainty is not yet attainable; but a fair average probability, for a limited area, or district, is already within our reach. Out of these forecasts spring the cautionary notices of impending storms.

It is by continuous observations of changes and indications of change, that we are now enabled to decide and direct with confidence. Without such a generally informed state we should often be surprised; as we should derive our warnings solely from distant stations, and should not be able, as now, frequently to warn even those outposts—such as Nairn, Valentia, or Rochefort.

That errors have occurred—that we have been too slow, or have given warning where it seemed to have been unnecessary—may appear to have been unavoidable in so new and tentative an experiment. But there have been four special causes of occasional failure which ought to be fairly considered.

First—A watch having been officially set to report on the results of each cautionary signal had somewhat discouraged such speedy action as would otherwise have been taken in signalling—fearing lest a record of their *inutility* might be compiled, rather than the contrary.

Secondly—Public offices are not open on Sundays, and only a few principal telegraph stations are then available: hence there is sometimes unavoidable delay between Saturday and Monday.

Thirdly—No one or two individuals can be always at their station, all the year round, from morning to night. The new subject of forecasting and warning is hardly yet so familiar to many persons, however zealous, as it may become in due time, if encouraged.

Lastly—The telegraph offices are not open, in general, till eight or nine in the morning, or after those hours at night. Therefore official communications are only practicable—over so wide a range as ours—between those times of the day. To communicate between Nairn, or Valentia, or Rochefort, and our office in London, usually takes about an hour in actual practice.

For proofs of what has been thus stated, perhaps too dogmatically, about the movements of air currents, and their lateral translation, I would suggest a reference to published works, except in one recent and very remarkable instance. During the storm of last October 29–30th, remarkably sudden shifts of wind

took place, near the same time, about many places in nearly a *meridional* direction across England, by Oxford, Greenwich, and Nottingham. To some meteorologists they seemed unaccountable. If we contemplate parallel currents side by side, moving rapidly in opposite directions, and having also a *lateral* movement to the eastward, such sudden and meridional changes may become as easy to comprehend as those so well described by aeronauts who passed out of one stratum or current of air into another, so closely superposed that while the balloon was tilted, dragged aside, as it were by the one, the car was influenced differently by the other. This momentary effect was accompanied by a rushing sound, like that of a torrent of water. These currents had different temperatures, electric characters, degrees of dryness or moisture, and horizontal motions. The sound, caused by pressure and friction, is suggestive of various ideas in connection with heat and electric considerations, inadmissible here. In this case of course the representative of an observatory moves vertically, through horizontal air currents—at times differing in velocity—(referred to earth's surface) from some 30 to 60 miles an hour. In the former instance—that of a land station—the currents are separated vertically: their division passing across any place suddenly, but horizontally.

This supposes an extreme case—when the currents are directly opposed—but generally they meet or cross at some considerable angle.

At the present time, our meteorologic communications are utilised, and highly appreciated on the continent. At about ten o'clock in the morning (as soon as London) Paris receives notices of wind and weather from our most distant stations, and distributes them. Two hours afterward the French Government dispatches our forecasts, and (if any) cautionary notices, to more than twenty stations on the coasts of France, and we send to Hanover, besides other places. This British system has therefore incurred a large responsibility.

"What does it cost?" is of course a frequent question. The Meteorologic Office of the Board of Trade, and for the Admiralty likewise, was established in 1855, with a yearly estimate of 4,200*l*. This was for many duties, exclusive of those now superadded—not then contemplated. To include and provide for all, with these additional objects, and their contingent expenses, I now ask to have 5,800*l*., being only 1,600*l*. more than in 1855–8, when meteorologic investigations had not led to their practical utilisation *nationally*.

## E.

### NOTE ON CHARTS, CURRENTS, &c.

From our synoptic charts, and other accumulated reasons, I now feel sure that the simply *mechanical* action of two (or more) air currents are the *immediate* causes of all our atmospheric motions, and that the antagonism of heat and cold occasion those currents—without electric *origination*—the developments of electricity being *consequences* of the atmospheric *action*, excited by *cold* and *heat* (space and sun).

Incessantly as the earth turns, atmospheric currents are moved, and their normals are modified by circumstances—often varying. Oceans, mountains, deserts, forests, even rivers affect the winds in their course, progress, and nature.

Constant progression *toward* the west,—in the intertropic zone—*must force* as incessant a movement of return toward the east—over, between, or under the perennial westward draught,—to equilibrate the fluid atmosphere, which is an almost generally concentric expanse of air—elastic, gaseous, infinitely mobile, chemically homogeneous, and *sensibly* not much exceeding ten or twelve miles in *depth*.

Each of the air currents acquires momentum, and each has obstacles in its progress. The effects of obstacles are not confined to their locality, but are carried elsewhere by the general movement.

Similarly, but on a merely microscopic scale—effects of rocks, piers, shoals, and vessels, are seen in a river, or tideway,—where eddies, swells, lines of broken water, rippings, or discoloration, are traceable to long distances from their causes.



All the variations and apparent anomalies of air currents, or winds, are remarkably like (though vastly more extensive and complicated, on account of elasticity, &c.), and indeed may be roughly illustrated,—in explanation, by oceanic and fluvial movements.

In the temperate zone the chief currents of air run against, and over or under each other—one follows the retreat of its opponent, or presses onward (direct or deflected), as the other runs in a nearly opposite direction, at the same level.

When this last condition occurs, horizontal eddies are caused,—travelling between the juxta-pressing breadths of air (hundreds of miles in extent, possibly much more, often far less; but always very broad in proportion to depth,) and carried along by them,—for a very few days, or only hours. These cyclonic effects are near the principal points of meeting, or *nodes* of the main currents.

As one current fails, becomes less in velocity, quantity, or momentum, another increases; but not *immediately*. Time must elapse to admit of changed impulse, altering old and exciting new movements, in any direction. Once effected the result is seen in a flow (or wind) from the one place (that of most pressure or highest tension) toward the other, until a balance is restored.

Another remarkable and interesting mode of aerial action is when the main currents are so equably impelled and co-extensive, that their antagonism is felt through many degrees of longitude at *nearly the same time*,—and unusual commotion, with many combinations, result over an extensive area: some effects being like those described—others cyclonic—the whole, however, being carried *eastward*, bodily, in accordance with the normal circulation of the atmosphere in temperate zones.

Lay a line (or rule) across a map of Europe—from Cape Clear to Toulon—it will lie N.W. and S.E.—nearly (true). Imagine a parallel line extended each way from Cape Finisterre, and let this be supposed to represent the *average* advancing front of a S.W. wind, which, as it moves toward the N.E. (*over*, between, or here and there, even under the air *already* impelled along the surface toward the S.W.) *also* sides eastward? The resulting effects seem to be more rapid advance in *some places* than in others, through a space some 20 or 30 degrees wide, and a consequent protrusion of stream-like quantities into, or over, or under the polar current, considerably before the *whole front* has arrived. Such streams, opposed by polar air, recoil, or turn, or eddy—hence squalls, or even cyclones.

When a cyclone is thus caused, or by an actual lateral action of main bodies of air, it does not lose its impetus and momentum suddenly; but travels on between the parent bodies, impelled *more northward or even southward* of east—*according as either current* is the gaining, or advancing body—along earth's surface.

On the 1st, 2nd, 3rd and 5th of December 1863,\* there were advancing bodies of air—each in great volume, and though their effects were very various—several characteristics were distinctly traceable. Owing to the *general* advance of one from north-east simultaneously with the other volume, or impulsion, from south-west—effects of a *similar nature* were felt all across southern and part of northern mid-Europe, say Ireland, Great Britain, Holland, Denmark, Germany, France, and Northern Italy.

But these effects were not due to *one travelling* cyclone—(*monstrum horrendum*!) they were results of two great atmospheric impulses—*seemingly*, not *truly* waves, but rather as it were pulsations from opposite directions, breasting each other in mutual opposition! When two such impulsions, however termed, are opposed to each other, or checked by any obstacle, they must swell or rise (if possible) or increase in *tension*. Their tendency (if unconfined) is to break against any impediment to their movements, and the results are horizontal currents. If the encounter is slow and *gradual*, vertical rise alone takes place—with increase of tension—checking any currents along the surface of earth. Of course currents already in motion act against each other similarly—with proportionate effect.

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\* See diagrams.

All our approaching Southwesters appear to have a wave like appulse—*aligning* from Cape Clear or Valentia, by Penzance, to Brest, and *further*, nearly at the same time. Now if such an alignment crossing Finisterre—advances parallel to itself—it will touch Rochefort nearly with Valentia; and, allowing for *resistance* with some deflection by *land*, it may touch Marseilles, Toulon, &c., soon after—(long before any cyclone could travel there *from the north-west*).\*

Complicated and difficult as the comprehension of all bearings of such cases of atmospheric commotion undoubtedly are, we must not be deterred from prosecuting them, or discouraged by quasi-uninformed men (on *these* subjects) saying—"Meteorology is a mystery impossible to clear, and unsuitable for practical purposes." Dynamics—a careful observation of the movements of fluids in general—a full allowance for expansion of air—for its *resilience*, and, when cooled, for its *contraction*—for *deposit* of fog, dew, rain, hail, or snow—for heat, latent or otherwise—and for chemical changes—will gradually aid in developing all atmospheric questions.

While the principal currents are impelled against each other, or one over the other, atmospheric pressure (or tension) is augmented; and if equality continue, with gradual action alone, the result is a calm, with fine weather;—but the contrary state or inequality—failure of one force—is directly followed by motion and its immediate results.

Among these *results*, I now venture to place electric action—"heat—a mode of motion."

Electricity produced or excited in *common air*, even in a room, causes drops of water to fall, or will make a breeze.

Electricity is developed by the *frictional* action of *steam*—even *gas*! as shown at various institutions—especially the Polytechnic.

#### WIRE-TREMORS.

Comparisons and registration of "wire disturbances," or "earth currents" have induced me to believe that they are all electro-magnetic—occasioned by action of atmospheric currents—and, consequently, only *indirectly* caused by *solar* action. I *believe* that whenever the magnetic instruments at observatories have been affected (as in a "magnetic storm") and whenever telegraph wires have vibrated to nature's operations—or have been disturbed by "earth currents" (so called) there has been a concussion, a commotion, or a much developed antagonism of *air currents*—*somewhere* within the farthest atmospheric limits, if not within a hemisphere.

A spider in its web "feels at each thread, and lives along the line." Does not the earth—even more than a telegraph wire—conduct electric or magnetic influence? Is not an earthquake felt, even by vibration alone, *thousands* of miles? And can a *violent* explosion—lightning and thunder—*anywhere* fail to cause vibratory or electric effects in *some*, if not in many directions?

Jan. 21, 1864.

#### F.

#### EXTRACT FROM LETTER TO ABERDEEN, ADVERTING TO SOME RECENT SUMMARY OPINIONS.

It does not appear *safe* to judge from *only a few* marked instances, in times when means of obtaining *many simultaneous* observations were far less available than now.

But the courses usually taken by *central areas* of depression (or least tension) of barometer at different times of years in different years—and perhaps certain *periods* of years—are important. Luke Howard specially noticed the lunar cycle of 19 years as including minimum and maximum condition.

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\* See "*Bulletin International*."

We have found differences of a notable kind, in local climate, at intervals of *about* ten years, between maxima and minima. Stevenson (of Dunse) said that during three consecutive years he had observed cyclonic storms (or gales) taking a direction—usually from South-west Ireland across the “Merse” of Berwick. Upon the course taken by (or the axis of) such circuits, strong or even moderate, in *outer* velocity, as may be, the precipitation of vapour, in rain or snow, would depend on such occasions, being always in excess on the tropical side.

Perhaps we *suppose* the changes are now “almost simultaneous,” because we hear of them more rapidly than formerly, and from more localities; but the said places are not affected by the *same* changes.

Successive, or consecutive *similarities* of alteration may occur, occasioning *appearances* of simultaneity.

In our atmosphere an incessant but most variable opposition of extensively wide polar, with yet vastly wider tropical, currents *inter-act* at equal or at various levels between the polar and the tropical regions. Suppose such aeriform currents sending out tongues (as it were like shoots of flame) onward direct, in advance of their *originating* current, above, into, or even below its antagonistic volume—(which is similarly preceded, however, by out-shoots).

Imagine such streamlets every way checked, deflected, or intermingled as they curve or curl lightly or forcibly, as it may be, according to resistance and impulsion (*vis a tergo*); and finally, consider the whole mass in progressive translation eastward, which will show what is meant (without any diagrams) by the *meetings* of air currents occasioning atmospheric changes; and how the place, manner, and momentum of their meeting determine all the various complications.

When two currents are passing in opposite directions, side by side, each acts on the other more or less actively, with greater or less *adhesiveness*, tendency to *draw* along or *turn* (rather than to operate by direct friction, as if each were a *solid* mass). This tendency, on a *great scale*, causes a gradual change in the sensible direction of *wind* along earth's surface, throughout the space that may intervene between one main current (say the polar) and its opponent.

As the two main breaths pass on laterally (translated toward east), while each flows onward direct, if the tropical is *passing off* and the polar coming on over any place, the wind will appear to veer, or shift, from the average south-west of a tropical current, through the north-west, and into the north-east or the polar movement.

When the latter is almost ended (having passed off to eastward, or having lost momentum *from* the polar regions,) its western side is more and more affected by the advancing tropical volume: hence the change from cold, dry, north-east to east, then to south-east—usually damp, if not wet—then through warm and rainy or snowy south to south-west: and thence to north-west again, or back; or fluctuating in every way—as either current temporarily predominates:—or the two, *equally* balanced, contribute to and maintain that normally prevalent westerly wind which is the “antitrade” of temperate zones two-thirds of the year—usually a composite or mixed wind; a combination of the two main currents.

*Much* more might be said on this *new* view of a subject in connection with parallel currents, hitherto explained only by reference to the earth's *rotation*; but it appears a *simple* idea, and, though given thus, in outline only, it may aid in illustrating, as well as explaining *many* meteorologic questions.

When two currents of wind *meet*, with great *velocity*, laterally, or otherwise, the result is *sudden* change of direction, extreme effects on barometer and thermometer, and *most violent* wind: usually with electric results and much precipitation,—as hail or rain.

Such collisions set immense volumes of air in motion *circuitously*, being especially causes of gyrations which do not soon lose their momentum.

The two main currents are persistent, during a certain time, through which only can such cyclones possibly last.

Now the principal *meetings* of these great governing volumes, in *mass*, are nearly along certain parallels of latitude; whence each sends out extensive

currents—*superposed, or interspersed*—every space, however, being always filled (though with air of varying nature and unequal tension)—no approach to a vacuum existing anywhere except in a local gust or blast.

