

REPORT
OF THE
METEOROLOGICAL COMMITTEE OF THE
ROYAL SOCIETY,

For the Year ending 31st December 1871.

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



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P R E F A C E .

THE Meteorological Committee consists of Fellows of the Royal Society who were nominated by its President and Council, at the request of the Board of Trade, for the purpose of superintending the Meteorological duties formerly undertaken by a Government Department, under the charge of Admiral FitzRoy.

The Committee are credited with a sum of £10,000, voted annually in the Estimates, for the administration of which they are wholly responsible, and over which they are given the entire control.

The Meetings of the Committee are held once a fortnight or oftener when necessary, when every subject on which action has to be taken by their executive officers receives their careful consideration. The duties of the Committee are onerous, and *entirely gratuitous*; they were accepted, and are very willingly performed by the members, on account of the earnest desire they severally feel for the improvement of Meteorological Science.

MEMBERS OF THE COMMITTEE :—

GENERAL SIR E. SABINE, K.C.B., *Chairman*.

Mr. DE LA RUE.

Mr. FRANCIS GALTON.

Mr. GASSIOT.

Rear-Admiral G. H. RICHARDS, Hydrographer to the Admiralty.

Major-General W. J. SMYTHE, R.A.

Mr. W. SPOTTISWOODE.

Sir CHARLES WHEATSTONE.

June 1872.

R E P O R T

For the Year ending December 31, 1871.

PART I.

THE Committee in this their Fifth Annual Report have no Introduction. special further development of their scheme of operations to describe beyond those which will be found in their previous reports, but they feel gratification in being able to point to highly encouraging and practical results which have already been secured by the modes of observation and investigation carried out under their superintendence.

The staff of the office and the distribution of duties remain almost unchanged. Mr. Robert H. Scott is charged with the entire management of the system, and in the department of Ocean Meteorology he has the assistance of Captain Henry Toynbee, the Marine Superintendent, who takes the immediate charge of that branch of the work.

The records from the seven self-recording observatories, as in previous years, are examined at Kew in accordance with the arrangements described in the Report for 1869, p. 19. They are then forwarded for discussion to the central office.

The results are published in the Quarterly Weather Report, of which the volumes for the years 1869 and 1870 have appeared, as will be described hereafter.

The operations of the Committee comprise the three following divisions :—

I. *Ocean Meteorology*, comprising the investigation of the meteorological conditions of the entire ocean by means of observations made at sea with instruments lent by the office. Subdivision of objects of inquiry.

The supply of instruments to the Admiralty is also undertaken by this branch.

II. *Weather Telegraphy and Signals*, comprising the entire system of observation and of telegraphy required for the preparation of the daily weather reports, and for the issue to our own ports and to foreign countries of telegraphic information of ordinary weather and of storms.

III. *Land Meteorology of the British Islands*, comprising the method of inquiry carried on at the seven self-recording observatories established by the Committee. The object of this branch is, firstly, to afford for the entire area of the United Kingdom accurate meteorological information, similar to that published in most European countries under the auspices of their respective governments ; and, secondly, to furnish better data for the study of our weather than had previously existed, so as to place the

investigations conducted in connection with Branch II. on a satisfactory scientific basis.

I.—OCEAN METEOROLOGY.

Issue of instruments.

The office continues, as in former years, the practice of lending, to captains in the mercantile marine, instruments which have been tested at Kew, and are generally, except in short voyages, returned for re-comparison with standards as soon as the ship returns to port. The loan is granted on condition of observations being regularly taken and entered in a meteorological register, which is issued with the instruments, and is sent to the office when they are returned.

The instruments supplied to a ship consist of—

- 1 Marine barometer (Kew pattern),
- 6 Thermometers with a thermometer screen,
- 4 Hydrometers ;

and in exceptional cases an azimuth compass is added.

Observations made with instruments which have not been supplied, or authentically verified, by the office are not employed in the investigations. Aneroid readings are never used.

Captains of merchant ships are allowed to purchase any of these instruments at cost price, on condition of their keeping a register of observations for the office.

The Committee undertake, in addition to their relations with the mercantile marine, the entire duty of supplying Her Majesty's navy with all the meteorological instruments used in the service. The observations made with these instruments are not necessarily sent to the Meteorological Office, as the keeping of a special meteorological register is entirely voluntary. They would here acknowledge the receipt of a most valuable register from H.M.S. "Orontes," Captain John L. Perry.

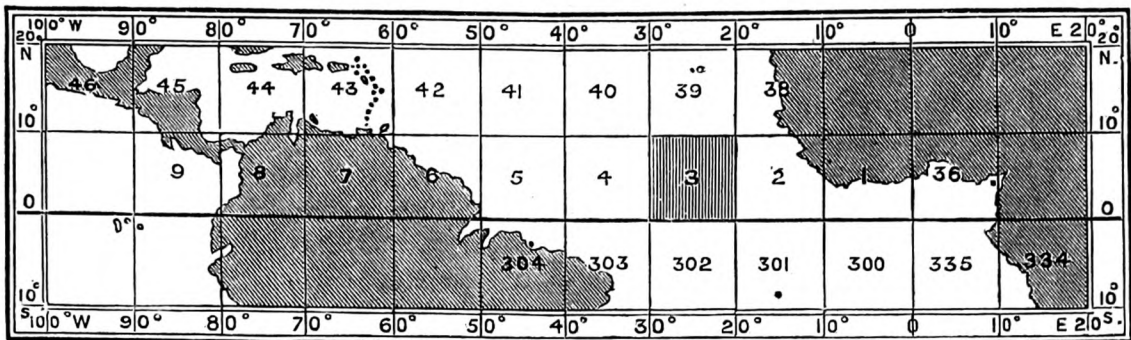
Progress of discussions.

The modes of examination of the registers as a test for their accuracy, and of correcting the observations, have been fully described in previous years, so that it is unnecessary to allude further to the subject.

The investigation into the meteorological conditions of the equatorial portion of the Atlantic Ocean has made regular progress, and at the end of the year all the information relating to that district which was contained in the 2,844 documents in the office had been extracted into the data books. The actual number of logs which were used for the extraction was 1,037, the remainder, nearly two-thirds of the entire number, either having no reference to the district in question, or bearing evident marks of inaccuracy and consequent worthlessness. Most of these 1,037 logs contain the observations of two passages, the ships having traversed the area both on the outward and homeward voyages.

The numbered squares on the accompanying small chart show the actual localities for which data have been extracted.

The shaded square, No. 3, being perhaps the most important district for seamen over the entire ocean, has been that first Equatorial region of the Atlantic Ocean.



taken up for discussion, and a method for publishing the information is under the consideration of the Committee.*

The present practice as regards the issue of instruments is that a circular letter is sent to every captain arriving in London who seems likely to keep a good register, requesting him to call at the office, and, by a personal interview with Captain Toynbee, learn the nature of the observations, &c. required by the office. In addition to the vessels leaving London, a few have been supplied in the ports of Liverpool, Glasgow, and Aberdeen, at each of which places verified instruments belonging to the office can be obtained. Collection of observations.

As soon as a register is received at the office it is examined, and if extra explanations on any points arising out of the log are found to be requisite, a letter is at once written to the Captain, asking him to furnish such additional information while the circumstances are fresh in his memory. His reply, when received, is registered, and all requisite notations are copied into the log before it is set aside, or handed into the Marine room for extraction.

The practice of classifying the logs according to their quality has been maintained; the grades are four in number: excellent; very good; good; ordinary.

To all the observers who have obtained the mark "excellent" a copy of the Atlantic Pilot Charts is presented. Any observers who have already received these charts, and who may continue to observe for the office, have the special thanks of the Committee for each register which has received the mark of "excellent." Presentation of Pilot Charts.

The names which have been added during the financial year to the list given in last year's Report are as follows:—

Presentation of Pilot Charts.

Captain's Name.	Ship.
Barwood, William Richford	- "Fugitive."
Campbell, Archibald	- S.S. "Britannia" and S.S. "Europa."
Ellery, William	- "Bowfell."
Grange, James	- S.S. "Acantha."
Gray, John McDonald	- "Speranza."
Harris, David	- S.S. "Medway."
Jones, George Henry	- S.S. "Nile."

* The discussion for the month of January was completed at the end of March; a notice of the results obtained will be found in Part II. of this Report, p. 28.

	Captain's Name.	Ship.
Presentation of Pilot Charts.	* Kennedy, Charles William	- S.S. "Scotia."
	Kerr, Thomas Coulter	- "Durham."
	Lunham, Robert Dowe	- S.S. "Berar."
	Maddison, John	- "Anglesey."
	† Manning, Henry	- S.S. "Kangaroo."
	‡ Menzies, Charles James	- S.S. "Austrian."
	Moore, Thomas	- "W. E. Gladstone."
	‡ Paterson, James Forrest	- S.S. "Moravian."
	Perry, John L.	- H.M.S. "Orontes."
	Renaut, Charles Henry	- "Celaeno."
	Steele, John	- S.S. "Erl King."
	Stuart, George Rennie	- "Otago."
	Stuart, William Henry	- Colonial Lighthouse Tender "Richmond."
	Tilmouth, Robert J. C.	- "Peeress."
	Townsend, William Henry	- "Valentine and Helene."
	Trench, Charles E. Le Poer	- "Newcastle."
	§ Vine, William W.	- H.M.S. "Orontes."
	Walker, John Burnett	- S.S. "Erik."
	Watkins, Thomas	- "Emulation."
	Wilcox, Henry George	- "St. Lawrence."

Two of the above names are those of officers in the Royal Navy, to whom the Committee do not feel themselves at liberty to present the Pilot Charts; they have, therefore, only received the letters of thanks. In Appendix II. will be found a list of all the observers whose logs have been classed as "excellent," since the beginning of the year 1869. Some of the gentlemen mentioned in the list have been regular observers for the office for many years.

Localities
whence obser-
vations are
being derived.

The geographical distribution of the vessels in which observations were being taken at the close of the year 1871 was as follows:

Voyages.	Ships.
To Baffin's Bay or Greenland	- 3
„ North America, East Coast	- 17
On East Coast, North America	- 3
To West Indies	- 8
„ Brazil	- 3
„ West Coast, South America	- 10
„ West Coast, Africa	- 3
„ Australia and New Zealand	- 7
„ India, viâ the Cape	- 26
„ India, viâ Suez	- 3
In India Seas	- 2
To China Seas, viâ the Cape	- 6
„ China Seas, viâ Suez	- 1
„ Mediterranean Ports	- 2
„ Home Ports	- 3
	<hr/> 97 <hr/>

* Then Chief officer.

† Assisted by Walter Goodsall, 3rd Officer.

‡ Chief officer.

§ Navigating Lieutenant.

As has already been explained, every one of these 97 ships carries a set of standard instruments, each of which has been verified at Kew, and is re-compared either at the office or at the port of arrival as soon as the voyage is over, so as to ensure that any, even the slightest, change in the corrections shall not pass unnoticed.

Appendix No. III. contains a list of the documents received during the year in this department.

In continuance of what was said in the Report for 1870 in reference to the arrears of work found by them in the office, the Committee are glad to say that good progress has been made in completing the several investigations. Arrears of work.

The monthly charts of the meteorological information for the west and south coasts of South America have been published with explanatory notes.* Charts of coast of South America.

The materials for some parts of the district referred to are very scanty, but from their general accordance with each other it is sufficiently apparent that they give a fair representation of the meteorological conditions of that part of the Ocean. Among other matters rendered visible by them is the existence of an area of relatively high barometrical pressure over the Pacific about the 30th parallel of southern latitude, which changes its position slightly from month to month, but never extends to the land. The sea surface temperatures also show that off the coast of Chili the water is warmer than the air, a fact at variance with the generally received opinion.

In addition to the information exhibited in the Charts, the publication contains meteorological results on the Falkland Islands and Valparaiso from information in the office, and for five other stations, Punta Arenas, Puerto Montt, Coquimbo, Santiago, and Copiapo from papers by Dr. J. Hann, published in the Journal of the Austrian Meteorological Society.

An investigation into the currents and surface temperature of the North Atlantic from the Equator to 40° N., for $2\frac{1}{2}$ degree squares, which had been left in an advanced state by Admiral FitzRoy has been completed, and the charts, one for each month, with a general chart for the year, lithographed. The text of the paper was in the press at the end of the year, and the work has since been published.† These charts do not, of course, aim at the same degree of minuteness of delineation as those which will result from the special investigation of the equatorial portion of the Atlantic to which reference has been made at page 7, but in the meantime it has been deemed desirable to place in the hands of the public an amount of information not elsewhere attainable. Atlantic Current Charts.

These Charts show that the easterly current which sets into

* Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. Stanford, 1871. Price 2s. 6d.

† Currents and Surface Temperature of the North Atlantic Ocean from the Equator to 40° N. Stanford, 1872. Price 2s. 6d.

Atlantic Current Charts.

the Gulf of Guinea has its maximum extent in August, reaching to 45° W. longitude, flowing between 3° and 12° N. latitude, on the meridian of 20° W. ; and its minimum extent in February in longitude 25° W., flowing between 2° and 5° N. on the 20th meridian. From February to August it is extending itself to the westward and northward, and from August to February it is retreating again. From March to November, that is, when this current is fullest, it abuts upon the African coast between latitude 5° and 11° N., part of it is deflected to the northward, and combining with the North African current, flows into the Westerly Drift. During the months from December to February inclusive, the North African current appears to be the stronger and flows to the south-eastward, mingling with the Guinea current. The North African current appears to be best developed during the months from December to June, and to be very feeble during the rest of the year. Thus, while the Guinea current is at its maximum, the North African current is at its minimum, and *vice versa*.

Anemometrical results for the Orkney Islands.

The discussion of the anemometrical data for the station of Sandwick Manse, in the Orkney Islands, for the six years 1863–8, was all but completed at the end of the year, and will be published as an appendix to the Quarterly Weather Report for 1871.

Do. for Bermuda.

The anemometer at Bermuda was erected early in 1859, and it has been at work ever since that time ; but it is found that only the first four years of the returns are sufficiently satisfactory to be worth the labour of discussion. These have been accordingly taken in hand. The instrument has lately been thoroughly repaired, and is again in complete working order.

“ City of Boston ” gale.

The special investigation into the weather of the Atlantic during the first few days of February 1870 has been prosecuted steadily by Capt. Toynbee, and the charts, 15 in number, were in process of being lithographed at the end of the year. They will be published in the course of the summer. It is hoped that the information afforded by these charts will form a really useful addition to our knowledge of the weather of the Atlantic.

Supply of unpublished information.

As in former years meteorological information has been supplied to several gentlemen who were engaged in various investigations, the expense of copying has been defrayed by the applicants whenever it amounted to more than a few shillings. The most important case of such supply has been that to Mr. Meldrum, of the Mauritius.

Stock of instruments.

In Appendix IV. will be found a list of all the instruments supplied to ships in the Royal Navy during the year, with a statement of the entire stock and distribution of instruments standing on the books to the account of the Admiralty on the 31st December 1871. This latter statement is prepared from the latest returns furnished by the storekeepers at the respective dockyards, &c.

Appendix V. gives similar information with regard to the Board of Trade instruments.

II.—WEATHER TELEGRAPHY AND SIGNALS.

The number of reporting stations on our coasts has been augmented by the addition of the station in the Shetland Islands, to which reference was made in the last Report. The station is situated at Dunrossness, about seven miles north of Sumburgh Head. The establishment of this outpost beyond our northern coasts has been of the greatest importance to the study of the weather both in these islands and in Norway and Denmark.

Station in the
Shetland
Islands.

It is to be regretted that the cable has not been constantly in working order, so that the communication with the islands has been subject to more frequent interruptions than was at all anticipated.

In a few cases changes have been made in the stations or in the observers. Of the former, the most important has been at Liverpool. The instruments at that place were formerly situated at the telegraph office, in the centre of the town, and as this was surrounded by high buildings the records of temperature and rainfall were unreliable. By the kind liberality of the Mersey Docks and Harbour Board the observations are now taken at their observatory on Bidston Hill, near Birkenhead, and transmitted over their wire, free of cost, to Liverpool. Mr. J. Hartnup, jun., has kindly undertaken to furnish the reports. At Aberdeen, Mr. J. Gibson, who has acted most efficiently as reporter for five years, has found that his duties will no longer allow him to take the observations regularly, and accordingly the reports are now furnished by Mr. J. M'Cormack.

Changes in
stations.

All the stations were, as usual, visited by Mr. Scott in the course of the year, and everything was found in good order. A list of the stations, with the observers' names, will be found at Appendix VI.

As regards the future extension of the telegraphic system, the Committee hope to be able to establish a station in the Hebrides as soon as the cable shall have been laid to those islands.

The Committee have been for some time desirous of rendering their daily reports more generally useful to the public, and particularly to the agricultural interest, than they can be at present. Information derived almost exclusively from coast stations must necessarily be incomplete as regards the weather of the interior, as the conditions of temperature, cloud and rain, on the seaboard are often very local. They opened communications with the Post Office authorities early in the year 1870, with the view of adding a small number of inland stations to their existing list, but up to the close of 1871 no definite arrangement had been made; however, they hope ere long to be able to state that the negotiations have come to a successful termination.*

Reports from
inland stations.

The reports from Heart's Content, for the free transmission of which over their ocean wires the Committee have been for four years indebted to the Anglo-American Telegraph Company, have

Discontinuance
of Heart's
Content as a
station.

* The system will come into operation on the 1st of July.

now been discontinued, as the Company intimated that they would be obliged to make a charge for the messages. The Committee have, therefore, deemed it advisable to decline the reports altogether, as they consider that the money would be better spent on additional stations in these islands.

Telegraphic
reports from
the Azores.

With reference to the proposal made last year to the British Association for the extension of the European telegraphic weather system to the Azores, the Committee have received an unofficial communication from Professor Buys Ballot, and have given him to understand that as soon as the proposal is in a sufficiently mature condition for him to give an estimate of the probable cost of the messages, they will be ready to take the matter into consideration.

Arrangements
with foreign
countries :
France.

The arrangements for exchange of information with foreign countries have been extended during the year. With France the system which was in existence before the war of 1870, and which was described in the Report for 1869, has been restored, the only change in it being the substitution of Charleville as a reporting station for Strasburg.

Norway.

There has been no change whatever as regards Norway during the year excepting that the office has forwarded the reports from the Shetland Islands to Christiania whenever they have been received.

Holland.

With Holland, too, there is no change to report; but as regards Denmark and Hamburg the arrangements have been materially modified.

Denmark.

From Denmark the office receives daily reports from the island of Fanö, and sends in return intelligence of storms whenever necessary.

Hamburg.

As regards Hamburg, the anticipations held out last year have been fulfilled, and the Norddeutsche Seewarte has undertaken to supply during the winter months daily reports from Cuxhaven, at the mouth of the Elbe. This service was commenced before the close of the year. In return the office sends occasional intelligence of storms similar to that transmitted to Holland and Denmark, and arrangements are in progress for a more complete system of exchange of information. As a proof that the British telegraphic reports are valued by the authorities at Hamburg, the Committee may quote Herr von Freeden's statement in his annual report for 1871, p. 7, that "it can be proved from our daily weather reports that out of 23 storms felt in Hamburg during the year, 22 had come across the British Islands."

The office receives, or would receive, were the continental telegraphic communications perfect, 38 reports every morning, and 9 every afternoon. The stations are situated along the entire coast of the continent, from Christiansund, in lat. 63° N., to Corunna.

Preparation of
daily weather
report.

The daily observations are taken at 8 a.m., Greenwich time, and most of the telegrams arrive in London about 9 o'clock. They are at once transmitted to the office by the private wire. An hour is required for their reduction, discussion, and the preparation of the daily weather report, copies of which are at once

supplied for the afternoon issue of several of the London papers. A wind chart for the day is also drawn for the "Shipping Gazette." A brief telegraphic *resumé* of the weather is despatched to the Marine Ministry in Paris, and if necessary, telegraphic intelligence of storms or of atmospherical disturbance is sent to our own coasts and to foreign countries. Later in the day the foreign telegrams, and subsequently the afternoon reports, come in. Copies of the complete report are then sent by post to the newspapers for next day's morning issue, and to certain seaports, 23 in number, which have applied for it on the terms named in the circular issued by the Committee in March 1867. (See Report, 1867, p. 17.) In addition, copies are supplied to a number of gentlemen, most of whom send in regular observations to the office. The Report is also sent to 9 societies, &c. in Great Britain, as well as to the Meteorological Committee of Calcutta, and to 18 foreign institutions. A complete list of the recipients will be found at Appendix VII.

Preparation of daily weather report.