It is not till temperate zones are reached that the usual *antagonistic* collisions occur. In low latitudes one (the tropical) current, or rather *general movement*, is through upper regions—without opposition—while a polar indraft is setting along the surface of earth, or ocean, toward the most torrid zone. Mutual counteraction begins in juxta-tropical parallels (commonly called “horse latitudes”), the regions of high barometer, calms, light variable winds, and squalls. some few degrees outside the tropic. Hence to the polar region is incessant inter-opposition; and as the tropical volume is far greater, more extended and expansive than the polar, it has longer *prevalence*, flows sooner *down* into any region of *lessened tension*, and generally exists as a *high upper current* (however *altered, or combined*), while, *apparently*, there is a polar wind everywhere along the surface of earth or ocean.

These ideas should tend to show the importance of remarking periodical changes of our climate and their respective localities. Though Continental *effects* of change—such as snow and rain, or severe frosts, are *greater* over extensive cold (or, in *summer*, heated) land—because winds over mountains, ice, or desert, there *meet* the tropical—our islands are not subsequently affected by *those* great results—(to the eastward of our meridians, and in a part of the atmosphere that has passed over them)—unless polar winds are temporarily so much turned or deflected as to reach *us* over a part of the continent with a considerable amount of *easting* in their direction; their velocity *direct* being then very much greater than their progress, *laterally*, in mass toward the east. *Continued* cold on the Continent *influences* exceedingly our own islands so nearly adjacent. When polar winds extend far, even into the regular trades, all the way from polar regions, they are much deflected by earth’s rotation, and become rather like a great extension of the normal trade winds.

26 Feb., 1864.

## G.

### REMARKS ON CAPTAIN MAURY’S Letter respecting METEOROLOGIC TELEGRAPHY.

Having read in the *Courrier des Sciences*, and in the *Bulletin International*, published at Paris, a letter from the celebrated Maury respecting Meteorologic Telegraphy, in which he gives certain views the importance due to his authority—and as their tendency is not of a *progressive* character, owing perhaps to his own able mind having lately been unavoidably engrossed by lamentable internecine war,—it appears to me a duty—considering the public interests affected—to comment briefly on my friend’s letter.

Captain Maury, like many other really competent and authoritative judges of various scientific questions, has not had time, means, or inclination to study the daily complications, and published facts of atmospheric changes.

It is only at such centres of communication, and continuous reference, as Berlin, Paris, or London, that deductions can be drawn satisfactorily, after years of experience.

Not only are telegraphic correspondents, at distant stations, in considerable number, indispensable; but the collection and collation of accounts, or descriptions of weather, in as many places as may afford them, must be practicable—speedily.

No private individual, unassisted by public aid, can have such machinery; and therefore his opinion of the systems in operation cannot be so valuable as the prestige of his name might lead the public to suppose.

For example: In this office, records, or data, have been gathered and considered during ten years, unintermittingly. My assistant, Mr. Babington, has incessantly devoted his chief attention to the constitution, and dynametry of the atmosphere—not over Europe and the Atlantic only, but the whole

world. We act on the same principles, and it is now absolutely a matter of indifference whether he or I draw the forecasts of weather—or send out cautionary signals.

This *could* not be without a definite system—on a truly scientific basis.

At Berlin the esteemed Professor Dové, with 30 years' of European reputation, has had accurate and extensive information for many years; while at Paris—excellent centre of continental communication, and great telegraphic combination—the eminent astronomer and senator, Le Verrier, well aided in meteorology by a learned electrician and physician, Marié Davy—have vast advantages in considering and treating meteorologic questions.

While these centres of opinion—aided by maritime reports—such as the *Moniteur de la Flotte*, the *Shipping and Mercantile Gazette*, and numerous local publications, have the means of comparing, checking, and duly considering each day's forecast (*prévision*), and the weather actually occurring afterwards—advantageous sources of opinion are available to which no individual can lay just claim.

In corroboration of what has been said about the general value of forecasts—as applicable to a *range* of coast, and *prevailing* direct wind, not specifically to *confined* localities, or mere eddy winds—I may refer you to Capt. Mouchez, my esteemed colleague in meteorology, at the Ministry of Marine in Paris.

Having premised thus much, allow me to say that in discouraging such forecasts as are now drawn in France and England, Captain Maury is unaware how completely he would destroy the scientific foundation of telegraphic *cautionary* notices (often, but less correctly, called “storm warnings”).

Only in consequence of attentive and incessant study of atmospheric dynamics, as well as certain statical facts—after a due apprenticeship (so to speak) to the very comprehensive subject—can adequate skill be attained in acting with these recently combined atoms of experimental knowledge. Like the not distantly related practical science of magnetism applied to compasses in iron ships it has yet only a few votaries—its intricacies and necessarily prolonged study not attracting some modern philosophers who would grasp all manner of subjects—although hardly able to realise mentally half the varying conditions of air and ocean. It is supposed, by many, that forecasts of weather, and their occasional results,—advertisement of strong wind, or, it may be, warning of a tempest,—depend only on notices sent from distant places at which a storm has begun. Nothing can now be more fallacious. True it is, that in 1861, we began with the belief that by such aid we might do so. But advances have been made day by day—and during the last year, or more, cautionary notices have often been sent by telegraph to the farthest stations—even most toward the coming storm (or to windward of us) in good time to warn them of the preparation necessary to be made in an exposed seaport, such as Valentia or Aberdeen. As I have said elsewhere on this naturally, and *very* properly *disputed* question—facts are as the ground—telegraph wires are roots—a central office is the trunk—forecasts are branches—and cautionary signals are as fruits of this youngest tree of knowledge.

Permit me now to turn for an instant to some special facts, too little known, even to one so well informed generally as the sagacious Maury.

In the zones of the world, usually called temperate, true east winds are so rare, that they become quite exceptional. What we call, in general parlance, easterly, or east winds, are polar currents more or less deflected by meeting opposition of air or land.

In these zones the atmosphere has a general progression toward the east. Storms, or vast eddies between great breadths of mutually antagonistic currents of air are therefore carried along (translated) toward the east (more or less deflected by local conditions toward the north or south), and, having passed the meridian of any place are *gone*—excepting their rearward effects—as far as the places under that meridian are concerned. Such storms may not, however, reach very far, in a meridional direction, although travelling eastward during *two or three days* on rare occasions. Hence it is obvious that in temperate zones, stations, for special warning statics, are required—north, west, and south of a centre—but not toward the east, except for general information,—and to be themselves warned.

Ask the learned and most experienced Quêtelet, who so satisfactorily pre-

sided over the Brussels Meteorologic Conference in 1853, whether he ever has observed any continuance of true east wind in Belgium, or enquire from any person of experience—at sea especially—whether the so called east wind is not a north-easter or a south-easter, while in *force*.

In this country, as in America, some *misquote* the lamented Espy (who said the wind blew from places of high barometer toward those of low pressure) by ascribing to him—a most unmathematical corollary that all gales are “straight lined,” and that cyclonic circuits are “fallacies.” Such persons surely betray themselves. Air moving from various spaces of high tension toward a limited area of *depression* must meet, and have a tendency to gyrate, being unable to go far upward on account of gravity. Any such upward determination must tend, however, by its overflow, to augment the tension or pressure about the outer portions of any such circuit.

We find here that the main currents, polar and tropical, have very different electric characteristics—one, the polar, being always plus; the other, always minus—if pure (unmixed with the polar).

We also have found the telegraph wires much disturbed when these main (principal) currents were beginning to act positively in force. No great tempest—no heavy polar or tropical gale has occurred here since 1860, without more or less “*wire disturbance*” (as the telegraphists say) and I am led by these, with other concomitant facts, and examination of numerous sea records, as well as registers on land, to believe that such electric effects are caused by atmospheric collision,—and that “*magnetic storms*,” sedulously watched now at many observatories, are *results* of atmospheric storms, somewhere in one hemisphere or the other, instantaneously felt through air, however remote—either by conduction, or by vibration—as an earthquake is felt on board ship in the middle of a deep ocean, even the South Pacific.

February 25, 1864.

## H.

### NOTE ON LETTER in *Bulletin International*.

16th March, 1864.

IN the *Bulletin International* of the 12th instant M. Marié Davy asked “*A quelle cause devons nous attribuer ces grands tourbillonnements de l'air?*”

Having particularly studied this interesting branch of atmospheric dynametry, and trusting to authorities like Sir John Herschel, Professor Dove, and others, during whose lives meteorology has been one of their pursuits, I will venture to offer a few observations.

Assuming that Hadley's and Halley's original hypotheses are sufficiently supported by the best subsequent authorities, and definitively proved by recurrence of accumulated facts—by adding to *their* views Dove's “parallel currents” and “gyrations” of wind, besides Herschel's “antitrades,” we are enabled to advance at once into details, easy *now* to trace out and connect.

Without adverting here to views circulated from the Board of Trade, since 1855, it will suffice to say that certain *periodic* effects of temperature, and of *gravitation*, have been traced by facts, whence the following *four* inductions seem warranted.

First—A very small tidal effect, caused semi-diurnally, by solar influence, and felt (meridionally) about the torrid and tropical zones.

Second—A solar tide, however small, due to gravitation, and only evident by its dynamic effects *horizontally*.

Third—A lunar tidal action, not evidenced vertically but *laterally*, and with *force*.

Fourth—A *mutual* attraction and consequent tendency (not unlike the effect of induced magnetism) between contiguous volumes of air, which occasions more or less adhesion (or resistance to separation), when they move, and a certain friction that may have *any* degree of force, from the gentlest movement

of a light breath to the escape of steam from a boiler into cool air, developing electricity (as seen experimentally at the Polytechnic). Now these results, (facts, accordant to philosophic principles,) when combined with previous generalizations, in their application, may be found adequate to solve many interesting but hitherto obscure problems in meteorologic dynametry—those especially which have immediate reference to practical forecasting of the weather.

The first is familiarly known to meteorologists as depending on the sun's position, and being regular to an hour or two, though not recurring exactly (as said by some) in *all* intertropic places, because occasionally affected by peculiar local conditions, such as high mountains, arid deserts, heavy continuous rain, or by storms.

The second effect of solar attraction is shown by the differences between syzygial and intermediate results, observed in connection with those of the moon's action.

The third and by far the most important disturbing cause, next to *heat and cold*, appears to be lunar attraction. But this effect of gravity is not *apparent*—like oceanic tides. Oceans are intersected by land; water is an inelastic fluid; a tidal impulse is not soon checked—the ocean *in mass* seeks equilibrium;—after disturbance it reverts, and with acquired momentum does more than restore itself to position—it advances *eastward* and then again *recoils* from its eastern boundary.

Air, our atmospheric enclosure, from 10 to 15 miles in depth, (practically considered,) is free to move in *any* direction,—excepting against a few high ranges of mountains such as the Himalayas and Andes, which on an *average*, are not three miles high, and do not extend through *many* degrees (*meridionally*) at their highest elevation; although a few peaks attain four or five miles in measured altitude.

The combined effect of moon and sun, or the “*luni-solar*” action of gravity on this *outer* atmosphere, has a tendency to draw it toward and after those bodies, as the earth turns eastward, whence motion, as of a perennial current, might be caused, did not “*ante-attraction*” (anterior effect on the mass *approached*) and centrifugal impulse of rotation, act in a contrary direction.

Antagonistic forces being thus nearly balanced in effects, no important longitudinal or equatorial, or east to west movement of fluid air exists; but the *waves* raised and *upheld* (by sun or moon, or by both *together* at syzygy,) *under* which has been an indraft, with momentum—are constrained to subside by *overflow*—running off in horizontal currents *meridionally*.

While so *lifted*, upheld by moon's or sun's attraction (however much above normal elevation) very little tension or sensible pressure on a barometer differing from that read off a few hours sooner or later would be noticed, because the earth's attraction diminishes as that of the luminary increases; and there would be no *other* reasons, *usually*, for barometric effects, of much comparative moment.

In those regions there would be no mutual *antagonism* or *overrunning* of air currents, no condensing body of cold dry polar air acting, as in temperate zones.

Not *long*, however, does *upper* air retain a *meridional* direction, whether maintaining its *equatorial* velocity, for a time,—and therefore moving more and more toward east, as meridians converge—or only impelled, by *tendency to equilibrium*, toward the polar regions—whence air is incessantly drawn that must be replaced.

In considering luni-solar attraction—the *difference* between vertical action and tangential, that on the torrid zone, and at the poles, (so dissimilar in their *directions* and in their *effects*,) should be carefully considered—one being *direct* the other as it were *glancing*.

High mountains and clouds crossing stars afford the most direct evidence in *low* latitudes of *upper* currents occasioned by luni-solar action. They are always seen in the tropics. Their variations and *periodicities* of effect have been observed to correspond nearly with lunar *intervals* (not *usually*, though sometimes, with the *phases*).

Hence ample causes exist for variations in force and regularity of upper, returning, or tropical currents of air, which must occasion many consequent

irregularities in the lower advancing, or polar winds, even in low latitudes ; but vastly more in the temperate zones, where other circumstances operate, and *variously*.

Volumes of tropical air, from around the whole world, thus pressing from every direction along, or across, converging meridians toward the poles—occasion incessant *antagonism* from polar currents in the middle and higher latitudes, but especially in the temperate zones.

Instead of passing *over* these advancing breadths of atmosphere the winds from tropical zones, when near middle latitudes, *usually* move along earth's or ocean's surface more or less interrupted, intermixed with, opposed or displaced by, occasional polar winds ;—and the collision of these incessantly antagonistic currents—at variance in quality and quantity, as well as in direction—is proved to be the cause not only of our storms, but of all minor changes, and of their *ordinary*, more or less rotary (rather indeed *semi-rotary*) effects, as commonly witnessed.

When two currents are passing in opposite or different directions—each acts on the other—and between them (if both move) is a *comparatively* neutral space. Unless very forcibly pressed together—by lateral, cross, or *wedging* action—each current yields, in some degree, to the other—(elastic air much more than water). If one be moving (say) to south-west—the other toward north-east—each some hundred miles in width (however shallow) there will probably be a space of very many miles between them, in which the wind will change from one point to the other, through a semicircle, or other curve, gradually (if *moderate*), and thus an appearance of turning, semi-rotation, or gyration of wind, is caused, at any station, in a simple manner, irrespective of *earth's motion*. Through the *next* current of air, *direction* of wind remains steady, or nearly so, until the western edge approaches, when a similar *half turn* commences, which, with the former, completes a gyration, when the other stream, or current, attains the place of observation, not usually by direct, but by *lateral* progression (as they move eastward with the whole mass of atmosphere in that zone).

As the *highest* barometer and *lowest* temperature are about midway in the polar current—the lowest or least tension, with the warmest air, being near the middle of each tropical current—it is natural that tabular co-ordination, in curves, on a diagram, should have induced ideas of “*atmospheric waves*,” moving from north-west to south-east.

When antagonistic or even crossing currents act *impulsively* against each other—forcibly, and with momentum—more than half a turn—even a cyclone is caused. If violently, and its *causing currents persist*, such a cyclone may last two or three days, and be carried on eastward between its originating currents.