The intelligence of storms which is sent out from the office is of different characters, according to the requirements of the place which receives it. In Appendix VIII. will be found a list of the stations which are furnished with drums, in accordance with circular 278 of the Board of Trade, issued in November 1867 (Report for 1869, Appendix VIII.). These stations were, at the end of December, 128 in number, situated, 63 in England, 14 in Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands. Lamps for night use are supplied to a few of the stations. All the stations have been established and are in accordance with the terms laid down in the circular, excepting the dockyards, which are of course under Admiralty management. The messages sent consist of an order to hoist the drum, accompanied by a brief explanation of the reasons why it is to be hoisted. The message is posted up as soon as it is received, for the information of the public. It continues in force for 48 hours, *and no longer*, from the time of its receipt, unless modified by a subsequent telegram, which is frequently sent, either when the danger is known to have passed over, or when there are signs of the approach of another storm.

Telegraphic weather intelligence.

It will be noticed that the time during which the drum is kept up has been extended from 36 hours to 48. It was found that not unfrequently the necessity of hauling down the drum at the expiration of 36 hours was disadvantageous. In any case if the danger appears to be over before the 48 hours are out, an order is issued to lower the drum.

Extension of time of keeping up drum.

In addition to the foregoing, a special telegram is sent to the Underwriters' Association of Liverpool, whenever the difference between any two barometrical readings taken that morning in these islands or on the adjacent French coast, exceeds half an inch. The message consists of reports of the atmospherical pressure and the wind at the most important stations. By this means intelligence of the general conditions of weather that morning reaches the underwriters' rooms daily before 1 o'clock,

Telegraphy to Liverpool.

Telegraphy to
Liverpool.

as long as the atmosphere continues in a disturbed condition. The entire expense of transmission of these telegrams is borne by the Association.

All intelligence transmitted to the coasts is also forwarded to Lloyd's Rooms, where it is at once posted up for the information of the members.

No change has been made in the character of the intelligence sent to foreign countries, or in the conditions under which the messages are despatched, so that the Report for 1869 gives full information on this point.

Results of
system.

There is no change to note in the system of issue of telegraphic warning messages, excepting that just mentioned, as to the extension of the time of keeping the drum up; but in the course of the past year a return* was supplied to the House of Commons, on the motion of the President of the Board of Trade, which gives some facts of interest as regards the practical value and utility of the system.

The warnings which were issued were compared with the weather experienced on the coasts as recorded by the various continuously self-registering anemometers, by the telegraphic reporter, and by the several gentlemen who have volunteered to observe for the office.

The coasts were subdivided into nine districts, as will be seen in the subjoined table. Two large tracts of coast are entirely omitted, the west of Ireland from the Shannon to Malin Head, and the west of Scotland from the Mull of Cantire to Cape Wrath. No warnings were sent to any place on those coasts except to Galway, and no information as to weather has been received from them.

It should be remembered that in analysing the reports "all observations of the wind in which the force exceeded 7 (a moderate gale), or the velocity exceeded 40 miles an hour, have been quoted as instances of the occurrence of a gale, but it has not been considered that the drum was hoisted *late* or was *hauled down too soon*, unless the force of 9 (a strong gale), or the velocity of 50 miles an hour was reached *prior* to the issue of the order to hoist, or *subsequent* to the issue of the order to lower."

In the summary, all cases in which the signal has been shown to be partially late by one single report of force 9, or of the velocity of 50 miles, have been specially noted in the remarks, and marked with a *p*.

All telegrams which were late, owing to the intervention of a Sunday, are marked with *s*. Two of the most serious gales of the year, those of February 6 and October 16, were missed, owing to the fact that they occurred on Sunday nights.

* Returns showing the lists of places to which telegraphic weather intelligence was sent in 1870, arranged according to coasts, and showing the number of telegrams sent to each station, and the storms reported on the coasts of the British Islands in 1870, with summary.—Parliamentary Paper, No. 504. August 21, 1871.

—		Total No. of orders to hoist and repetitions.	Warnings justified by subsequent gales, force 8 and upwards.	Warnings justified by subsequent strong winds, forces 6 and 7.	Warnings not justified by subsequent storms.	Warnings, late, force 9 reached at two stations before issue.	Warnings partially late, force 9 reached at one station before issue.	Warnings late, owing to Sundays, or telegraphic errors.	Storms for which no warning was issued.	Results of system.
Ireland, South	-	42	23	3	6	3	5	2	1, 2 s, 2 p,	
„ East	-	47	18	16	11	—	—	2	2 s,	
Scotland, East	-	31	10	3	14	1	2	1	1, 2 s,	
„ West (Clyde)	-	42	13	9	14	—	3	3	5 s,	
England, North-west	-	47	27	11	8	—	—	1	2 s,	
„ West	-	43	27	9	2	—	2	3	5 s,	
„ South	-	40	20	11	7	—	—	2	3 s,	
„ South-east	-	30	11	7	12	—	—	—		
„ East	-	27	14	7	4	1	1	—		
Totals	-	349	163	76	78	5	13	14		
Per-centages	-	- -	46·7	21·8	22·4	1·4	3·7	4·0		

The Report concludes with the following words:—

“ From the above summary it will be seen that the absence of out-stations on the west coast of Scotland throws serious difficulties in the way of forming a judgment as to the prospects of weather in that country. The number of instances in which telegrams sent to the south-east coast of England were not justified by subsequent weather, is attributable to the fact that many of the storms did not advance beyond the entrance of the English Channel.”

The Committee cannot but consider the figures shown in the foregoing table as very satisfactory.

The mean monthly values for barometrical pressure and for rainfall for several of the telegraphic stations for the five years, 1866–70, have been published in the Quarterly Weather Report for 1870.* The means for temperature were not calculated, owing to the unsatisfactory conditions of the exposure of the thermometers in many instances.

In the last Report the Committee intimated that they were anxious to extend the system of exchange of telegraphic information to Sweden and Denmark. Accordingly they instructed Mr. Scott, who was in Norway in the course of the autumn, to extend his tour to Stockholm, Upsala, and Copenhagen, with the

Mean results for telegraphic stations.

Mr. Scott's tour to Sweden, &c.

* The stations are:—Nairn, Aberdeen, Leith, Scarborough, Yarmouth, Androssan, Greencastle, Holyhead, Valencia, Roche's Point (3 years only), Penzance, Plymouth, Portsmouth, and London.

view of instituting negotiations for the above object. On his return he submitted a report to them from which they would extract the most important particulars for these pages.

Christiania.

At Christiania he saw Professor Mohn, the Director of the Meteorological Institute of Norway, an establishment with which the office has maintained for several years relations of a most satisfactory nature.

Stockholm.

At Stockholm he saw Dr. Lindhagen, Secretary to the Academy of Science, and made arrangements with him to submit, through the Academy, to the Swedish Government any proposals for an interchange of telegraphic information with Sweden which the Committee might be disposed to make. From Professor Gylden, also, Director of the Observatory of Stockholm, considerable assistance was derived.

Upsala.

At Upsala, which was the next place visited, Mr. Scott received a most cordial reception from Professor Gustav Svanberg and Professor Rubenson, the latter of whom takes charge of the meteorological department of the Observatory, and has for some years, with the voluntary assistance of some of the students, carried out an uninterrupted series of hourly eye observations. The amount of labour entailed thereby has been very serious, but it has been fortunately rendered no longer necessary by the adoption of Dr. Theorell's meteorograph.

To Professor Rubenson, especially, Mr. Scott is indebted for most useful advice as to the proposed system of telegraphy with Sweden.

Copenhagen.

At Copenhagen the idea of an exchange of telegrams was received with the greatest readiness, not only by Professor Steenstrup and the professed meteorologists, among whom Captain Hoffmeyer and Herr Docent Fjord should be named, but by the Government. The Minister of Finance, to whom Mr. Scott was introduced by Herr Tietgen, chairman of the Great Northern Telegraph Company, was most favourably disposed to the plan, as was also the Telegraph Director, M. Faber.

Herr Tietgen further expressed his readiness on behalf of the Great Northern Telegraph Company to allow the messages to pass free over their lines.

Proposed
exchange of
Reports.

Under these circumstances the Committee have addressed a letter to the Academy of Stockholm, proposing a daily exchange of telegrams from four stations (Haparanda, Hernosand, Upsala, and Wisby,) in return for reports from any four British stations.

To the Ministry of Finance at Copenhagen, they have proposed an exchange of reports from two stations, naming Fanö* and Skagen.

Very satisfactory answers have been received to the respective proposals, and the negotiations are still in progress.

While thus gradually extending their network of stations over Northern Europe, the Committee have not been neglectful of the study of our own weather, which is now regularly and carefully discussed for the purposes of the Quarterly Weather Report, as has been described in previous Reports. In order to

* The reports from this station began on the 1st of October.

render this discussion more complete, the various continental bulletins are consulted, a list of which is given in the note.*

Before the close of the year the attention of the Committee was directed to the desirability of publishing a daily chart of the weather. Various plans were proposed, and early in January 1872 one was adopted, which was suggested by Mr. Francis Galton, and of which a specimen is shown in Part II. The information is given on four separate charts, exhibiting respectively the conditions of—I. Barometrical pressure; II. Temperature; III. Wind and Sea disturbance; IV. State of the Sky and Rain.†

Daily Weather Charts.

The practice of lending fishery barometers to small ports and fishing stations, as described in previous reports, has been continued. Two of these instruments were issued during the year, and there are now 115 stations on our coasts supplied by the office with barometers for public use. They are situated 50 in England, 2 in Wales, 40 in Scotland, 21 in Ireland, and 2 in the Isle of Man. See App. No. IX.

Fishery barometers.

III.—LAND METEOROLOGY OF THE BRITISH ISLANDS.

This branch of the office has not undergone any material change in its operations during the past year. The seven Observatories were visited by Mr. Scott in the course of the summer, and were found to be uniformly in thorough working order.

The anticipations held out in the Report for 1870, with reference to the future relations of the office with the central Observatory at Kew, have been fulfilled in a satisfactory manner; the Council of the Royal Society having requested the Members of the Meteorological Committee, under the name of the Kew Committee of the Royal Society, to undertake the management of the Observatory, and placed at their disposal a sum of money from the Gassiot Fund, sufficient to defray the expenses of the magnetical observations carried on there. The entire

Kew Observatory.

* LIST of Daily Meteorological Bulletins received at the Meteorological Office :—

Place.	Whence issued.
Christiania - - -	Norske Meteorologiske Institut.
Copenhagen - - -	K. Landhus-holdning's Selskab.
Hamburg - - -	Nord-deutsche Seewarte.
Lisbon - - -	Observatorio do Infante D. Luiz.
" - - -	Angra do Heroismo, Azores.
" - - -	Funchal, Madeira.
Madrid - - -	Observatory.
Paris - - -	Observatoire National.
Paris - - -	Observatoire Météorologique Central de Montsouris.
St. Petersburg - -	Central Physical Observatory.
Utrecht - - -	Koninklijk Nederlandsch Meteorologisch Instituut.
Vienna - - -	K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.
Washington - - -	War Office.