Observations have shown that impulses or “*pulsations*” extend from tropical latitudes toward the poles ; that they are resisted and divided into *currents* unequal, irregular, and diverging (as it were) projected like tongues, streams, or shoots, from broad tropical impulsions, which sometimes advance like immensely wide “bores” (of rivers) causing great commotions, such as storms, cyclones, gales, or squalls, along their *front*, and between the *streams* sent on in advance some hundred miles, more or less. The alignment of the front of such an impulsion (tropical “*downrush*” of Herschel) is north-west and south-east, nearly (if not altered by land).

As thus impelled with great momentum outshoots advance, and alternating volumes or streams of polar wind, are met ;—by which collisions, squalls, semi-rotary, or even cyclonic, are caused—tension is raised by mechanical resistance—temperature is affected, and storms often follow.

Such movements occurred on a *great scale*—early last December, when a tempestuous space extended from the Atlantic to Italy, and some observers thought that one and the same storm, even the *same cyclone*, traversed Europe from Ireland to Rome, in little more than 24 hours,—therefore imagining that the *centre* of the storm moved about fifty miles an hour ; with which the wind's velocity at one part of the gyration must then have been about 130 miles an hour *continuously*.

Such a view requires the progress of that storm to have been from the north-west toward the south-east, which our charts show did *not occur*.



It travelled, as usual, *toward north-east*, while *other* rotary or semi-rotary storms were occurring in the south of France and in Italy,—all within two or three days of each other, between the Atlantic and Adriatic commotions—but *different* disturbances, occasioned by the same great tropical action against Arctic cold atmosphere.

Usually such tropical impulses seem to divide or branch off into currents—as any resisted water-wave impels streams onward horizontally, which separately intermingle with other *resisting* fluid, at rest or moving antagonistically.

To produce a *complete* cyclone there must be *great forces* engaged, in order to cause sufficient impulse, with momentum, for entire and *continued* rotation.

Many, if not most of the gales, supposed to be *cyclones* (in *one side* of which the observer *seemed* to be) are believed by the present writer to have been such *semi-rotary* effects of adjacent currents, in antagonism, as have now been described.

All the effects of gyration, or rotary change, may be explained by consideration of currents moving *variously*, while all are *uniformly translated* toward the east in the temperate, but toward the west in the torrid zone.

In connection with these subjects a few remarks on the *Bulletin International* may be not entirely out of place, or unacceptable, it is hoped.

Since the first appearance of Meteorologic charts *last summer* (in that valued daily publication), attention has naturally been drawn to the marked isobarometric curves, which seem indicative of such combinations of movements as have been outlined in this paper, intermixtures of advanced tension in a *south-west* to a *north-east* direction, and parallel breadths or bands of alternate high and low tension in similar *lines*, *sectional* diagrams of which have a wave-like curve, which shows the greatest *apparent* undulations in a *north-west* to *south-east* direction—whence a double curve or intersection.

Neither isobarometric curves, nor any kind of wave or *crest lines*, seem to show *directions* of wind.

How can they? Winds being *dynamic currents*, occasioned by differences of atmospheric conditions, tensions, and temperatures—while lines of approximately equal tension are *statical* positions, showing quantities, or amounts, (but not directions) whence the varied *dynamic* consequences are derived.

But they might be shown by *other directional lines*.

We have heard and read a good deal about “atmospheric waves,” and winds supposed to be their *consequences*, but I have not yet been so fortunate as to discover any author’s illustrations of the *practical manner* in which a wave (supposed) from north-west does occasion a south-west or a north-east storm. The mechanical action, the horizontal (or other) motions of fluid air, in volumes, zones, or bands, have not been traced out, or followed satisfactorily. Yet they must be the basis of practical meteorology.

Not irrelevant to these atmospheric questions, and a subject of extreme interest to speculative meteorologists, is the problematic uncertainty respecting our atmosphere’s extreme periphery.

Poisson, in his Treatise on Heat, assumed that the excessive cold of space has a condensing effect on air, causing it to become viscous; and a very eminent mathematician lately wrote to me, saying, that he inclined to a similar view, if not to a belief in its actual *congelation*.\*—Frozen air around our atmosphere! Is there air, or only the lightest of all gases beyond our *sensible* atmosphere? How would centrifugal force affect air in a comparatively solid state? How would transmission and refraction of light be affected? What effects would there be on heat—on tides of air, and on the passage of *meteorites* (if extra mundane in origin?)

These and other great difficulties appear to be in direct opposition to such theories; however eminent the mathematicians may have been by whom they were supported.

There may be a less involved and difficult explanation of this subject (a solution, possibly, of the chief questions) attainable by careful consideration of the dynametry of air, or water, displaced by a solid body moving through either—and by expanding the simile, infinitely.

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\* Sir John Lubbock, Bart., F.R.S.

As a ship passes through water a certain quantity of fluid almost adheres to the solid body, and is drawn along, by induced or cohesive attraction, causing some friction. Close adjacent to this slight, even *film* like quantity, the fluid has less impetus *along with* the ship, and still less as distance increases,—the practical result being that a band, or ribbon-like strip of fluid is drawn onward by and with the ship—actually following after in the wake.

Disturbance caused by the ship's motion affects a certain extent of circumambient fluid, but less and less, as distance from the motor augments, until destroyed by resistance.

May we not imagine that a somewhat similar process is in operation, however vastly grander the scale, around our world? The whole depth or body of atmosphere (*sensibly* ten miles, or thereabout), may be carried on, and around with earth, as a band of water is drawn along by a moving ship; the extreme exterior portion, above the highest mountains, having a gradual inclination, more and more *westward*, till lost, as to matter and motion, in the immensity of space?

Either a *gradual* diminution of such a kind as this must take place, or a *definite limit* of material fluid, air, or gas must be imagined.

And such a *material* limit would demand some kind of demarcation in extent, with relation to effects of centrifugal force, and much more consideration respecting its bearings on light, heat, and their correlatives, than have been applied to our atmosphere, on a supposition of gradual attenuation without definable limit.

March 17, 1864.

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## PARIS.

OBSERVATOIRE IMPÉRIAL, BULLETIN, DU 23 AVRIL 1863.

Des nouveaux Sémaphores des Côtes de France (Extrait).

On voit depuis un an sur les falaises les plus arides et les rochers les plus escarpés des côtes de France, s'élever des maisonnettes blanches surmontées d'une tour dont la toiture rouge, les murs badigeonnés et les persiennes vertes offrent le plus souvent un singulier contraste avec l'aspect sauvage des lieux qui les entourent. Ce sont les nouveaux Sémaphores que l'Etat fait construire sur toute l'étendue de notre littoral. De Dunkerque à Bayonne, de Port-Vendres à Menton, leur nombre ne s'élève pas à moins de cent cinquante,—et la solidité, on peut dire le luxe, de leur installation, atteste l'importance des services que l'on attend d'eux.

Destinés à remplacer les anciennes vigies, ils ne sont plus forcés de correspondre entre eux. Chaque poste est seulement chargé d'explorer l'horizon : Quelqu'avancé qu'il soit sur le bord de la mer, au milieu des rochers, il peut à chaque instant du jour et de la nuit entrer en communication avec l'Autorité chargée du Littoral.

Un fil télégraphique le relie au grand réseau des lignes électriques. Deux Gardiens veillent à l'appareil. Cet appareil est un télégraphe à cadran d'un usage facile, analogue à ceux que l'on emploie sur les chemins de fer.

La tour du Sémaphore est surmontée d'un arbre vertical de 10<sup>m</sup> de haut, muni de trois ailes mobiles qui servent à faire aux bâtiments qui passent des signaux que l'on distingue encore à plus de six milles au large. Le navire y répond avec ses pavillons, et c'est ainsi qu'entre la terre et les marins en mer se trouvent établies des communications nouvelles que l'électricité peut instantanément propager du rivage sur toute l'étendue du continent.

Les avantages que l'on peut tirer des nouveaux Sémaphores du point de vue *météorologique* sont nombreuses et d'une importance facile à comprendre.

Sir,

Meteorologic Office, Board of Trade,

August 6, 1863.

I am honoured by the letters which have just reached me, and I thank you much for having given attention to the subject.

The directions, already in course of execution, to which your letters advert, entirely meet our present wishes at this office of the Board of Trade.

That any others, suggested at a future time by yourself, will be most readily and fully considered—I need not now offer any assurance.

For the present, pray allow me to confine my remarks to existing circumstances and useful arrangements, in immediate relation to them.

Having found by trial and error, that increase of telegraphic extensions, however encouraging in theory, always has some practical drawbacks in additional interruptions and casual delays.

Having ascertained the very important fact that no *principal* atmospheric changes advance, horizontally, from east toward the west, across any part of Europe, or other zones of latitude in either hemisphere usually called temperate, and that two or three days interval, or (equivalent in horizontal translation of air)—about three to six hundred miles of distance—seems to be nearly the limit to satisfactory forecasting (even where ranges of high mountains do not intervene), I have been induced to try a diminution of our range (in appearance rather than reality), by omitting Copenhagen, the Helder, and Lisbon—in order to secure a constant, reliable, and manageable series of stations, as I believe sufficient for their more immediate objects.

At present, the system in this reduced form, appears to work well.

Being thus *limited*, inspection and daily correct attention can be given more regularly—not only at this central office, but by the telegraphic officers and other persons employed.

We now receive morning reports from all stations at or before 10 o'clock. In the afternoon, between 3 and 4, reports are received from a few selected stations—as cautionary checks—and very useful we find them in confirming or correcting the forecasts, which are then dispatched to the newspaper offices for immediate publication.

I also submit to your notice a “Weather Book,” published lately, which was intended to be as practical as so complicated and truly difficult a scientific subject might admit.

The arrangements existing now between Captain Mouchez, under the Minister of Marine, and this office, being well known to and approved by yourself. I will only say here that they seem to answer well, and to give satisfaction in France as well as in this country.

I have, &amp;c.,

R. F.

Monsieur le Sénateur,

J. U. Le Verrier, &amp;c.

Observatoire Impérial,

Paris, le 19 Août 1863,

Monsieur l'Amiral,

Je vous remercie pour les divers documents que vous avez bien voulu m'adresser, et en particulier pour l'envoi de la 2<sup>me</sup> édition de votre excellent “Weather Book” qui est ici dans les mains de tout le monde.

Je suis entièrement de votre avis, qu'un nombre limité de stations, avec une très grande régularité dans les envois, est très préférable à un système plus étendu mais irrégulier; et j'agirai en conséquence.

Déjà j'ai obtenu que les dépêches françaises me parvinssent plus rapidement et j'arriverai, je l'espère, au même résultat avec l'étranger.

Veuillez me dire, je vous prie, d'une manière très précise, quelles sont les stations françaises et de l'étranger que vous désiriez recevoir, pourvu qu'elles vous arrivassent avant une certaine heure que je vous prie de m'indiquer, soit 10<sup>h</sup>, 11<sup>h</sup>, ou midi. Je travaillerai à obtenir ces stations en temps utile; et je ne doute pas que si j'agis en votre nom et au mien, je parviendrai à vous donner toute satisfaction.

De mon côté, puisque vous voulez bien nous envoyer sept stations, voici celles qui nous seraient les plus utiles et dans l'ordre de leur utilité :—

1. Nairn.
2. Greencastle.
3. Galway.
4. Valentia.
5. Penzance.
6. Scarborough.
7. Queenstown (près Cork).

Aujourd'hui que nous avons les dépêches des côtes de France, ce sont les dépêches du N.-O. de l'Angleterre et de l'Irlande qui nous sont les plus nécessaires.

Je désire en outre très-vivement, Monsieur l'Amiral, que vous puissiez m'expédier les dépêches de ces stations aussitôt que vous les aurez reçues. Si quelque station était en retard pour vous, je préférerais que vous ne l'attendissiez pas.

Enfin, toujours dans le même désir d'arriver à une très grande netteté dans l'exécution, je vous prie de vouloir bien, dans le bulletin imprimé que vous m'adressez chaque jour, inscrire, comme par le passé, l'heure de la réception de nos dépêches et du départ des vôtres.

Avec ces renseignements, comptez que j'interviendrai pour réclamer toutes les fois qu'il y aura en un retard ; et j'espère qu'ainsi nous parviendrons en peu de temps à toute la précision désirable.

Si vous voulez bien me dire la forme à donner à nos dépêches, pour que vous en receviez le plus grand nombre avec les moins de frais, je les mettrai avec un soin scrupuleux sous cette forme, tant celles de France que celles de l'étranger que vous désirez recevoir, dès que j'aurai assuré leur arrivée en temps utile.

Lorsque tout cela sera fait, Monsieur l'Amiral, et établi d'une manière invariable et sûre, il restera une dernière chose à examiner.

En écrivant à l'Espagne, au Portugal, à la Hollande, à l'Italie (parceque j'ai à me préoccuper de la Méditerranée), j'ai demandé, outre l'accélération de la dépêche régulière du matin, qu'on veuille bien dans les circonstances extraordinaires, nous prévenir si quelque tempête venait à survenir brusquement dans l'intervalle.

Si vous accédez de votre côté à cette manière de voir, je m'empresserai de vous transmettre les dépêches accidentelles et rares qui me parviendraient ainsi du Golfe de Gascogne ou de tel autre lieu que vous indiqueriez. Aussitôt arrivées à l'observatoire ces dépêches seraient traduites et vous seraient expédiées.

Veuillez agréer, Monsieur l'Amiral, l'assurance de mes sentiments de haute considération.

U. J. LE VERRIER.

Monsieur l'Amiral,

Observatoire Impérial,  
Paris, le 21 Octobre 1863.

Je vous remercie pour le nouvel envoi que vous voulez bien nous faire des deux stations du Nord.

Elles nous arrivent chaque jour en temps utile, et sont de nature à nous donner une plus grande sécurité. Nous n'avons rien de plus à désirer de vous, et nous restons toujours à votre disposition pour tout ce que vous pourrez désirer.

Je vais voir s'il serait possible de tirer du Portugal des renseignements dans les circonstances extraordinaires et sous la condition qu'il fussent transmis en temps utile.

Je sais déjà que l'Espagne s'y prêtera avec empressement.

Veuillez agréer, Monsieur l'Amiral, l'expression de mes sentiments dévoués.

U. J. LE VERRIER.

Board of Trade, Meteorologic Office,  
19th October 1863.

Sir,

I have been honoured by two letters (one dated August 19th, and the other October 1st) from yourself, to which it has not been possible for me to reply properly until now, when the Authorities under whom I act, are returned to London.

After due consultation with those who are more immediately responsible for our arrangements and expenditure, I am enabled to answer as follows, to your letter of August.

Having found that the telegrams sent through your Government, by the Minister of Marine, from Rochefort, L'Orient, and Brest, arrive here as early as our Irish and Scotch telegrams, and are quite sufficient for our *immediate* purposes, it is unnecessary to trouble you by either repetition of or addition to them.

For record, for intercomparison, and for study, your lithographed daily Bulletin is important, indeed invaluable, but for these purposes it is sufficient when sent *by post*.

According to your expressed desire, I have arranged for the regular transmission to the Imperial Observatory, of our early reports from eight stations, being one more than you mentioned.

These are sent, from this office, as soon as possible after their receipt here.

One practical consequence of the atmospheric motion, bodily, eastward, in this zone, is, that observations from places on the continent far eastward, are not in request here, for immediate use in "forecasting," as they can only be used in comparisons, and study, subsequently.

In this centre I now find that daily reports, six days in the week, from about twenty stations are, practically, sufficient.

More would delay, without doing good, while remoter stations, if not *unreliable*, may be in a somewhat different climate, and unable to communicate within a sufficiently small interval of time.

As we have found all our storms move progressively *eastward*, it does not appear that any notices are requisite for *these Islands*, of storms occurring far to the eastward, or further south than the Bay of Biscay. From Portugal, indeed, early intelligence would be very valuable, at times, but telegraphic communications thence, through Spain, France, and this country, are too irregular and (comparatively) tedious to admit of our being warned *in time* from Portugal.

Proceeding now to the subject of your letter dated October the 1st.

It appears that data sent to you, at present, from our eight stations, are in Paris as soon as information of a similar kind is received there from other distant places.

The eight stations specified include all those selected by yourself.

We receive the Bulletin from Paris Observatory, regularly, on the morning following its publication. It is at present impracticable to send our telegrams, in their corrected detail, sooner from eight stations, separately. Neither office arrangements, nor expenditure of money authorized, nor time, will admit of an earlier re-transmission of full reports, from our out-stations, than is now effected.

Brief reports are sent *direct* to the Ministry of Marine at an earlier hour, as you are aware, but they are not perhaps sufficiently detailed for your scientific exposition; as their object is chiefly maritime, for forecasting probable winds and weather; and the information thus received here, through the Ministry of Marine from Paris, seems to be all that we can utilise, in the present state of meteorology, for such practical purposes.

I have, &c.

R. F.

Monsieur le Sénateur

U. J. Le Verrier,

Observatoire Impérial, Paris.

(Extract.)

Observatoire Impérial,

Paris, le 5 Novembre 1863.

Monsieur l'Amiral,— \* \* \* Entre l'arrivée des dernières dépêches européennes et l'heure du dépôt du bulletin à la poste, nous nous trouvons resserrés entre des limites tellement étroites qu'il nous devient très difficile d'assurer le service de nos correspondants, et qu'il nous serait impossible de satisfaire aux demandes d'envoi du bulletin qui nous sont adressées par les météorologistes.

Je me trouve donc dans l'obligation de faire, au nom des collaborateurs du bulletin, une nouvelle démarche auprès de vous, qui avez accueilli avec le plus grand empressement toutes les demandes en vue du progrès de l'organisation commune, pour vous prier d'avancer l'heure d'expédition de vos dépêches.

Les dépêches de France vous parviennent, d'après ce que vous avez bien voulu me dire, *entre dix et onze heures*, et vous m'avez exposé que celles qui vous étaient expédiées plus tard ne pouvaient plus vous être d'aucune utilité. Vous ne trouverez donc, j'en suis convaincu, aucune difficulté à nous expédier aussi les dépêches anglaises pour la même heure où vous recevez les dépêches françaises.

Permettez-moi de vous prier de prendre connaissance de la circulaire que nous adressons à nos correspondants et que vous trouverez insérée au bulletin de ce jour. J'y exprime l'espoir que toutes les dépêches pourront arriver à Paris à dix heures. Si vous pouviez, Monsieur l'Amiral, aller jusque là, et combler ainsi les vœux de tous les amis de la science, nous vous en serions particulièrement reconnaissants, et je prends l'engagement que toutes les dépêches de France vous parviendraient à la même heure.

J'ai le ferme espoir, Monsieur l'Amiral, qu'en m'adressant ainsi à vous dans l'intérêt de tous nos correspondants, et parlant en leur nom, vous voudrez bien accéder à notre demande et nous mettre en état de transmettre nos renseignements collectifs à une heure qui puisse en assurer l'utilité pour le service de tous.

U. J. LE VERRIER.

Monsieur l'Amiral FitzRoy.

Board of Trade, Meteorologic Office,

9th November 1863.

Sir,

I am much honoured by your letter of the 5th instant. \* \* \*

Allow me to state that the cost of transmitting daily (except Sundays) eight telegrams to the Imperial Observatory and five to the Ministry of Marine, besides occasional warnings, amounts to about 500*l.* a year.

In exchange we receive daily from the observatory your bulletins, and from the Ministry of Marine three telegrams, being all that are requisite for our purposes.

To send telegrams direct from London "Central Telegraph Office" to Paris—without coming *here*—may save an hour's time, but would increase expense, as they must be sent separately.

Neither an out-station nor a central telegraphist could duly combine several telegrams and forward them in one message, as at present is done in this office.

But without much increase of expense, I could send you half the number (say *four* telegrams) *direct*, which might reach your observatory at 10 o'clock, or soon after, instead of the eight reports which are now forwarded at noon.

It may be remarked that one transmission of these telegrams, either to the Observatory or to the Ministry of Marine, might possibly be made to serve for both these public institutions.

I have, &amp;c.

R. F.

P.S.—Extract of proposed arrangement enclosed.

M. le Sénateur Le Verrier,  
Observatoire Impérial, Paris.

(Extract.)

Meteorologic Office,  
7th November 1863.

Sir,— \* \* \* I have now to request that you will move your directors to authorize your Central London Station to send daily, *direct to Paris*, a duplicate of each telegram from Nairn, Greencastle, Valentia, and Penzance separately, immediately *after* their transmission to this office?

In each of these four separate telegrams, for the address to London, *Observatoire, Paris*, should be substituted.

I am, &c.  
R. F.

The Secretary,  
Submarine Telegraph Company.

## HANOVER.

(Translation.)

In consequence of the numerous disasters which occurred in the North Sea during the storms which prevailed early in December last, the Directors of the various Marine Insurance Companies have expressed to the undersigned an urgent wish that, in order to prevent as far as possible such disasters, the Royal Meteorological Office in London should be requested to communicate to this country, by telegraph, such meteorological observations as in the opinion of the president of that office, based on scientific grounds and upon experience, foretold an impending storm in the North Sea, and to state at the same time, the opinion of the office as to the probable sort of weather which will prevail during the days immediately preceding it.

The undersigned takes the liberty, therefore, of requesting the obliging intervention of H. Ex. Sir H. Howard, H. B. M. Minister Plenipotentiary in this matter, and begs to be informed whether, and under what conditions, the Royal Meteorological Office in London, is prepared to transmit to this country the desired communications.

In adding that there is every readiness on this side to communicate to the Royal Meteorological Office all the information which it may desire as to any meteorological phenomena here foretelling the somewhat rare occurrence of storms from the east, the undersigned, &c.

VON ROSSING.

Sir H. Howard, K.C.B.,  
&c. &c.  
Oldenburg, 15th February 1864.

(Extract.)

Board of Trade, Meteorologic Office,  
March 1, 1864.

As this office has sent cautionary notices of impending storms in the North Sea, to Heligoland regularly, to Rostock and to Copenhagen occasionally, it will not be difficult to arrange for transmitting similar intelligence to Oldenburg, or any Hanoverian town, through Cuxhaven.

Hanoverian Legation,  
4th March 1864.

My Lord,

My government appointed last year, two commissioners to visit England for the purpose of inspecting and examining the nautical and meteorological institutions of this country, and especially the system of storm signals established by Admiral Fitzroy, and adopted by the British Government. These commissioners, who, owing to the kind interference of your Lordship, received every facility and opportunity for making the observations they had in view, reported, after their return to Hanover, so favorably as to the excellent

system of storm signals established in this country, that my Government has instructed me to claim your Lordship's kind interference in order to ascertain if it should be possible to convey notice by telegraph, to the Royal General Direction of Water-Works (Königliche Wasserbau-Direction) at Hanover, of course at the expense of the Hanoverian Government, whenever the results of Admiral Fitzroy's weather researches show the probability of storms on the English coast near Hanover, or on the Hanoverian coasts.

If the British Government should wish it, my government offers, in exchange for the above-mentioned information, to communicate (at the expense of the British Government), all the observations made three times every day, at the meteorological stations at Hanover, Göttingen, Clausthal, Hünzburg, Ottern-dorf, Lingen, Emden, and Norderney, with regard to the barometer, thermo-meter) and hygrometer.

In recommending this request of my government to your lordship's kind consideration, I have, &c.

V. BLOME.

Hanoverian Legation, 44, Grosvenor Place,  
21st April 1864.

Sir,

With reference to my letter of the 1st instant I have now the honour to express to you in the name of my government their best thanks for the memorandum and the pamphlets enclosed in your communication of the 30th March last, and in the same time I beg to inform you that the Telegraph Station at Cuxhaven has received due instructions for the ulterior rapid communication of the telegraphic notices of such impending storms as may be likely to affect Hanover.

I have, &c.,

To Vice-Admiral FitzRoy.

O. BLOME.

## BERLIN, ROSTOCK, GOTHENBURG.

Berlin, 9th May, 1863

J'ai reçu votre ouvrage très intéressant, *The Weather Book*. J'étais occupé d'un travail analogue, mais d'un but plus réseré, c'est-à-dire d'écrire un mémoire sur les grandes perturbations atmosphériques de cet hiver. Un grand nombre de notices a été mis à ma disposition par notre Direction Télégraphique, mais c'est seulement depuis quelques jours que j'ai pu finir mes recherches. J'ai dressé une carte de l'ouragan du 20 Janvier 1863.

Les minima barométriques du 20 Décembre, du 6 Janvier, et du 20 Février ont été accompagnés de phénomènes remarquables par l'intensité des explosions électriques et les immenses quantités de neige tombées sur les montagnes de la Suisse ; que je regrette que ces phénomènes n'étaient pas à ma disposition lorsque j'écrivais la seconde édition de mon *Law of Storms*. J'aurai l'honneur de soumettre à votre jugement ce mémoire, qui sera imprimé sous la forme d'une monographie, dont les lacunes soient peut-être remplies par les recherches des observateurs qui auront à leur disposition des données plus précises sur les indications du baromètre dans l'ouest de l'Europe. J'ai pu dresser, en détail seulement, les lignes isobarométriques pour l'ouragan du 20 Janvier, parceque je connais seulement, pour un petit nombre de stations du système Le Verrier, la valeur moyenne pour en déduire la diminution de la pression [atmosphérique de l'époque de ces grandes perturbations.

Notre gouvernement veut établir, pour le besoin de nos ports Baltiques une institution semblable à celle que vous avez établie pour le Royaume Uni, et c'est dans le but de m'orienter dans ce vaste champ de recherches, que j'ai repris mes travaux anciens sur les mouvements de l'atmosphère que j'avais mis à côté pour des recherches sur la distribution moyenne et non-périodique de la température sur la surface du globe. Mais j'ai trouvé de grandes difficultés à vaincre parceque les indications des instruments météorologiques



dans les tempêtes de translation et les mouvements gyroïdes de l'atmosphère sont souvent si semblables qu'il me paraît très difficile de savoir, dans un cas donné, avec précision, si la direction de la girouette indique la tangente d'un tourbillon, proprement dite, ou la direction du courant même.

Je suis au désespoir que je n'ai pu profiter pendant mon séjour à Londres de votre expérience dans ce genre de recherches, mais j'étais si occupé par les travaux d'un *juror* de l'Exposition, que je suis retourné à Berlin tel que j'étais, c'est-à-dire, sans avoir pu profiter d'une occasion si favorable de remplir les lacunes de mon savoir.

H. W. DOVE.

Admiral FitzRoy, F.R.S.

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#### ROSTOCK.

When Professor Dove was in London for the International Exhibition in 1862, he personally delivered an application from a society in Rostock written by their principal, Dr. John (Ph. D.), requesting that telegraphic communication might be made to them from the office of the Board of Trade, under certain contingencies, specified by his society, and at their expense.

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#### GOTHENBURG.

In this month, April, application has been made to this office of the Board of Trade by the Consul General of the Swedish and Norwegian Government through a deputy from Gothenburg, who has obtained the full information that he was charged to seek, and is now making known to his Government how our notices of impending gales or storms may be communicated.

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#### DENMARK.

My dear Sir,

Copenhagen, 12th November. 1863.

The last storm, of 29th October, has made great disturbances in our country, and occasioned enormous losses on our seas, and even on the dry land (by throwing down the cow-houses and killing the cows). It seems, by collecting the information which the newspapers have given, that a great deal of the misfortune might have been avoided if we had received news in due time about the weather, and the state of the barometer, in the British Isles.

The storm appears to have had a very slow, progressive motion toward the east, but, when arrived, it expended its greatest fury in Jutland and the Duchy of Sleswick, while its force had considerably abated further to the south, and in Holstein it seems to have had much less force. The same was the case at Copenhagen, which it reached in the night between the 30th and 31st October, and where the wind was very high, but not a single tile was blown off the houses, while the towns in Jutland were half unthatched.

As a member of the Meteorological Committee of our Academy of Science, I now appeal to your kindness, of which I have personally had so many proofs, and entreat you to assist us in meeting similar catastrophes. If you would have the kindness to send us a telegram whenever from your observations you think that a storm is approaching which might reach our shores, we should be able to transmit the warning to the ports of our peninsula, and you would extend your humane influence far beyond the boundaries of the British Empire.

We now receive telegrams daily from Paris, but we think that telegrams such as you send to the British harbours would be of much more use to us. I beg you to understand that we would not trouble you to send us a telegram whenever you send one to the British harbours, but only in such case where it might be expected that the storm would reach us. By that we avoid giving you more trouble than necessary, and we are sure of a better result in our country.

With us the whole series of investigations which have led to your highly interesting results is quite unknown to the public, principally in Jutland, and to ensure attention we would rather at first only warn against great dangers.

Measures will be taken with the Telegraphic Office in London that the telegram may be immediately forwarded to us, without expense to your office, by the cable from England to the Duchy of Sleswick.

I have finished my analyses of the-sea water from the "Porcupine" (H.B.M.S.) and shall very soon send you the result.

F. G. FORCHHAMMER,

Admiral Fitzroy, F.R.S.

My dear Admiral,

Copenhagen, 14th December, 1863.

I cannot show you my gratitude for the two storm telegrams which you were so kind as to send us, in a better way than by reporting how well the prophecies have foretold the truth. Your telegram of the 4th did not reach us, I do not know for what reason, before the 6th, in the afternoon, but it was immediately telegraphed to all stations in the country; and in the night between the 7th and 8th we had a violent storm on the peninsula of Jutland, which however only reached Copenhagen as a rather high wind.

Your telegram of the 8th reached us the same day late in the evening, and in the night between the 10th and 11th we had a most violent storm with thunder and lightning and a very violent hail-fall. It was all over the country, and, in the northern part of Jutland, has set many houses on fire.