† These Charts are delivered *by hand* at about 2 p.m. in London. They are furnished to most of the public offices. The rates of subscription are : for hand delivery, 10s. per quarter; for delivery by book post, 5s. per quarter.

operations will therefore be conducted in future under their own superintendence.

Alterations in
instruments.

It need scarcely be stated that the management of the Observatory and the office are totally independent of each other, inasmuch as the former has been entrusted to them by the Royal Society, to which body therefore the annual reports will be presented.

The self-recording rain gauges at all the observatories commenced regular work on the 1st of April.

The only change in the instruments which is now in contemplation, is an alteration in the mode of registration of the anemographs. It will have been noticed in the last Report that the continuous records of velocity furnished by the instruments are cut up into hourly sections for the purposes of publication in the Quarterly Weather Report. Mr. De La Rue, to whom the suggestion of this improvement is due, has devised a method of modifying the registering portion, so that the instrument itself should furnish the hourly traces. One of these anemographs is now ready, and performs satisfactorily, and it is intended gradually to alter the anemographs to correspond.

Quarterly
Weather Re-
port.

Considerable delays have unfortunately occurred in the publication of the volume of the Quarterly Weather Report for 1870, so that as yet no material reduction of the amount of arrears has taken place. These delays have been partly caused by the difficulties met with in the adoption of the process of printing the plates from the copper.

The scale portion of the plates is now produced by the process of electrotyping, and it was found that several of the plates first produced were not sufficiently solid to bear the pressure necessary for printing, so that serious inconvenience thereby resulted.

Vapour
tension.

The vapour tension has been inserted on the plates by the use of the trace computer, of which a description will be found in Part II., and from the beginning of April the rain returns also have been added; the amount which has fallen in each hour is shown by a line similar to that for the wind.

Rain.

The first appearance of these returns of rain seems a suitable opportunity to introduce fuller records of rain into the Quarterly Weather Report than have hitherto appeared in it, and accordingly monthly returns will be published from the various stations whence observations are received at the office.

Discussion of
data.

As regards the mode of treatment of the observations, in order to show the monthly and daily march of the several elements, it has been determined to employ Bessel's well-known interpolation formulæ, and, as a first step towards this end, a translation of Bessel's original paper, "On the Determination of the Law of a Periodical Phenomenon," has been inserted in the Quarterly Weather Report for 1870.

The plan of publication of the plates having now been definitely adopted, it has been determined to consider the year 1871 as in arrear, and to accelerate as much as possible the plates for the year 1872, clearing off the year 1871 as opportunity may offer. It is hoped that Part I. for 1871, as well as Part I. for 1872, will be published at latest in July 1872.

In addition to the anemometrical records from their own Volunteer stations, the Committee have received similar returns from observers. several private observers, to whom they would here express their most sincere gratitude. Among these they would name particularly His Grace the Duke of Northumberland, Alnwick Castle, and L. J. Crossley, Esq., Moorside, Halifax, whose returns are complete. Mr. R. H. Barnes, of Kensington Palace Gardens Terrace, also furnished returns as long as his anemometer was in operation.

The list of volunteer observers who send in returns of various natures has grown considerably since last year. It now consists of 28 names :—

Volunteer Observers.

Name.	No. of Form.	Place.
* Baxendell, Joseph, F.R.A.S.	—	Fernley Observatory, Southport.
Bellingham, J. G. - -	14	Saffron Walden.
Byron, Rev. J. - -	17	Killingholme, Lincolnshire.
Clouston, Rev. C., LL.D. -	12	Sandwick Manse, Orkneys.
Cooper, Col. E. H., F.R.A.S.	12	Markree Castle, near Sligo.
Cooper, W. F. - -	14	Sheffield.
Curtis, Professor A. H. -	19	Queen's College, Galway.
† Dunlop, W. H. - -	—	Annan Hill, Ayrshire.
Dunn, F. - -	12	Moreton-in-the-Marsh.
Gerhardi, C. - -	19	St. Helier, Jersey.
† Hoskins, S. E., M.D., F.R.S.	—	Guernsey.
Griffith, Rev. C. H. - -	17	Strathfield Turgiss, Hants.
Irvine, J. - -	15	North Shields.
Livesay, J. G. - -	17	Ventnor.
Mackrell, T. - -	19	Barnstaple Meteorological Committee.
Malleson, Rev. F. A. - -	17	Broughton-in-Furness.
† Mansell, Dr. - -	—	Guernsey.
Moore, J. W., M.D. - -	19	Dublin.
Moyle, M. P., M.R.C.S.	12	Helston.
Prince, C. L., F.R.C.S.	17	Uckfield.
* Redford, Rev. F. - -	—	Silloth, Carlisle.
* Richards, W. H. - -	—	Penzance.
Rosse, Earl of, F.R.S. - -	19	Birr Castle, Parsonstown.
Sawyer, F. E. - -	17	Brighton.
Stanford, W. - -	15	Gorleston, Yarmouth.
Sutherland, A. - -	15,17	Carrickfergus.
Wilson, J. M., F.R.A.S.	19	Rugby Natural History Society.
Woollett, G. C. - -	19	Acrise, Canterbury.

Description of Forms.

12. Monthly tables, 2 observations daily ; 14. Monthly table and diagram, 1 observation daily ; 15. Monthly register, diagram of barometer and thermometer ; 17. Occasional observations, wind and weather ; 19. Complete monthly register.

* Printed weekly register.

† Printed observations monthly.

‡ Printed occasional observations.

LIBRARY.

Appendix X. contains a list of the donations made to the library during the year. Most of these have been received in return for the publications of the office. In addition a few volumes have been purchased.

In consequence of the constant reference which is made to the office for information on meteorological questions, it has been endeavoured to collect a small library containing the standard works on meteorology, and the subjects allied to that science. The Committee are glad to say that they have already succeeded in obtaining several of the most important works.

The library at present consists of nearly 1,800 volumes, and about 1,200 pamphlets, exclusive of charts and MS. records of observations. The pamphlets are bound in convenient volumes for reference. The books, &c. are lent to the staff of the office, under the usual regulations.

EXPENDITURE.

The expenditure during the year has exceeded that during the preceding year by the amount of 800*l.* 2*s.* 11*d.*, in consequence of the heavy balances due to the Post Office for telegraphy, when the last report was printed, which have since been paid.

The balance sheet will be found at Appendix I. On the whole the transactions of the year show that the actual expenditure, duly belonging to the year 1871–2, has been within the income of that year to the extent of 400*l.* The following table shows the general distribution of the expenditure under the several heads:

—	1870–71.			1871–72.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Office, salaries, &c. -	1,195	7	0	1,222	15	2	27	8	2	—		
" rent, attendance, and contingencies -	787	11	10	866	11	3	78	19	5	—		
Observatories -	4,375	11	9	3,621	5	7	-	-	-	754	6	2
Telegraphy -	1,394	0	4	3,022	15	2	1,628	14	10	—		
Ocean Meteorology -	2,007	16	8	1,827	3	4	-	-	-	180	13	4
Totals	£ 9,760	7	7	10,560	10	6	1,735	2	5	934	19	6

Net increase, 800*l.* 2*s.* 11*d.*

The only items which exhibit a material difference are the observatories and telegraphy, the former owing to the cessation of the heavy expenditure for pantagraphs and other appliances for reproduction of the curves.

The telegraphic accounts show a large increase, due to the circumstance, already stated, that the accumulated bills for two years were paid within the 12 months.

As regards the accommodation of the office, in addition to the rooms in No. 113, Victoria Street mentioned in last report, two other rooms in the same house were secured at a rent of 70*l*. All these rooms have now been given up, inasmuch as the second floor of No. 116 became vacant, and it was very desirable to place all the departments of the office under one roof. This step has not involved any additional pecuniary liability.

Accommodation of the office.

The head of Ocean Meteorology shows a decrease of 180*l*. It will be seen on the revenue side of the balance sheet that a sum of about 100*l*. has been received from various foreign institutions. This money has been expended in the purchase of certain instruments ordered by the institutions in question, which the office has procured and supplied to the recipients at cost price. These items have tended to swell the cost for instruments, charged under Ocean Meteorology, to the extent of 100*l*.

Instruments procured for foreign institutions.

The general financial statement shows an apparent balance of 1,496*l*. 3*s*. 6*d*. in favour of the office at the end of the year, but of this sum 368*l*. is due for the expenses of telegraphy during the three months ending March 1872. 130*l*. will be required for instruments already ordered for the Admiralty and the Mercantile Marine, and about 80*l*. for other outstanding accounts, leaving a probable surplus of about 920*l*., an increase of 466*l*. on the balance with which they commenced the year.

Liabilities.

The alteration of the anemographs, in accordance with Mr. De La Rue's suggestion, already noticed, will, if carried out, involve an expenditure of upwards of 200*l*.

The proposed addition of reports from inland stations to the Daily Weather Reports, and a fuller discussion of the materials in hand will also entail extra outlay ; so that on the whole the Committee can only consider that their finances are in a satisfactory condition. The expenses of an extra observatory could not be estimated at a lower figure than about 700*l*. per annum.

Appendix XI. gives a list of the present staff in the employment of the Committee, and of their several occupations and remunerations.

Staff.

SUMMARY.

The Committee subjoin the usual summary of their operations during the past year.

I. *Ocean Meteorology*.—The number of barometers afloat on the 1st of January 1872 was 105, as compared with 123 in the preceding year. In addition all the ships in commission in the Royal Navy have, as usual, received all their meteorological instruments from the office.

Sixty-eight gentlemen have sent in registers which have received the mark of "excellent."

The investigation into the meteorological conditions of the Equatorial portion of the Atlantic Ocean is in a satisfactory condition. Notes of the results obtained will be found in Part II., p. 28. Specimen charts are to be issued to elicit opinions as to the proposed system.

The arrears of unfinished work found in the office have been nearly cleared off. Charts of Meteorological Data for the West and South Coasts of South America and Monthly Current Charts for the Atlantic Ocean from the Equator to lat. 40° N. have been published.

The discussion of the anemometrical results for six years, from the Orkney Islands, has been completed, and the work is in the press.

The investigation into the weather of the Atlantic at the beginning of February 1870 is nearly complete.

The cost of this department has been 1,827*l.* 3*s.* 4*d.*

II. *Weather Telegraphy and Signals.*—No serious change in the system has been made during the year excepting the extension of the time during which the drum is kept up from 36 hours to 48 hours.