All our provincial papers acknowledge the importance of these communications, and one of the few towns that are situated in the interior of the country has complained of not having received the important news, and entreated to be favoured for the future with similar communications. So you see, my dear Sir, that the principle is happily established with us, and your name is known all over the country. It happened so that the French telegram for the 10th announced complete calm for the Baltic, and the answer was "tempête violente."

I should be very happy if we, from our country, could give you similar information, but this could only be with respect to easterly storms, which, however, are very rare with us. It is only in few cases that our weather is made in Russia first, in the beginning of winter frosts, which we may expect five or six days after the telegraph has brought us the news that the Neva is frozen. Also in the spring we observe Russian influence; as long as the plains of Russia are covered with snow we are sure of easterly winds, bright sunshine, and cold frosty nights, which check the vegetation, and first when the snow in Russia is gone the westerly winds will prevail.

Before I conclude my letter I must still mention that the newspapers from Jutland describe the storm of the 11th-12th December as a complete hurricane, and the damage occasioned by lightning has been all over the whole country very great indeed. There must have been something very peculiar in the hurricane, because I have never seen so many vessels mentioned to have been wrecked on our shores which had been previously quitted by the crew.

F. G. FORCHHAMMER.

Admiral Fitzroy, F.R.S.

## ITALY.

Mon cher Ami,

Turin, 5 January, 1864.

J'ai appris que vous avez déjà eu la bonté de remettre à mon ami Mr. Le Comte Pasolini le cahier des mémoires de Taylor dont je vous avais prié. J'espère aussi que vous aurez déjà su par Mr. Pasolini qui, ayant déjà

recu d'autre part ce même volume, je n'étais plus forcé de profiter de votre bonté. Mr. Pasolini est encore à Londres et j'espère qu'il vous aura déjà rendu le livre. Maintenant j'ai un autre grace à vous demander. Je n'ai pas l'honneur de connaître l'Amiral Fitzroy, et je ne saurais même comment m'adresser à lui; on vient de former ici une commission chargée d'étudier le sujet des présages météorologiques.

L'Amiral Fitzroy est certainement l'autorité la plus compétente pour donner un conseil. Si vous aviez la bonté de lui remettre la page ci-jointe avec deux ou trois questions et de m'envoyer les réponses que j'espère bien il voudra faire, je vous en serai très reconnaissant.

C. MATTEUCCI.

A Monsieur M. Faraday,  
&c. &c.

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TURIN.

1° Le soussigné chargé par le gouvernement Italien d'étudier la question des présages météorologiques, croit qu'un premier essai, facile à faire et d'un résultat sur, serait d'établir dans un certain nombre de villes, ports de mer de la Méditerranée et de l'Adriatique, un baromètre qui serait observé régulièrement et dont l'autorité locale serait chargée de publier les variations brusques et assez grandes annonçant certainement des tempêtes ou des gros coups de vent. En vaut-il la peine? Est ce quelque chose d'une certaine utilité?

2° Un baromètre anéroïde pourrait-il servir?

3° Au lieu de réunir les observations météorologiques du jour transmises par télégraphe à un point central où ces observations sont discutées et les présages formés, ne serait-il pas utile de commencer par faire donner, conformément à des instructions, et au moyen du télégraphe, journellement de chaque port de mer les nouvelles du vent, de l'état de la mer et de la pression barométrique aux ports voisins latéraux.

C. MATTEUCCI.

A L'Amiral Fitzroy.

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Board of Trade, Meteorologic Office,

January 22, 1864.

Sir,

I am much honoured by the communication from yourself—forwarded to me on the 13th instant by our mutual friend, the most eminent Faraday.

Immediately I transmitted, through the Foreign Office, such information as I then thought might be acceptable, and I now proceed to offer replies, after due reflection, to your questions.

1. It would be very useful, locally, to place a barometer in charge of a reliable person who would set it once or twice a day—as is done around our coasts—for respective localities solely.

2. Undoubtedly a good aneroid is as useful for such an object as any other barometer, but it is almost, if not quite as expensive, and it is *not* independent.

3. Probably it would be advisable to begin by intercommunication along the coast, between the ports separated *farthest* (preferentially), but including others.

By these steps a certain advance may be made forthwith.

Others, unquestionably, will be taken in due time.

Although I ought not to say so, it appears to myself that our publications, and those which are now transmitted with this letter, will afford other requisite information.

I have, &c.

R. F.

Signor Matteucci,  
Senato del Regno, Turin.

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(Senato del Regno.)

Monsieur le V. Amiral,

Turin, 3 Fevrier 1864.

Mon premier devoir est de vous remercier beaucoup de toutes les ouvrages, brochures, instructions, que vous avez eu la bonté de m'adresser et que j'ai donné à traduire.

L'essentiel pour moi maintenant est que vous ayez la bonté de me dire ce qui ne peut pas ordinairement se mettre dans les ouvrages; comment vous reglez-vous pour rédiger les présages?

Je suppose que vous réunissez les points d'égale pression barométrique sur une carte géographique préparée à cela. Je suppose que toutes les pressions doivent être réduites d'avance au niveau de la mer et à zéro. Il faudrait à cette indication du baromètre ajouter celles des vents. Et encore, je suppose que vous ne notez sur les cartes que les vents d'une certaine intensité. Cela fait, vous verrez sur la carte les points où les lignes ou la pression a diminué rapidement. Cette diminution—avec la direction des vents et la température—est-elle suffisante pour former les présages?

Quelles règles la pratique vous a-t-elle indiqué?

Il se peut, M. le V. Amiral, que même dans ces peu de mots j'ai fait des erreurs énormes,—mais ce n'est là qu'une raison de plus pour que vous ayez la bonté de m'instruire.

J'attends donc une longue lettre pour acquérir *rapidement* un peu de cette science que vous avez dû acquérir avec *tant de travaux*.

J'ai l'honneur d'être tout dévoué,

C. MATTEUCCI.

M. le V. Amiral FitzRoy.

Board of Trade, Meteorologic Office,

Parliament Street, London, S.W.

10th February 1864.

Sir,

You honour me by a request that, taken in earnest, would quite overtask me; being, of course, unable to put in a letter even the *principal* points of various books, including those which I sent to you recently.

Dove says (in his preface to the work of which I now offer an English copy, "the problems of the atmosphere are too complicated to allow of their solution off hand." And probably no one has studied them either in more detail, or more comprehensively than himself.

Nevertheless, I will hazard a few words, as sign posts, so to speak, of the paths I should advise to be preferred.

Considering polar cold, tropical heat, and earth's motion, as causing atmospheric currents in a fluid equilibrated by gravity, however mobile and elastic its nature;—

Having no *proof* that our atmosphere reaches above fifteen miles vertically from ocean, and knowing that the depth (or height) of about twelve miles would diminish air pressure (or tension) to very few (if any) inches of mercury, one may treat the whole circumjacent and concentric volume of atmospheric air as a kind of ocean; exceedingly incompressible, but marvellously self-counterpoising by gravitation.

This tendency to general equilibrium is the principal clue to meteorologic forecasting. Normal tensions, and temperatures of air being known, any marked deviation is premonitory of a certain compensation—sooner or later, attended with more or less atmospheric commotion, with changes of vapour into visible substance; or of solid or liquid matter into invisible gas.

Constant transference or translation of the atmosphere *bodily* eastward, in temperate zones, while voluminous streams, or excessively broad currents, sweep around in varying directions (inclining usually to south-west or to north-east), and the *influence* of these extensive volumes of air, approaching or retreating, or remaining stationary, are most important considerations.

Such expansive, but comparatively shallow aerial currents spread above, or below one another, or intermingle variously. Like currents of water, they may run nearly parallel, although in opposite directions, side by side, or curling around. Their influences in their respective actions on each other, and on earthly surface, afford reliable data for forecasting meteorologic effects.

Dynamic considerations, arising out of statical facts observed synchronously and consecutively, are the basis of these operations, and not a reliance solely on the *height* or *motion* of mercury in the Torricellian tube, as some sciolists imagine.

Beyond these brief remarks I will not now venture, as anything I could add would be but a repetition of what has been more deliberately, if not more carefully, expressed in the "Weather Book," which has a copious index.

May I observe, however, that Turin, so near Alpine ranges, and to the north-west of all Italian coasts, must depend chiefly on French and Spanish observations for indications of weather—localities eastward being comparatively valueless for forecasting at Turin, although these places might themselves be cautioned thence, instead of from Florence, Rome, or Naples. Allowances, of course, will be made of course for climates and latitudes, to which it is unnecessary to advert further at present.

R. FITZROY.

Signor C. Matteucci,  
Senato del Regno, Turin.

Senato del Regno,  
Turin, 15 Fevrier, 1864.

Monsieur et illustre V. Amiral,

1. Je m'empresse de vous remercier de la lettre et des bonnes et utiles informations qu'elle contient, mais en profitant de votre bonté et franchise permettez-moi de vous répliquer encore une fois.

2. Laissons de côté la théorie et les grands principes de la météorologie qui sont, je crois, bien peu de chose encore—la chaleur de l'équateur, le froid du pôle, la rotation de la terre—cela est vieux et n'a pas suffi à fonder la météorologie pratique. Quant à moi je n'ai jamais (essayé?) de comprendre les grandes découvertes de notre collègue M. Dové.

3. Parlons à l'anglaise—c'est-à-dire de choses pratiques et prouvées par un grand nombre d'observations. Chargé d'organiser ce service en Italie, je veux marcher pas à pas et très modestement.

4. Permettez moi, M. le V. Amiral, de vous dire mes idées sur lesquelles je vous prie de m'écrire votre jugement. J'ai choisi 24 ou 26 stations, le plus grand nombre sur la côte, les autres sur les Apennins. Je vais envoyer à ces stations, baromètre, thermomètre, et psychromètre, et j'enverrai un ingénieur à les placer et à lire et expliquer les instructions. Ces stations faisant trois choses :

1° En certains cas prescrits par les instructions, elles annonceront les *gales*, *storms*, les vents subis dans le port même où elles sont placées.

2° Elles donneront les signaux aux deux stations *latérales*.

3° Enfin elles donneront tous les jours à Turin, à Florence, à Rome, les observations ordinaires : baromètre—vent—mer.

5. Le bureau central recevra les observations, les insérera sur les cartes géographiques pour tracer les courbes, et recevra aussi de Paris, de Trieste, de la Dalmatie les airs météorologiques. À la suite, dans *des cas donnés*, et pas toujours, il donnera par télégraphe les airs d'orages, vents forts, *probables*.

6. Voilà mon programme : ayez la bonté de m'en dire votre opinion.

7. Maintenant je voudrais vous prier de me donner, très condensées, les connaissances suivantes :

Quels sont en Angleterre les changements de temps qui précèdent aux *différentes* variations du baromètre ? Et quoi la température, les signes de le psychomètre, de l'état du ciel qui aident à former les probabilités plus grandes en faveur des changements prévus par le baromètre ?

8. J'admet l'existence des centres de dépression barométrique très grande—c'est la condensation rapide de la vapeur, ou c'est autre chose. Ces centres ou cyclones est-il prouvé qu'ils se promènent sur la surface de la terre ? Avec quelle vitesse, si cela est ? J'admets aussi qu'il peut se former dans l'atmosphère des courants parallèles—dans la même place, ou à peu près, et opposés. De la aussi des *tornados*. Ces tornados se progressent-ils ? avec quelle vitesse ? Quelles sont les modifications dans la course de ces *tornados* produites aux causes locales, montagnes, mer, lacs, &c. ?

9. Lorsqu'elle en face d'une longue côte où il y a des chaînes de montagnes, la neige tombée sur ces montagnes n'est elle pas la cause fréquente de bourrasques et de vents très forts sur la côte?

10. Je vois que M. Le Verrier donne dans ses probabilités—"vent léger," "quelques nuages," &c., ces probabilités sont-elles utiles?

11. Je sais, mon cher monsieur, que mes demandes peuvent exiger des volumes, mais je sais aussi que vous pouvez condenser vos réponses et ne me donner que les résultats les mieux établis indépendamment de toute théorie.

12. Veuillez m'aider et croire aux sentiments de ma plus haute considération.

C. MATTEUCCI.

Monsieur M. le V. Amiral Fitzroy.

Board of Trade, Meteorologic Office,  
2nd April, 1864.

Sir,

I have been prevented from answering your last letter promptly; but now a reply shall be forwarded. And as it is possible that you kept no copy, I enclose one, numbered for reference.

1. It is an honour, and very satisfactory to me to communicate thus freely, in hopes of being useful.

2. I cannot leave all theory out of sight—nor do I find M. Dove *now* difficult to understand; but, turning as you wish, to practical results; and,

3. Our English practice, I am free to say that—

4. Your number of stations seems suitable to your extensive coast line, including Corsica, Sardinia, Sicily, and the Adriatic. I send you our arrangements by which it will appear that instruments are sent in duplicate or triplicate, to each station: not only to provide against accidents, but as checks on registration.

I do not think ordinary observers at *out stations*, should be trusted to act in an independent manner *at first*. But each such person may inform his *own* neighbourhood (as shown in the annexed Manual), advantageously.

Without dynamic information, which can only be obtained by comparing simultaneous observations at many places, an isolated observer cannot advise *others* at a distance, although he may transmit to them *statical* facts which they may collate and weigh.

5. I have yet to learn the *quick practical* value of charts and curves. To philosophers, or even students, they may be useful, according to their plan, and its execution; but, *unavoidably*, they *must appear* too late for use in *daily life*.

"*Forecasts*," from a central office, and *their* results, *at times*, cautionary notices of storms or gales, may be *telegraphed* in time to be *useful*.

We have three objects in view—*Local information for Coasters*—*General notices* for the *public*, and an accurate record for subsequent *study*.

7. I cannot give, in a brief letter, a reply to your paragraph which is here numbered seven. You have my "Weather Book," which contains vastly more than could now be written hastily.

8. The subjects about which you ask in the eighth paragraph of your letter are fully discussed in the book just mentioned; and, very recently, letters on those subjects have been published in the *Paris Bulletin International*, in the *Courrier des Sciences*, in *Cosmos*, and *Les Mondes*—some of which are from my humble self, and too long to be repeated even by extract here.

9. The effects of great falls of snow or rain, and of high mountains are discussed in letters from M. le Maréchal Vaillant to M. Le Verrier, and by others, in the *Bulletin*, as well as elsewhere.

10. At first sight it may seem unnecessary to publish "vent léger"—"quelques nuages"—but the *negative* evidence of *no storm* impending—the positive information of *fine* weather may be *greatly* appreciated by intending voyagers—by farmers—and even by gardeners.

11. Very truly you say, that to answer all your requisitions adequately might necessitate *volumes*, and, frankly, I would refer you to such sources, among

them that which I now send—Dove's latest, translated into English by his pupil, Mr. Scott, of Dublin, at his own desire.

R. F.

Signor C. Matteucci.

MEMORANDUM communicated by the Directors of the Austrian Consulate General in London, the CHEVALIER DE SCHAEFFER, April 2, 1864.

"In the year 1861, Her Britannic Majesty's Admiral FitzRoy introduced his happy idea of signalling changes of weather by means of the telegraphic wire.