The number of British reporting stations has been increased by one, Dunrossness, near Sumburgh Head.

The drum is hoisted at 63 stations situated in England, 14 in Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A return relating to the warnings issued in 1870 has been presented to the House of Commons.

Warnings are sent to the coasts of Norway, Denmark, Holland, and France, as well as to Hamburg.

Reports are now received from Fanö in Denmark, and, except in the summer months, from Cuxhaven.

Mr. Scott was commissioned to visit Sweden and Denmark, in order to make arrangements for an exchange of telegraphic information, and his visit has already led to practical results.

A daily weather chart is now issued, as is explained in Part II., page 43.

The number of stations to which fishery barometers have been lent has been increased to 115, situated 50 in England, 2 in Wales, 40 in Scotland, 21 in Ireland, and 2 in the Isle of Man.

The cost of this department has been 3,022*l.* 15*s.* 2*d.*, being an increase of upwards of 1,600*l.* on the amount for the previous year, owing to the settlement of the accounts with the Post Office outstanding, April 1, 1871.

III.—*Land meteorology of the British Islands.*—The seven observatories are in active operation.

Self-recording rain gauges have been introduced at all the observatories.

The Quarterly Weather Report for 1870 has been published, and contains some valuable appendices.

The cost of this department has been 3,621*l.* 5*s.* 7*d.*, as compared with 4,375*l.* 11*s.* 9*d.* in the previous year. This reduction is due to the cessation of the heavy expenditure for new instruments.

Office.—The expenses of management in salaries and wages have been 1,222*l.* 15*s.* 2*d.*

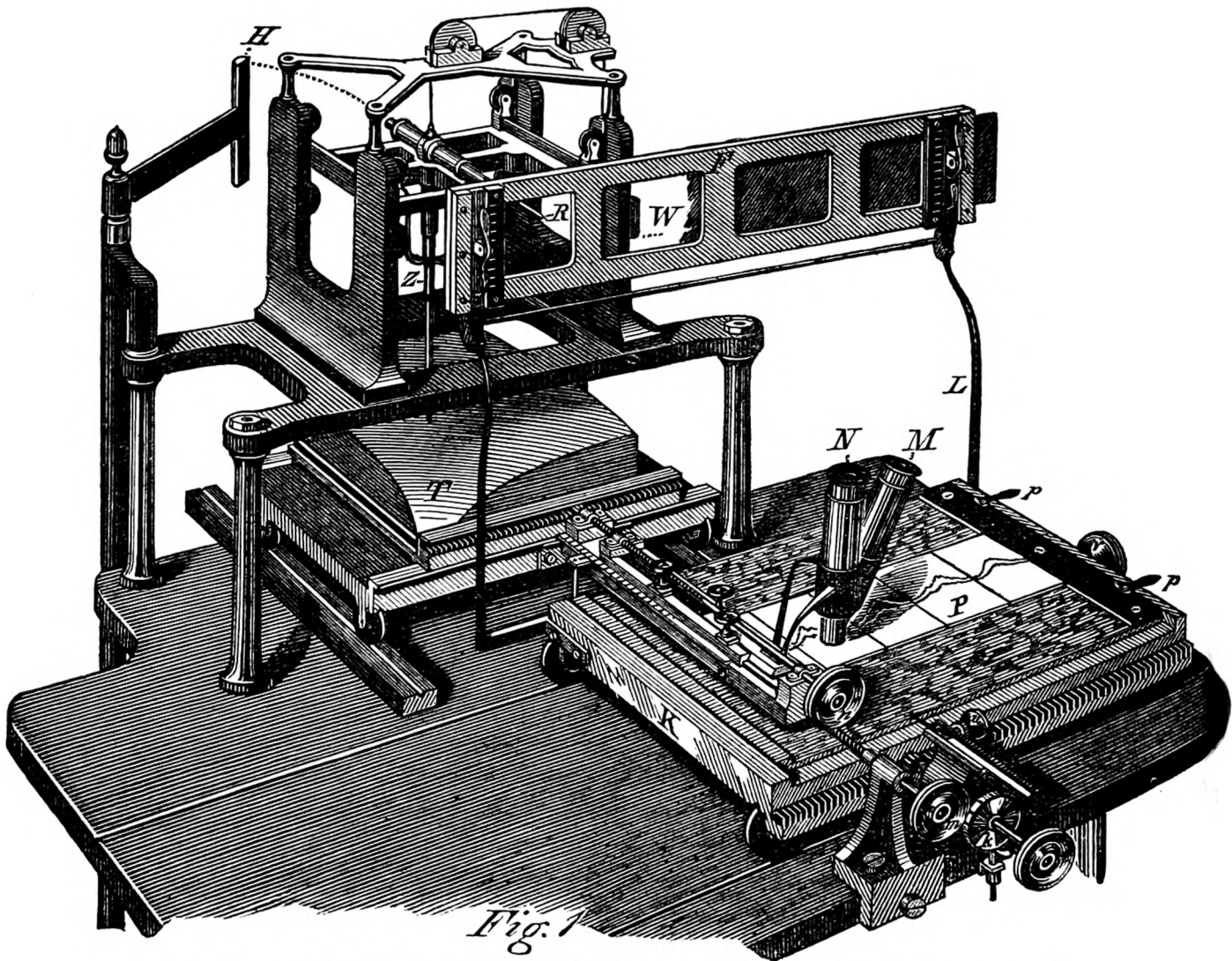
The other charges incident on the office for rent, furniture, postage, &c., have amounted to 866*l.* 11*s.* 3*d.*

PART II.

No. 1.—DESCRIPTION OF THE TRACE COMPUTER, DESIGNED BY MR. GALTON.

(Constructed by Messrs. Beck, 31, Cornhill.)

This instrument, which is at present employed in deducing and dotting out a vapour tension trace from the corresponding traces of the dry and wet bulb thermometers, is applicable to all kinds of similar work, by using appropriate templates. It may be used to deduce and dot out a trace, whose ordinates shall be any given function of the ordinates of two other independent traces, the abscissæ of all three being identical.



The machine consists of three portions. The first portion comprises a carriage K, shewn only in Fig. 1, which moves on tramways, from side to side. Its motion is governed by turning the lowermost of the three milled heads shewn at the bottom of the drawing, the axis of this milled head carrying a pinion in gear with rack work fixed to the carriage. On the same axis

another wheel is attached, it is the middle one of the three wheels shown at the bottom of the figure, and is marked *k*; this has notches into which a light spring falls as a click, to enable the operator to move the carriage through definite small steps. On the carriage *K*, a stage is mounted, so as to slide to and fro upon it, by turning the milled head just seen at the extreme right hand of the carriage and marked *V*. This stage has clamps *p, p*, and is otherwise conveniently arranged for holding firmly a row of five zinc templets, marked *P*, on which the dry and wet bulb traces have previously been scratched, by the pantagraph, invented by myself (see Report for 1871, p. 31.) To the carriage *K* is attached a vertical frame *F*, parallel to the front of the instrument, by means of two standards, of which the outside one is marked *L* in the drawing. Into the frame *F* is slipped a long zinc plate *Q*, intended to receive the trace to be dotted out by the machine. This plate is imperfectly shown in the figure, to enable the machinery to be drawn, which lies behind it. It is represented as not being quite thrust home, which accounts for the piece projecting on the right of the frame, and all the left hand part of it is broken away out of the frame, its position being indicated only by the jagged edge lying under, and to the left of, the letter *F*. It follows, from this description, that the plate which receives the trace of vapour tension, and that bearing the wet and dry thermogram traces, move together, and therefore the intersections of all three of them by any vertical plane, parallel to the sides of the instrument, will give ordinates having identical abscissæ. Now the optical position of the cross wires of the microscope *M*, which is directed on the dry bulb trace, that of the microscope *N*, which is directed on the wet bulb trace, and the pricker *R*, which dots the vapour tension trace, are, by the construction of the instrument, always in the same vertical plane, parallel to the sides of the instrument, and therefore in every position of the carriage they deal with ordinates having identical abscissæ.

The second stage is shown in the lower part of Fig. 2 more clearly than in Fig. 1. It comprises a templet *T*, having a curved surface, which slides from side to side on a carriage, the carriage itself running to and fro on a tramway. The carriage is of the shape of a **T**, its leg, which is prolonged towards the front, is in gear with a screw *m*, so that by turning the milled head the carriage is made to move to or fro on its tramway. A microscope *M*, pointed to the dry-bulb trace (furnished with a sliding adjustment, for use before commencing operations,) is fixed to the leg, and therefore follows the to-and-fro movements of the templet *T*. In short, to use well-known phrases, the movement of the templet in *Y* corresponds to the ordinate of the dry-bulb trace, at an abscissa, made by the intersection of the trace with the vertical plane spoken of at the end of the last paragraph. Again, on the same leg, is mounted another screw *n*, which, as it turns, does two things: it screws to and fro the microscope *N* which is pointed to the wet-bulb trace, and also

by a pinion at its end, in gear with rack work fixed to the templet, it causes the latter to slide from side to side on its carriage. In short, the movement of the templet in X corresponds to the ordinate of the wet-bulb trace, just as that of the templet in Y corresponds to the ordinate of the dry-bulb trace, both ordinates having identical abscissæ.