"The results of this arrangement have been surprising.

"As a member of the Danubian Commission, I am about to propose a similar system on the coasts of the Black Sea; and I should feel very much obliged by exact and detailed explanations of the Fitzroy system."

### POSTSCRIPT.

While adding these extracts to my Report, a small volume, just published, has been sent to this office by the author, of whose statements I feel obliged to take some notice, because they are so directly addressed to our meteorologic questions.

Well-known as a *Lunarist*, the author of this new work is anxious to prove his claims to be the original, and *only one* previous to 1860.

But there is nothing new, or even modern, in the assertion of lunar influence on weather. Some have denied, while others have advocated it, time out of mind.

What is *now* wanted, is the *modus operandi*; how dynamic effects, which we observe, are caused?

To give a list of "suspected periods" (of danger) for two years in advance,—from four to six periods in each month, with a marginal "day or two" before and after each such period, is to include at least half the days in *each* month!

Of course, therefore, nearly all bad weather, of a few days duration, may be said to occur at or near a "suspected period,"—and as the author of this "system" in no way notices publicly those very numerous "suspected periods" which pass by, every month, *without* accompanying bad weather, he takes credit for all (occasional) coincidences, and would now try to persuade his readers that he has been the victim of plagiarism, and has not received the reward due to merit.

Navigators of centuries past—those of this century—and physical philosophers in every age,—have anxiously considered lunar changes and consequences. It is easy to run through an almanac, make a list of days when the moon is in extreme position, north, south, east, or west, when near the equinoctial line, when full, or otherwise, and deem these "suspected periods;"—but this "system" is indefinite, and, *in principle*, at least three centuries old.

We are now trying to go much further,—to advance from long known statical facts—to their mutual relations—and resulting dynamic consequences.

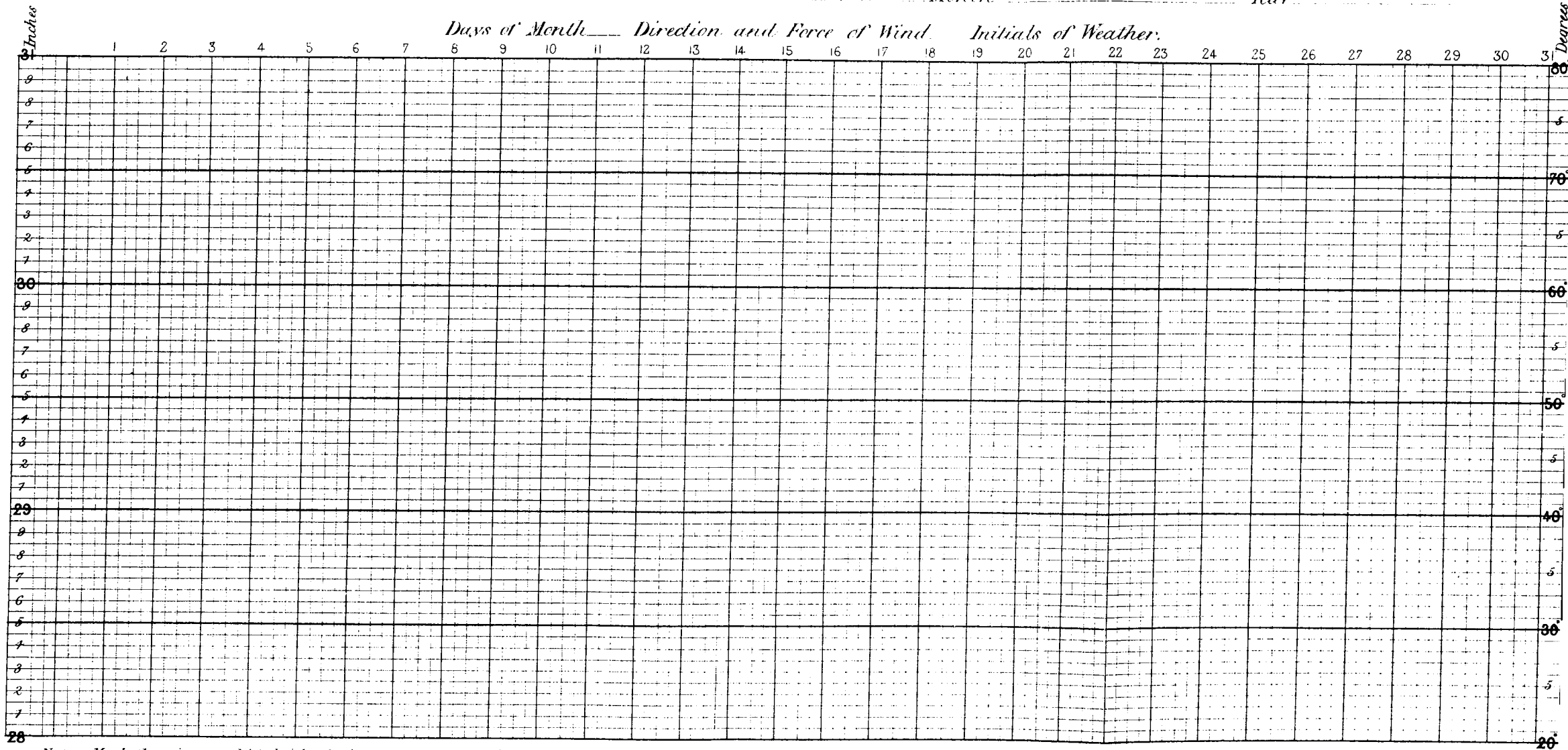
L O N D O N :  
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty  
For Her Majesty's Stationery Office.



# FISHERY OR COAST DIAGRAM.

Barometer and Thermometer at \_\_\_\_\_ Month \_\_\_\_\_ Year \_\_\_\_\_

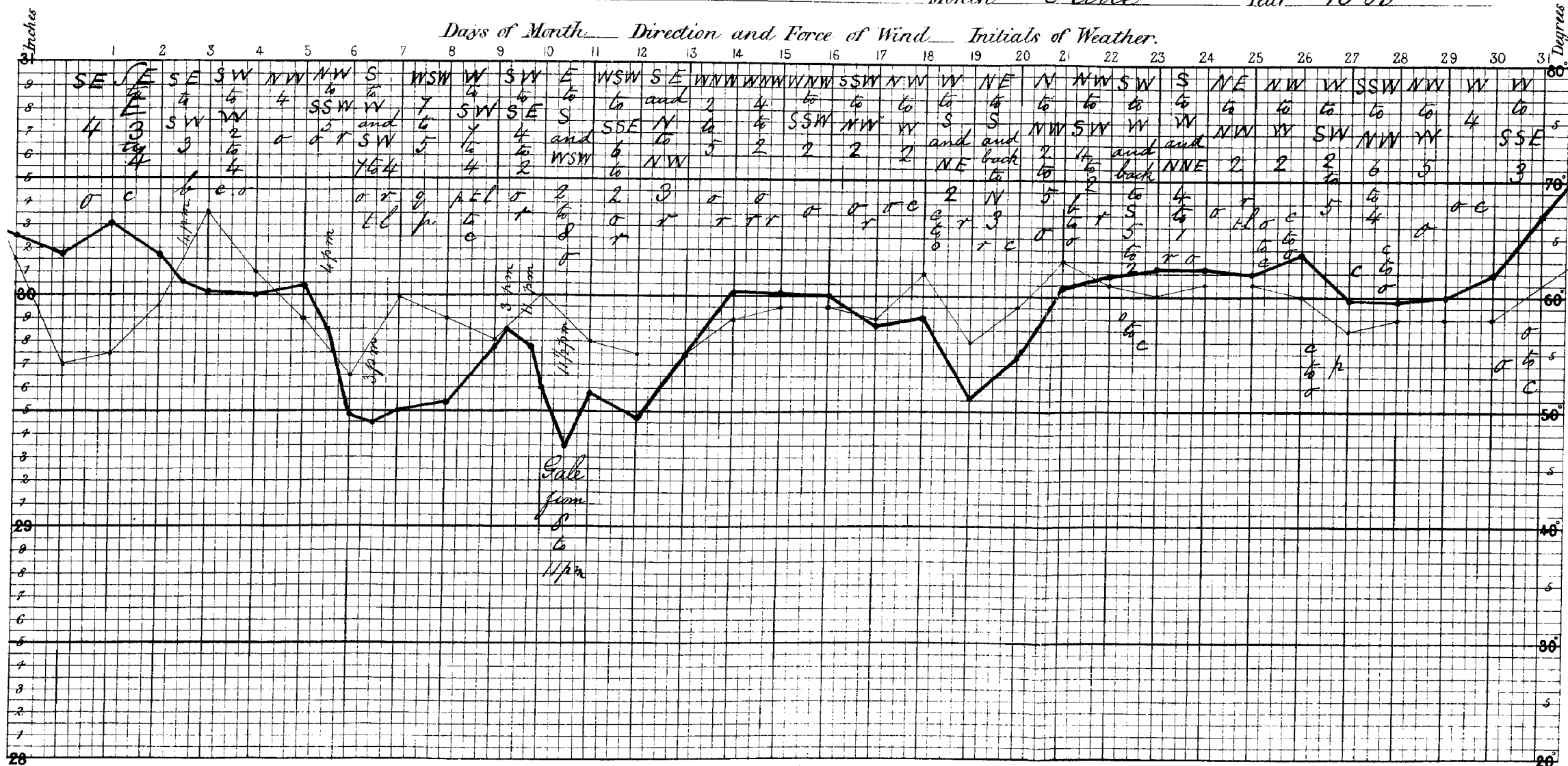
Days of Month \_\_\_\_\_ Direction and Force of Wind \_\_\_\_\_ Initials of Weather \_\_\_\_\_



Notes. Mark the points at which height (by side scale) and time lines cross. Draw a line through the points. The vertical lines are at each six hours. Barometer line should be darkest.  
 First days are of previous month, for reference, in judging of weather, in order to foretell its character. Time lines or day figures are at 8 A.M. nearly when the temperature is about the mean  
 Intermediate, or alternate lines are for degrees of thermometer, or half tenths of inches. or average of night and day.  
 The angles made by the drawn lines with those of the form are very useful aids in foretelling weather, especially with exact squares such as the above, without thermometer lines between.  
 N.B. This paper should be held on a board by an edge above and below, each end being free for reading; or to hold while shifting.

# FISHERY OR COAST DIAGRAM.

Barometer and Thermometer at London Month June Year 1863



Notes. Mark the points at which height (by side scale) and time lines cross. Draw a line through the points. The vertical lines are at each six hours. Barometer line should be darkest. Time lines or day figures are at 8 A.M. nearly when the temperature is about the mean or average of night and day.

First days are of previous month, for reference, in judging of weather, in order to foretell its character. Intermediate, or alternate lines are for degrees of thermometer, or half tenths of inches.

The angles made by the drawn lines with those of the form are very useful aids in foretelling weather, especially with exact squares such as the above, without thermometer lines between.

N.B. This paper should be held on a board by an edge above and below each end being free for reading; or to hold while shifting.

Monday, January 19<sup>th</sup> 8 A.M.

1863.

SYNOPTIC CHART.

BOARD OF TRADE.

VI.

Explanatory.

Wind true direction drawn to toward of Station by scale of five, 1 to R, 1 being represented by 1 inch; thus ———— West Gale.

Pressure barometric single, dark line.  
Temperature single, light line, measured from parallel of latitude below, on each scale marked 28° N and 30° S.

Sky blue, clear (or no recorded observation) blank paper.

Cloud small curve or circle.

Snow horizontal lines (E-W).

Rain vertical line (N-S).

Hail broken alternate lines.

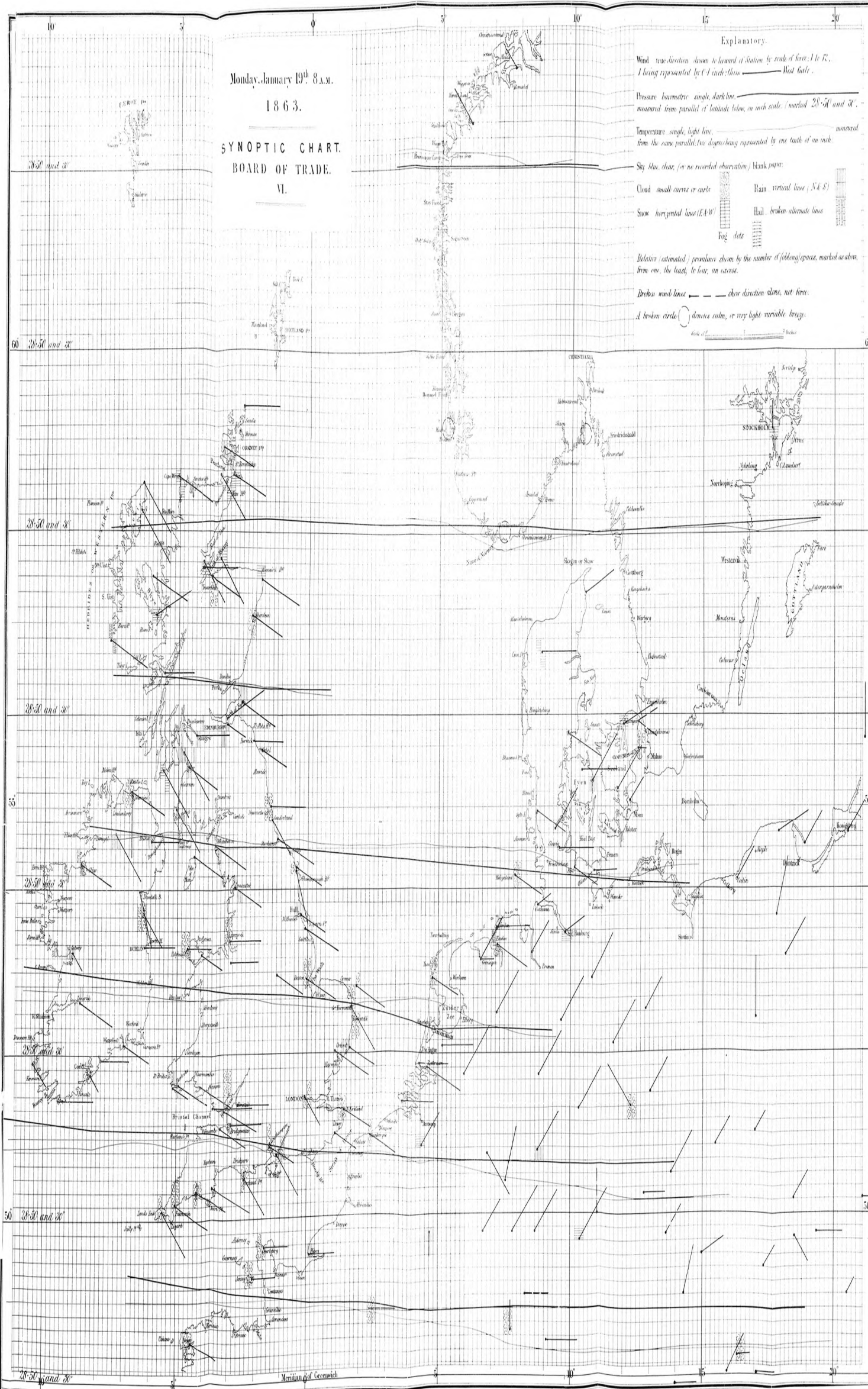
Fog dots.