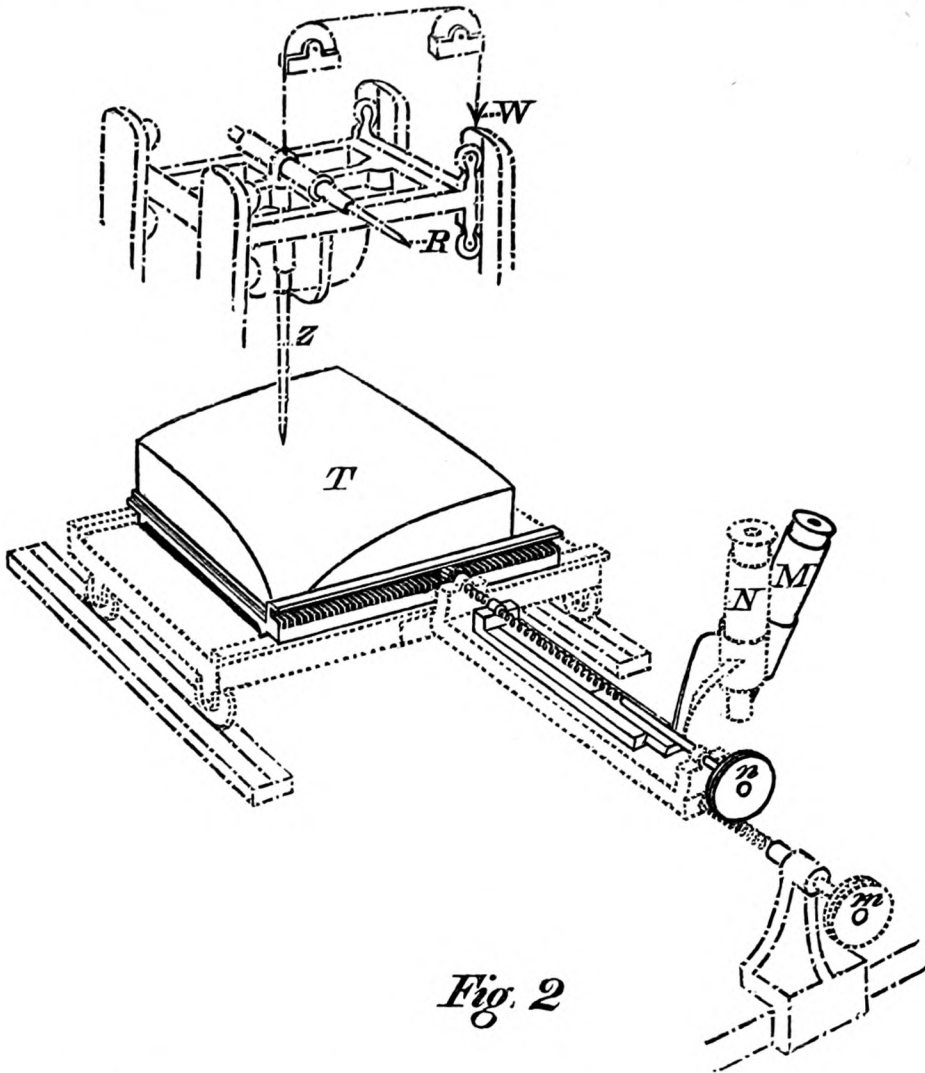


Fig. 2

The templet T is a curved surface, fashioned according to the Vapour Tension tables. Supposing its sides (Y) to be graduated to degrees of temperature, ranging from 17° to 93° , and its front and back (X) to be graduated to the range of ordinary differences between the dry and wet bulbs, that is from 0° to 23° , the height, z , of any point in its surface corresponding to the ordinates x , y , has been made proportionate to the tabular value of the vapour tension corresponding to y° = temperature of the dry bulb, and to x° = excess of temperature of the dry bulb over the wet bulb. The mechanical construction of a templet suitable for any required function of two variables, is neither difficult nor costly, owing to the excellent machinery now used by first-class makers. About 400 holes are drilled by an accurately graduated drill, to the depth given by the tabular values; and the intervening surface is filed and smoothed away. The points intermediate between those that

are actually measured are thus, in fact, graphically interpolated. There has been occasion to make two templets for this instrument; both were carefully tested and found exceedingly accurate;* yet their cost did not exceed 6*l.* each.

The third stage is more clearly shown in the upper part of Fig. 2 than in Fig. 1. It consists of a style *Z*, partly counterpoised by a weight *W*, allowed to rest vertically and with slight pressure on the templet. It carries an horizontal tube, in which a pricker *R* slides. This is struck, when desired, by a hammer *H* worked by the foot, which swings through the dotted arc shown in Fig. 1, and delivers its dot upon the plate *Q*, at a height varying with the height of the surface of the templet at the point on which the style rests at the moment of delivering the blow.

The action of the instrument will now be clearly understood: the carriage is moved through a short space, the screws *m* and *n* are turned until the cross wires of the microscopes *M* and *N* respectively intersect the dry and wet-bulb traces; then a pressure of the foot causes the pricker to deliver a blow. This is the whole proceeding: the contrivance of the spring click mentioned in the second paragraph ensures the dots being made at half-hourly intervals, that interval being considered the most suitable to the present case. In this way a succession of dots are rapidly made, which are joined together by a graver, and so form the zinc original from which the mechanical reduction by Wagner's pantagraph is made on the copper plates of the Quarterly Weather Report.

There are many small matters of detail, especially of adjustment, in the instrument, which it is impossible to draw except on a large scale, and difficult to describe except at much length. A few more important points may be mentioned. Thus, the frame *F* can hold *Q* at various heights, to allow of a number of traces being dotted out, each below the other. In this way a single plate *Q* contains the vapour tension traces for the usual five-day period at each of our seven stations. Again, as this instrument may require to be used with other traces for purposes when *x* and *y* are replaced by *x* - *w* and *y* - *w*, *w* being also a variable, there is a slide rest at *u*, in front of the carriage, in which a pointer maybe fixed (and adjusted) in the same vertical plane with the pricker, and with the optical position of the cross wires of the two microscopes. As an example, suppose it was desired to obtain the inclination to the horizon of the barometric plane passing through three stations; then, three rows of zinc plates (one row corresponding to each of those stations) would be placed one above the other. The microscopes *M* and *N* and the pointer would be severally adjusted to the fiducial lines in each of these rows; then, for each consecutive position of the carriage *K* three operations would be required—first, to turn *v* (the screw to the

* See Report for 1871, p. 30, for a description of the tests applied to the first of these templets. This templet was abandoned, because the absolute scale on which it was constructed was found inappropriate. It was replaced by the one now in use, which is just as accurate.

extreme right of Fig. 1,) until the stage, containing all the plates, is so moved that the trace in the lowermost row comes beneath the pointer; then to bring M and N respectively on the traces on the topmost and on the middle plates, and then to make the dot as before.

FRANCIS GALTON.

NO. 2.—SUMMARY OF THE RESULTS OBTAINED FOR SQUARE 3
FOR JANUARY.

The district referred to lies in Latitude between the Equator and the parallel of 10° N., and in Longitude between the meridians of 20° and 30° W. The Committee have directed that a specimen chart showing the results for each degree square should be lithographed and distributed to men of science and to seamen to obtain opinions as to the value of the proposed method of publication.

Remarks explanatory of this chart have been drawn up, and from these the following observations have been extracted:—

“ ISOBARS AND ISOTHERMS.

“ *Air and Sea.*—With the object of showing more clearly the relative distribution of pressure and temperature, the accompanying isobars and isotherms of air and sea-surface have been drawn.

“ In all cases the means of four single-degree squares have been combined.

“ They seem to show a relation between the lowest pressure and highest temperature, also between the temperature of air and sea. The isobars and both isotherms are very similar in their direction, and the air is just one degree colder than the sea, which might perhaps be expected in the winter months.

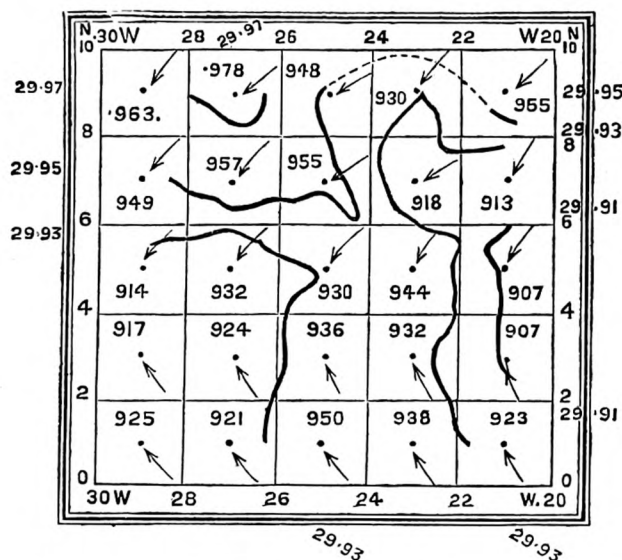
“ Table 3, page 35, shows that between 4° and 7° N. a south-easterly current prevails, and as it is said in remarking on the currents that this is probably a back drift of water heaped in the doldrums by the counter actions of the N.E. and S.E. trades on each side of them, it is not remarkable that to the eastward or south-eastward of this zone of the square we find the warmest water, as it is water that has been accumulating for some time in this low latitude.

“ So far as we can judge, the zone of easterly current shifts north or south with the doldrums and hottest water, depending for its latitude on the position of the doldrums in the month.

“ By referring to the Monthly Charts of “Currents and Surface Temperature of the North Atlantic,” published by this office, it will be seen that the sea surface isotherm of 70° dips to the south-eastward, and comes very near the north-eastern corner of

Square 3 in January. This fact, considered together with the Harmattan winds bringing the hot dust from Africa, and the easterly current bringing the hot doldrum water into the same neighbourhood, may account for the remarkable difference of temperature in both air and sea which is found on the eastern side of the square between 5° and 10° N., as well as for the very unsettled weather which prevails where the N.E. trade is blowing.

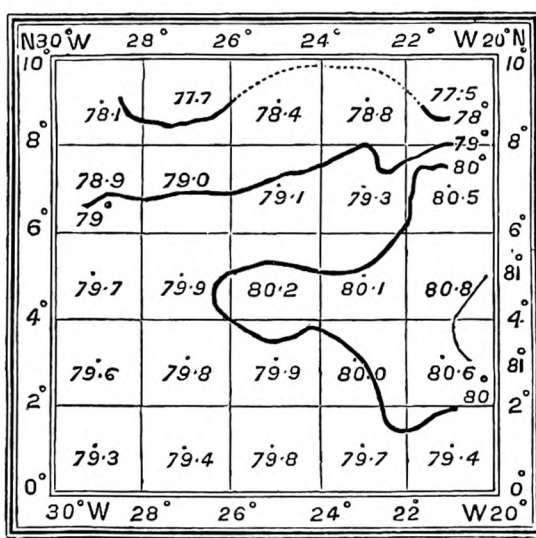
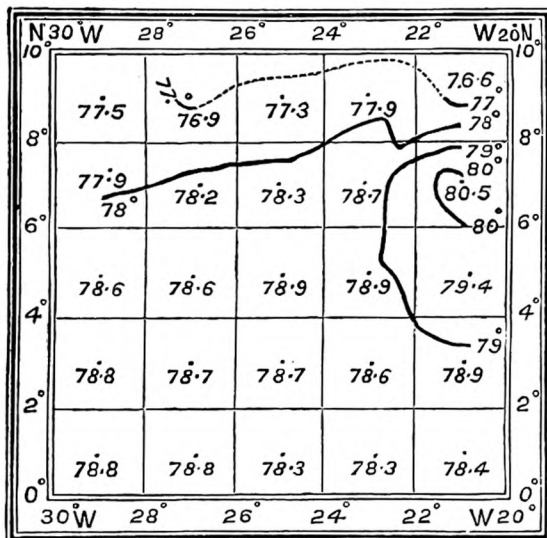
" ISOBARS FOR EACH .02 OF AN INCH.



Note.—The prevailing wind is represented by an arrow, its length being in proportion to the mean force by Beaufort's scale; the greatest force is about 5 of that scale.

" ISOTHERMS OF AIR FOR EACH DEGREE FAHRENHEIT.

ISOTHERMS OF SEA-SURFACE FOR EACH DEGREE FAHRENHEIT.



The isotherm of 81° is found by considering the temperature of 1° squares.

Note.—The dotted lines in these diagrams show the *probable* pressure or temperature.

It is an interesting coincidence that the square which has the highest pressure has very nearly the lowest temperature, of both air and sea, whilst the two which have the lowest pressures are those which have the warmest sea, and include one of those with the warmest air; the other with the warmest air is immediately to the northward.

WIND.

TABLE 1.

LATERAL STRIPS.

Lateral Strips.	No. of Observations.	N. to E. by N. or N.E. by.		E. to S. by E. or S.E. by.		S. to W. by S. or S.W. by.		W. to N. by W. or N.W. by.		Variables.		Calms.	Mean Force of Strip.	Prevailing Wind.		Strongest Wind.		
		%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.	No. of Observations.	Direction.			No. of Observations.	Direction.			
0° to 1° N.	-	279	9	3.0	70	3.2	7	2.5	3	2.1	6	2.2	5	2.9	⁴³ S.E.	3.1	¹ S.S.W.	5.0
1° - 2°	-	383	12	2.4	51	3.0	12	2.1	4	2.1	11	2.2	10	2.4	³⁷ S.S.E.	2.8	² E.N.E.	4.5
2° - 3°	-	385	18	2.9	49	2.8	7	2.3	6	2.3	11	1.7	9	2.4	⁴⁴ S.E. by S.	2.8	² N.N.W.	3.5
3° - 4°	-	406	28	3.0	37	2.8	7	2.0	7	2.4	9	2.2	12	2.4	²⁸ S.S.E.	2.7	²² N.E. by N.	4.0
4° - 5°	-	362	48	3.2	21	2.7	5	1.7	9	1.8	10	1.9	7	2.5	⁴¹ N.E. by N.	3.8	⁴¹ N.E. by N.	3.8
5° - 6°	-	304	58	3.3	18	2.8	1	1.6	2	2.1	8	1.5	^{13*}	2.6	⁴⁵ N.E. by N.	3.6	⁴⁵ N.E. by N.	3.6
6° - 7°	-	219	74	4.0	8	3.3	1	2.0	4	2.4	6	2.0	7	3.4	⁴² N.E. by N.	4.2	¹ E.S.E.	6.0
7° - 8°	-	170	85	4.3	7	3.9	—	—	4	3.4	3	2.5	1	4.1	³² N.E. by N.	4.3	¹⁸ N.E. by E.	4.5
8° - 9°	-	136	98	4.4	1	4.5	—	—	—	—	1	4.0	—	4.4	³² N.E.	4.4	²⁰ N.E. by E.	4.7
9° - 10°	-	126	97	4.4	2	4.0	—	—	—	—	1	5.0	—	4.4	²⁷ N.E.	4.7	²⁷ N.E.	4.7

* About half of the calms in this strip were found between 20° and 22° W.

TABLE 2.
VERTICAL STRIPS.

Vertical Strips.	No. of Observations.	N. to E. by N. or N.E'y.		E. to S. by E. or S.E'y.		S. to W. by S. or S.W'y.		W. to N. by W. or N.W'y.		Variables. ¹		Calms.	Mean Force of Strip.	Prevailing Wind.		Strongest Wind.	
		%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.			No. of Observations.	Direction.	No. of Observations.	Direction.
20° to 21° W.	208	45	3.1	26	2.7	8	2.1	7	1.9	6	1.5	8	2.5	²⁰ N.N.E.	4.0	²⁰ N.N.E.	4.0
21° - 22°	302	28	2.9	30	2.6	10	2.1	6	1.9	12	1.9	14	2.1	²⁴ N. by E.	3.7	³ S.S.W.	3.7
22° - 23°	304	34	3.0	30	2.9	6	1.9	7	2.4	15	1.9	8	2.4	¹⁷ N.N.E.	3.9	⁴ E. by S.	3.9
23° - 24°	330	41	3.5	31	2.8	4	2.4	5	2.1	8	2.3	11	2.7	²³ N.N.E.	4.1	¹⁷ N.E.	4.1
24° - 25°	353	46	3.6	30	2.9	4	2.3	4	2.4	7	2.5	9	2.9	³¹ N.E.	4.1	²⁶ E.N.E.	4.1
25° - 26°	289	48	3.9	30	2.8	5	2.0	4	2.0	6	1.7	7	3.0	²⁸ N.E. by E.	4.4	¹⁹ N.E. by N.	4.4
26° - 27°	343	43	4.0	33	3.1	5	2.2	5	2.6	7	1.8	7	3.1	³¹ N.E. by N.	4.4	¹⁹ N.E. by E.	4.4
27° - 28°	300	46	3.9	39	3.0	2	1.9	4	2.2	4	1.9	5	3.2	⁴⁶ N.E. by N.	4.3	¹⁹ N.E. by E.	4.3
28° - 29°	224	46	4.3	41	3.5	1	1.8	2	2.5	7	2.5	3	3.7	⁴² N.E. by N.	5.0	² E.S.E.	5.0
29° - 30°	117	44	4.2	40	3.5	11	2.0	2	1.3	2	1.8	1	3.5	¹⁷ N.E.	5.2	⁶ N.N.E.	5.2

WIND.

“ The accompanying Tables 1 and 2 have been formed from the marginal strips.

“ *Lateral Strips.*—To commence with the lateral strips running in the same degree of latitude, it will be seen that the S.E. trade prevails both in direction and force between the Equator and 2° N., that it prevails in direction to 4° N., but the N.E. wind prevails in force. From 4° N. to 10° N. the N.E. wind prevails in both direction and force, for by consulting sub square 84 it will be seen that the one wind in the strip between 8° and 9° N., which is entered in the south-eastern quarter with force 4.5 (Beaufort scale), was really from E. (that point being given to the south-eastern quarter by the method of classifying) though it actually belongs as much to N.E. as to S.E.

“ From 1° N. to 4° N. the *mean* force of all winds in each strip remained 2.4, but the N.E. wind was gradually increasing, whilst the S.E. was diminishing in force.

“ It will be noticed that the lowest barometer was between 4° and 5° N., and that it increased at the rate of 7 or 8 thousandths of an inch for each degree of latitude from this to 10° N. ; now Table 1 shows that the frequency of the N.E. wind increased 20% here.

“ The isobars already alluded to show how the pressure increased in a north-easterly direction from 4° to 10° N., just where the N.E. wind increased in per-centage and force.

“ The close proximity of most calm, lowest pressure, and hottest air and sea, is very interesting.

“ The relation between direction and force of wind, and disposition of pressure in these low latitudes, will be much more clearly shown when we are able to combine the observations of several months in cases where a trade wind blows for several months together in the same square.

“ *Vertical Strips.*—Table 2 is deduced from the sums of vertical strips at the bottom of the Chart ; it shows a marked increase in the force of the wind in the western strips. The least mean force of strip (2.1) lies between 21° and 22° W. ; the greatest (3.7) between 28° and 29° W.

“ The per-centage of N.E. wind is 45, force 3.1, between 20° and 21° W. ; between 21° and 22° W. it falls to 28% , force 2.9 ; from this it gradually increases to 48% force 3.9 in 25° to 26° W. ; from 26° to 30° W. its per-centage is about 45, and the force increases to 4.3.

“ The large amount of N.E. wind between 20° and 21° W. may be due to the great difference of temperature and pressure in the north-eastern part of the square.

“ The per-centage of S.E. wind is about 30 from 20° to 26° W., and its force is about 2.8, but between 26° and 30° W. it rises gradually to 41% and its force increases to 3.5.

“North-westerly wind is much more frequent in the eastern than in the western half of the square.

“The mean force in each strip gradually increases from 22° to 29° W., being 2·1 in the former and 3·7 in the latter ; hence a ship passing through the square and keeping in 21° to 22° W. would have an average force of wind to drive her about two knots an hour, whilst another in 28° to 29° W. would have an average force to drive her about five knots.

“In the strip running N. and S. in 29° W. there are 46% of north-easterly winds, average force 4·3, and 41% of south-easterly winds, average force 3·5, leaving only 13% for all other winds and calms, of which only 3% are calms : whilst in the strip between 21° and 22° W. there are 28% north-easterly, force 2·9, and 30% south easterly, force 2·6, leaving 42% for other winds and calms, of which 14% are calms.

“It has been remarked that from 21° to 26° W. the per-centage of S.E. wind continues about 30, with a mean force of about 2·8, and that the N.E. wind gradually increases in per-centage and force in the same space as you go to the westward.

“An inspection of the wind arrows of the sub-square shows that to the west of 26° W. the S.E. trade pushes itself further north, and approaches nearer to the N.E. trade, which keeps up a steady per-centage of about 46 from 25° to 30° W., though it increases in force as you go to the westward. It will also be noticed that what the S.E. wind gains the N.W. loses, for there is an average of 6% of north-westerly winds in the eastern half of the square against only $3\frac{1}{2}\%$ in the western half. In the two most western strips there are only 2% of north-westerly winds, of which nearly half were from west, which could not drive a homeward bounder to the eastward. These north-westerly winds are very troublesome to homeward bounders, as they drive them to the eastward where most calms and light winds prevail.

“These figures speak for themselves, showing, that so far as SQUARE 3 is concerned *the homeward bounder should not cross the Equator to the eastward of 25° in January.* As the winds near Cape St. Roque do not hang to the southward in January and February, but are well to the eastward, it seems advisable for an outward bounder also to cross well to the westward in January ; but we shall know more of this after working up squares 302 and 303 (*see Chart, p. 7*). It must also be borne in mind that to the southward of 5° N. a westerly current of a mile an hour may be confidently expected, sometimes amounting to two miles an hour.