Relative (estimated) pressure shown by the number of felling spaces, marked as above, from one, the least, to four, an excess.

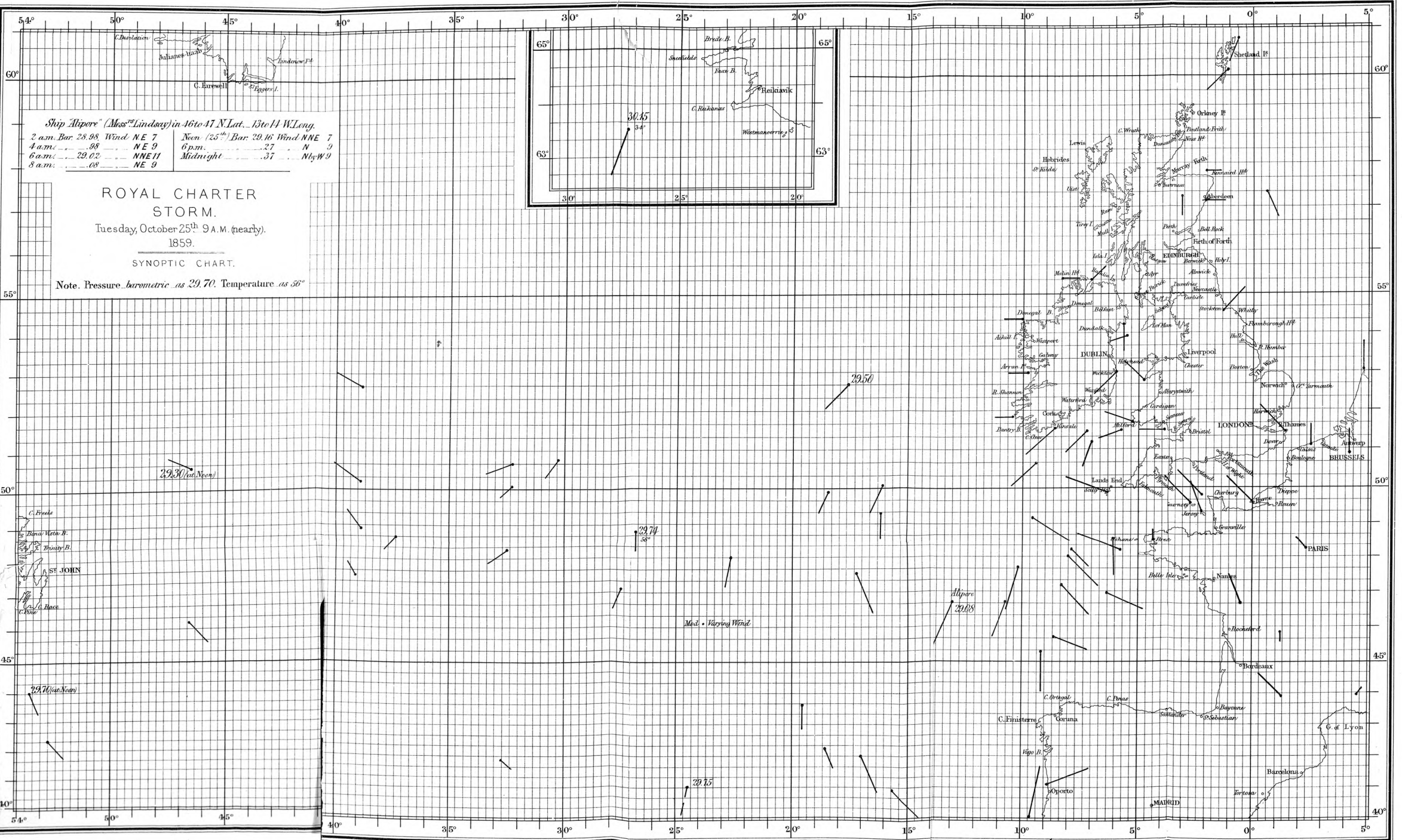
Broken wind lines ———— show direction alone, not force.

A broken circle ( ) denotes calm, or very light variable breeze.

Scale of 1 inch = 2 degrees







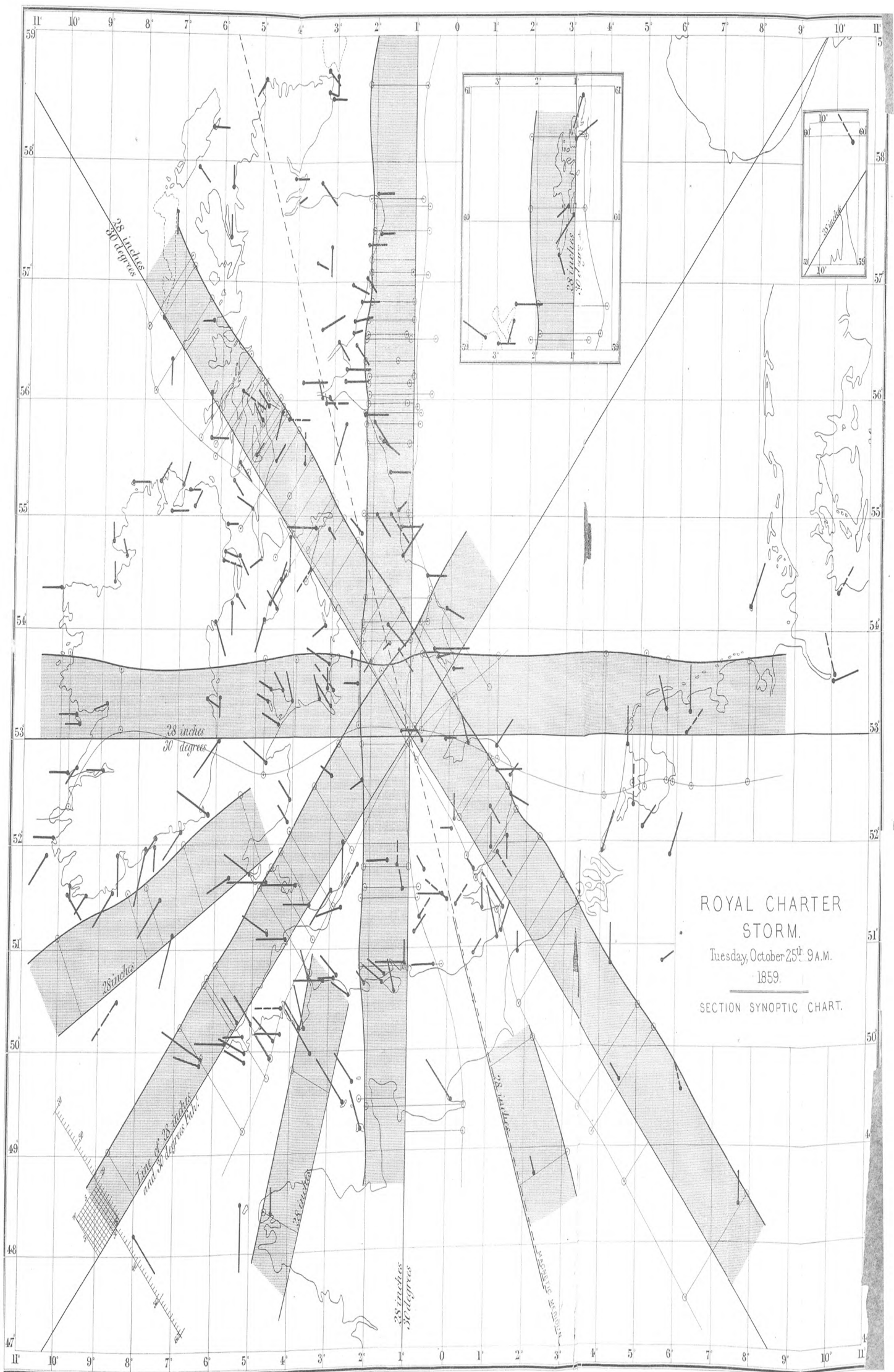
Ship Alipore (Miss Lindsay) in 16 to 17 N. Lat., 13 to 14 W. Long.  
2 a.m. Bar. 28.98 Wind N.E. 7  
4 a.m. " 29.02 " N.E. 9  
6 a.m. " 29.02 " N.N.E. 11  
8 a.m. " 29.08 " N.E. 9  
Noon (25<sup>th</sup>) Bar. 29.16 Wind N.N.E. 7  
6 p.m. " 29.27 " N. 9  
Midnight " 29.37 " N by W 9

# ROYAL CHARTER STORM.

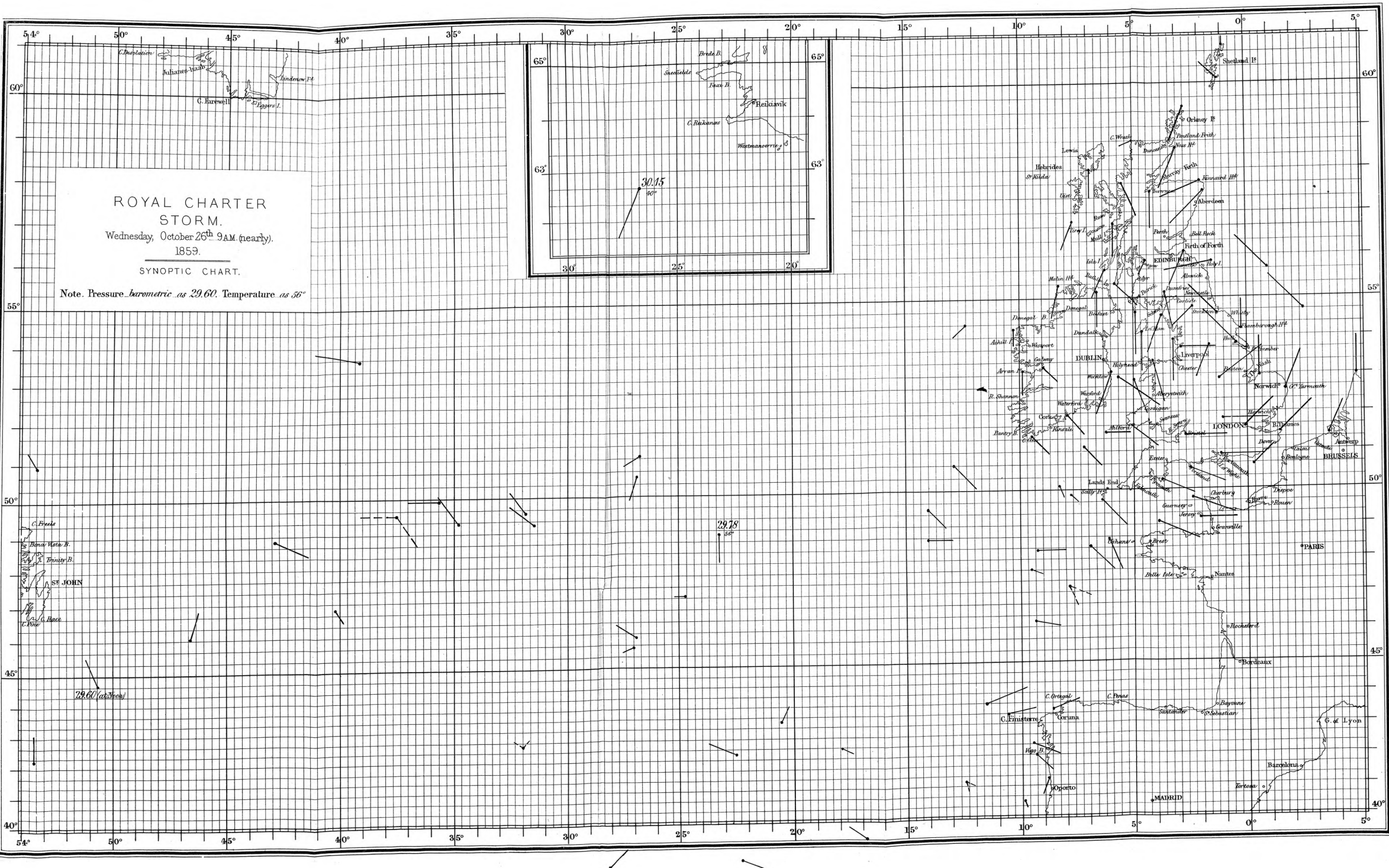
Tuesday, October 25<sup>th</sup> 9 A.M. (nearly).  
1859.

SYNOPTIC CHART.

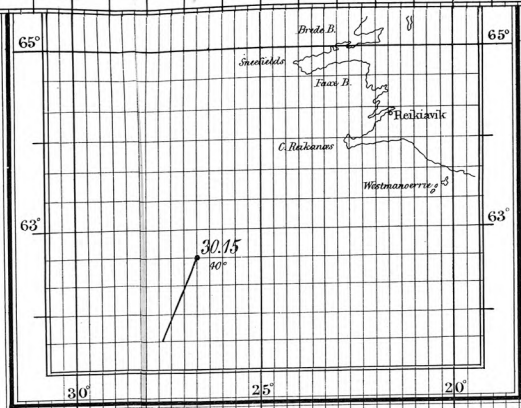
Note. Pressure barometric as 29.70. Temperature as 56°

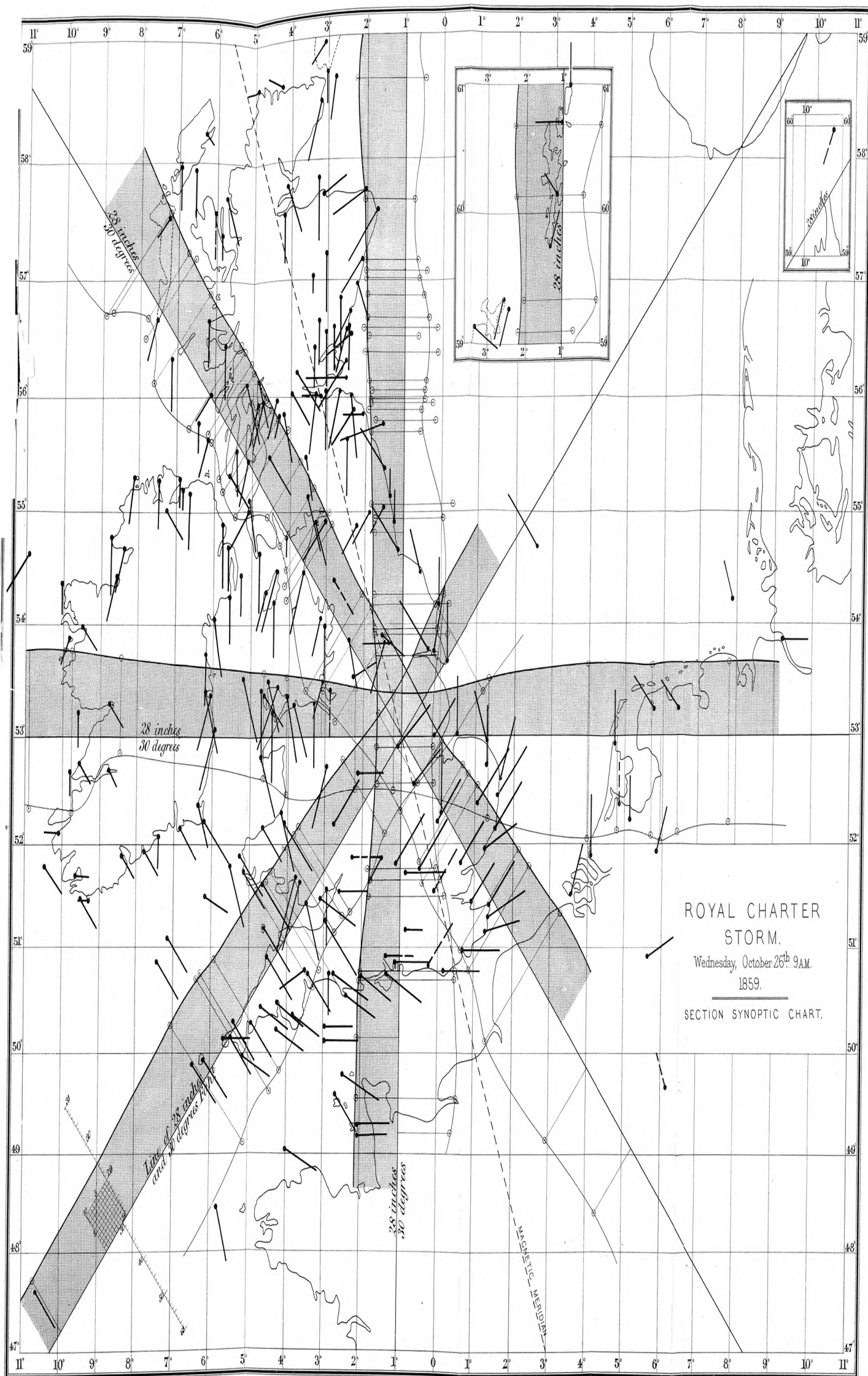






ROYAL CHARTER  
STORM.  
Wednesday, October 26<sup>th</sup> 9AM (nearly).  
1859.  
SYNOPTIC CHART.  
Note. Pressure barometric as 29.60. Temperature as 56°



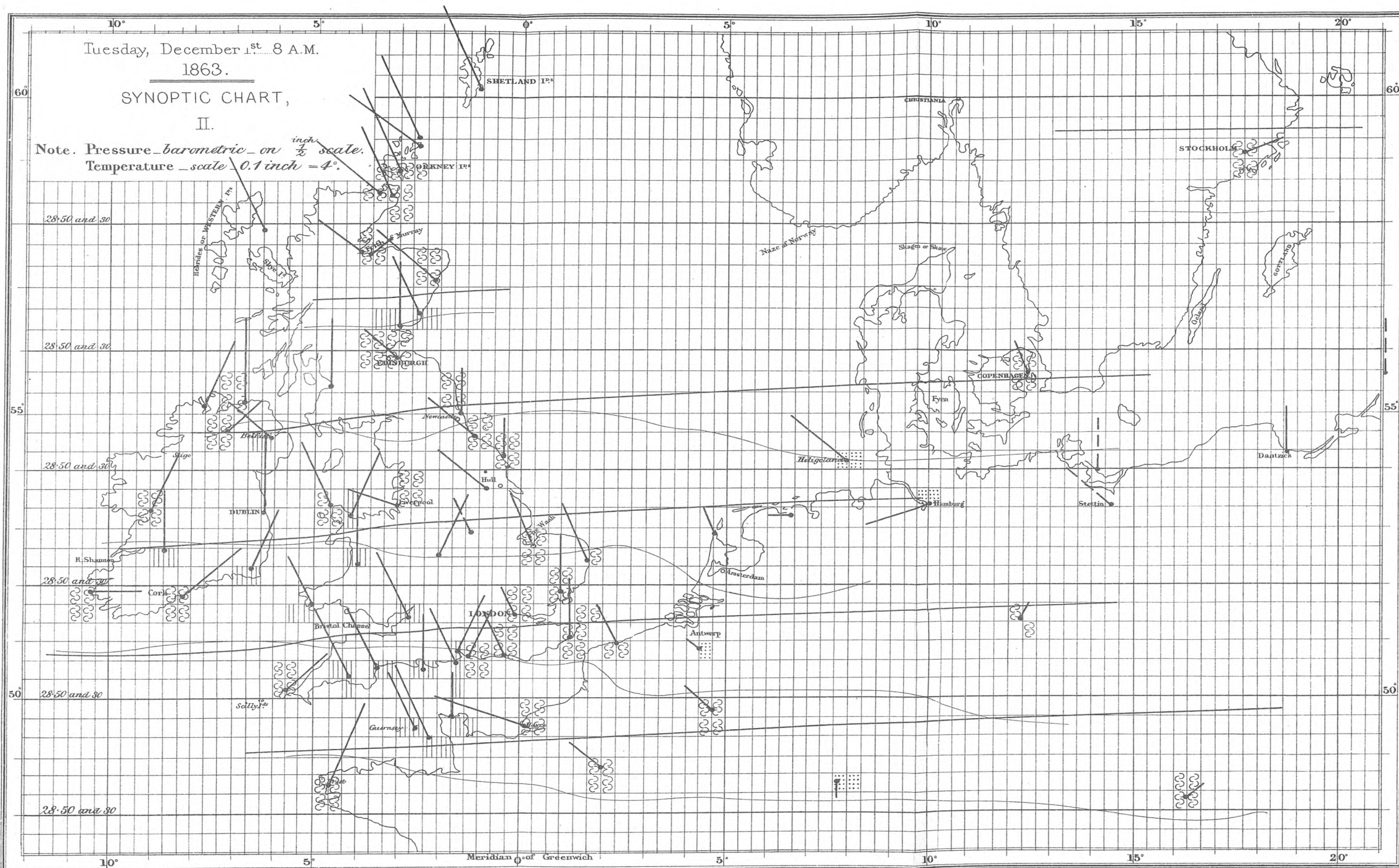




Tuesday, December 1<sup>st</sup> 8 A.M.  
1863.

SYNOPTIC CHART,  
II.

Note. Pressure barometric on  $\frac{inch}{2}$  scale.  
Temperature scale  $\backslash 0.1 \text{ inch} = 4^{\circ}$ .

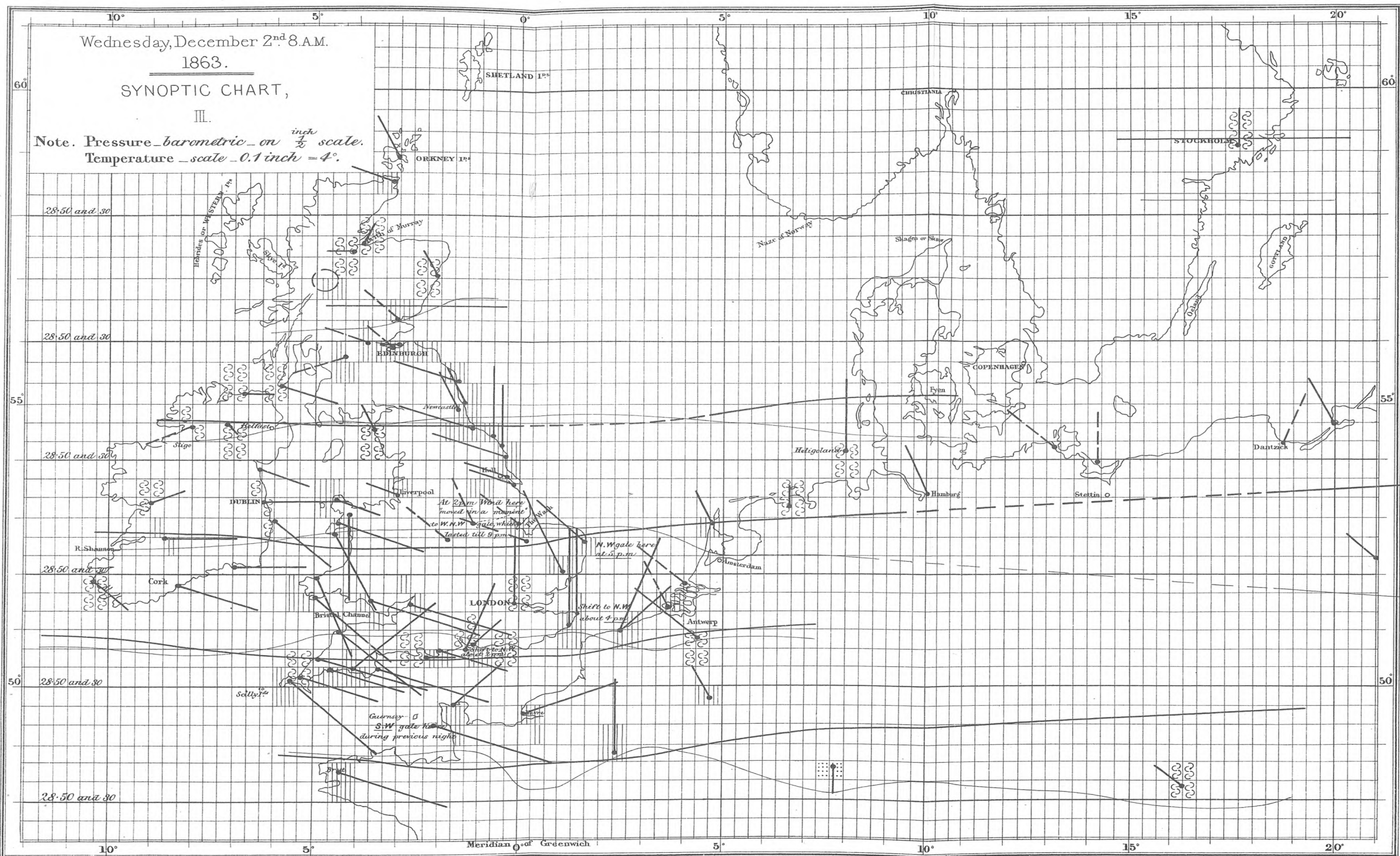




SYNOPTIC CHART,

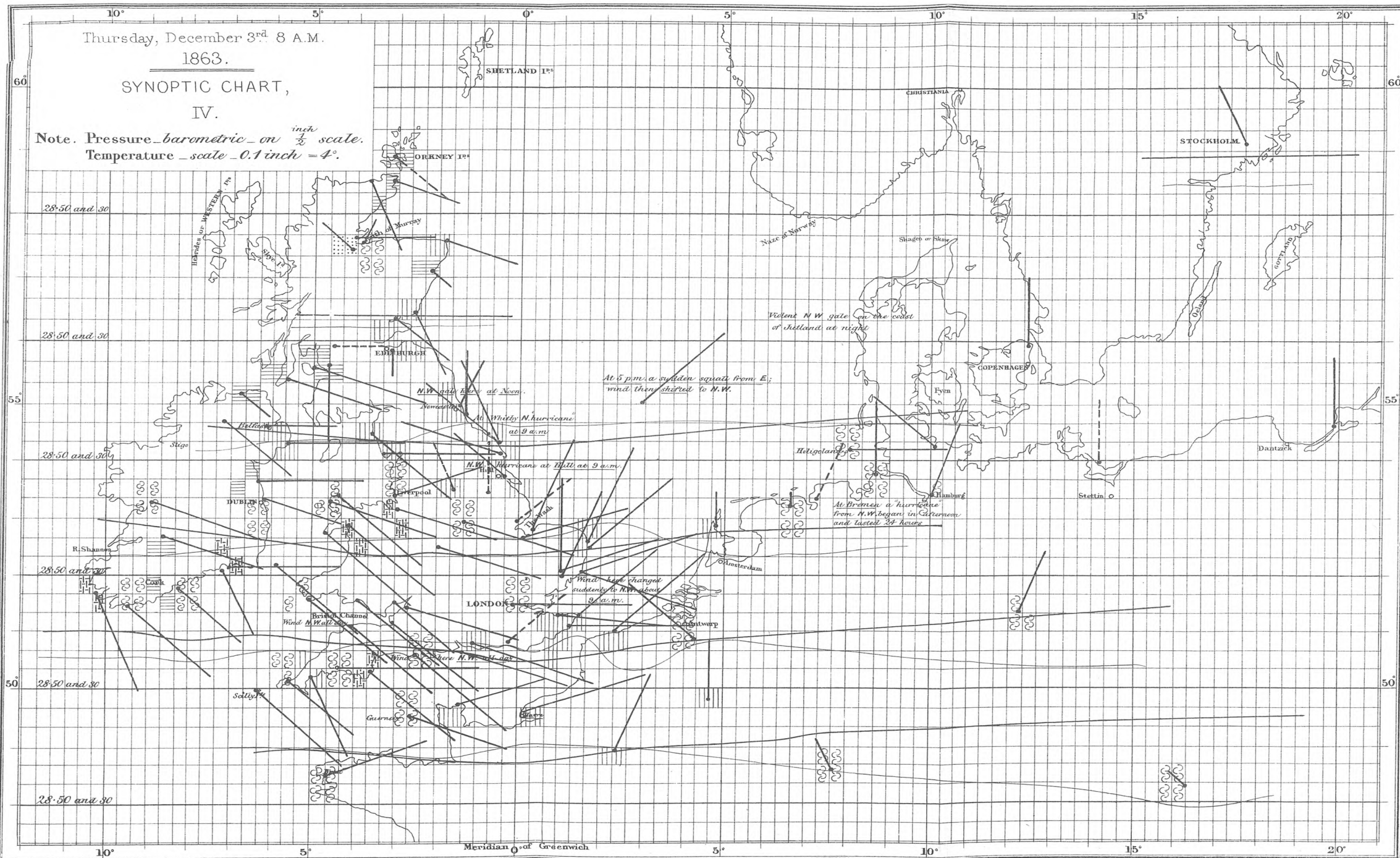
### III.

Note. Pressure - barometric - on  $\frac{1}{2}$  inch scale.  
Temperature - scale - 0.1 inch = 4°.



SYNOPTIC CHART,  
IV.

Note. Pressure barometric - on  $\frac{1}{2}$  inch scale.  
Temperature scale - 0.1 inch = 4°.





Friday, December 4<sup>th</sup> 8.A.M.  
1863.

SYNOPTIC CHART,  
V.

Note. Pressure barometric on  $\frac{\text{inch}}{2}$  scale.  
Temperature scale  $0.1 \text{ inch} = 4^\circ$ .