“The following table is given to show some of the results which may be deduced from comparing the data of various months. It divides the square into eastern and western halves, each containing 5° of longitude, and gives for January, February, and March the per-centage and force of wind for each quarter of the compass, as well as the per-centage of variables and calms :

5° Strips.	Months.	North-easterly or N. to E. by N.		South-easterly or E. to S. by E.		South-westerly or S. to W. by S.		North-westerly or W. to N. by W.		Variables.		Calms.
		%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.	%
Eastern Strip 20° to 25° W.	January -	39	3·2	29	2·8	6	2·2	6	2·1	10	2·0	10
	February -	43	3·3	21	2·6	6	2·2	15	2·4	9	1·8	5
	March -	45	3·0	22	2·7	6	2·2	10	2·5	7	1·6	10
Western Strip 25° to 30° W.	January -	45	4·1	37	3·2	5	2·0	3	2·1	5	1·9	5
	February -	70	4·1	14	3·0	2	2·8	3	2·2	6	1·9	5
	March -	74	3·9	14	3·3	2	2·2	4	2·2	3	2·2	4

“ The above table shows that the eastern half of the square has but a slight change in the per-centage and force of the N.E. and S.E winds during the three months, but that the western half has great changes.

“ There is always more N.E. wind in the western than in the eastern half of the square ; but in February the difference amounts to 27°/°, and in March to 29°/°. This may be caused by the sun’s advance to the northward, heating equatorial South America, and drawing the N.E. wind towards it. We know that N.E. winds are frequently experienced near Cape St. Roque in these months.

“ In January there is more S.E. wind in the western than in the eastern half of the square, but less in February and March. This shows that the western half of the square is particularly good for the homeward bounder in January.

“ In the eastern half of the square, during the three months, south-westerly winds are absolutely the same in per-centage and force, and they vary very little in the western half. There is much more north-westerly wind in the eastern than in the western half of the square ; the difference is greatest in February. It has already been remarked that this is a very troublesome wind for a homeward bounder. The force of the N.E. wind is always nearly 0·9, of Beaufort’s scale, stronger in the western than in the eastern half of the square, whilst that of the S.E. wind is only about 0·5 stronger in the western half. The strength of westerly winds and variables does not seem to differ in the eastern and western halves. Calms are much more abundant in the eastern than in the western half, except in February ; but it must not be forgotten that even in February the force of wind is generally greater, and there is less north-westerly wind in the western half.”

CURRENTS.

TABLE 3.

LATERAL STRIPS.

Lateral Strips.	No. of Observations.	N. to E. by N. or N.Ely.		E. to S. by E. or S.Ely.		S. to W. by S. or S.Wly.		W. to N. by W. or N.Wly.		None.	Prevailing Current.		Strongest Current.	
		%	Rate.	%	Rate.	%	Rate.	%	Rate.		No. of Observations.	Direction.	Rate.	Rate.
0° to 1° N.	-	—	—	8	13	22	23	68	24	2	8 ⁸ W.	2 ² W. by S.	26	35
1° - 2°	-	—	—	—	—	14	22	79	27	7	10 ¹⁰ W.N.W.	5 ⁵ N.W.	24	34
2° - 3°	-	4	11	5	19	13	10	67	22	11	8 ⁸ W. by S.	2 ² N.W. by W.	29	32
3° - 4°	-	14	12	13	14	7	8	43	18	23	7 ⁷ W.	2 ² N.W. by N.	17	29
4° - 5°	-	14	18	26	21	14	19	29	15	17	4 ⁴ E.	1 ¹ E. by S.	21	30
5° - 6°	-	13	16	27	17	22	16	11	16	27	4 ⁴ E.	1 ¹ W. by S.	16	37
6° - 7°	-	11	14	26	12	11	15	19	11	33	3 ³ E.S.E.	1 ¹ S.W. by W.	14	24
7° - 8°	-	6	6	6	13	38	13	19	22	31	1 ¹ W.N.W.	1 ¹ W.N.W.	28	28
8° - 9°	-	22	13	9	10	21	14	26	16	22	3 ³ W.N.W.	1 ¹ W.	17	24
9° - 10°	-	16	9	—	—	21	8	26	14	37	2 ² W.S.W.	1 ¹ N.W.	10	22

CURRENTS.
TABLE 4.
VERTICAL STRIPS.

Vertical Strips.	No. of Observations.	N. to E. by N. or N.E'y.		E. to S. by E. or S.E'y.		S to W. by S. or S.W'y.		W. to N. by W. or N.W'y.		None.	Prevailing Current.		Strongest Current.			
		%	Rate.	%	Rate.	%	Rate.	%	Rate.		No. of Observations.	Direction.	Rate.	No. of Observations.	Direction.	Rate.
20° to 21° W. -	26	15	9	15	15	12	16	23	29	35	W.N.W. ³	17	¹ N.W.	50		
21° - 22° -	31	26	17	6	16	10	11	35	24	23	³ W.	24	¹ N.W. by N.	27		
22° - 23° -	32	6	11	9	15	13	17	63	22	9	⁵ N.W.	30	¹ N.W. by W.	49		
23° - 24° -	42	5	19	21	18	22	15	33	19	19	⁵ W.	18	¹ N.W.	25		
24° - 25° -	40	5	11	23	17	25	19	25	17	22	W.N.W. ⁵	18	W. by S. ²	32		
25° - 26° -	30	7	15	13	15	20	20	47	23	13	W. by N. ⁵	24	W. by S. ¹	37		
26° - 27° -	39	10	9	8	14	10	16	49	22	23	⁶ W.	21	W. by N. ¹	48		
27° - 28° -	39	5	13	5	15	18	15	62	21	10	⁹ W.	23	N.W. by W. ¹	27		
28° - 29° -	32	9	14	3	17	22	13	44	18	22	⁴ W.	20	N.W. by W. ¹	38		
29° - 30° -	17	6	24	17	15	12	10	59	26	6	³ W.	27	N.W. by W. ¹	36		

CURRENTS.

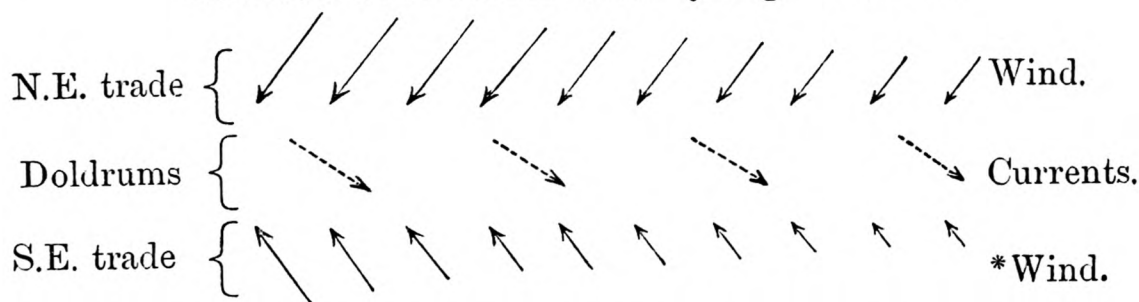
“*Lateral Strips.*—Table 3 gives the currents for strips running in the same degree of latitude, and shows that north-westerly currents prevail very much both in direction and rate up to 4° N. where the south-easterly *wind* ceases to prevail; in 4° to 5° N., north-westerly currents prevail in direction, being $29^{\circ}/_{\circ}$, whilst south-easterly are only $26^{\circ}/_{\circ}$; but the speed of the south-easterly is 21, or 6 miles per day more than that of the north-westerly.

“In 5° to 6° N. the south-easterly current prevails both in direction and rate; in 6° to 7° N. it prevails in direction, but is less than south-west in rate; in 7° to 8° N. the south-westerly current prevails in direction, but the north-westerly in rate; from 8° to 10° N. the north-westerly current prevails, but it must be remembered that west has been given to the north-westerly quarter in the classification,

“*Conclusions.*—Of course there is much doubt in estimating current by the difference between a ship’s observed and dead reckoning position, but it is manifest that from 5° to 6° N., where there is so much calm on the eastern side of the square, and the doldrums prevail in January, easterly currents prevail, having strong westerly currents to the southward, and weaker westerly to the northward.

“Perhaps the greater strength of both trades in the western part of the square, and the excess of force of the N.E. over the S.E., may incline the water (heaped up, as it were, in the doldrums by the drift of the trades), to run as a back current to the south-eastward; the following arrows seem to represent the facts.

Relative force of wind indicated by length of arrow.



“We have already remarked that from a cursory examination of the data for other months, the easterly current seems to move north or south with the doldrums.

“The largest per-centage of north-westerly wind exists where there is the most south-easterly current, as if some similar cause induced a back drift of air as well as of water. This is also found to be the case in February and March.

“*Vertical Strips.*—It seems well to consider the vertical strips in Table 4, by dividing them into two strips of 5° each: by this means we find that the mean of the five *prevailing*, as also of

* No scale has been used for the length of the arrows, they are only intended to show that the N.E. trade is stronger than the S.E., and that both are stronger on the western than on the eastern side of the square.

the five *strongest* currents in the eastern half of the square are slightly weaker than those in the western. All these currents are westerly in direction, and it will be remembered that the N.E. and S.E. trades are stronger and more prevalent in the western half, which points to the cause of the increased strength of these currents.

“The following summary has been made to show the prevalence of various currents in the eastern and western halves of the square.

5° Strips.	N. to E. by N. or North-easterly.		E. to S. by E. or South-easterly.		S. to W. by S. or South-westerly.		W. to N. by W. or North-westerly.		None.
	%	Rate.	%	Rate.	%	Rate.	%	Rate.	%
Eastern, 20° to 25° W.	11	14	15	16	16	16	36	22	22
Western, 25° to 30° W.	7	15	9	15	16	15	52	22	15

“From this it will be seen that in the eastern strip (where, we must remember, both trade winds are lightest and least constant,) the per-centage of easterly currents is 26, against 16 in the western strip: whereas in the western strip, the north-westerly currents (which, it must be remembered, include all the west) increase 16% on what they were in the eastern. Table 2 shows that in this same strip, the S.E. trade increases from 30%, force 2·8, between 25° and 26° W. to 41%, force 3·5, between 28° and 29° W.; so that the connexion between the direction and force of wind, and direction and speed of current, seems to be very close here.”

“ WEATHER.

“*Lateral Strips.*—The lateral strips show that the largest per-centage of *thunder and lightning* is in 4° to 5° N. at the southern verge of the N.E. Trade.

“The largest per-centage of *squalls* is in 3° to 4° N. *Heavy squalls* are experienced from the Equator to 7° N., but most between 4° and 5° N. *Very heavy squalls* are experienced between 3° and 6° N., but only one in each strip.

“There was 32% of *rain* between 3° and 4° N., gradually decreasing as you go N. or S., there being 19% in 5° to 6° N., and also between the Equator and 1° N.

“The *gloomiest* weather is naturally where there is the most rain.

“*Mist* increases from 6% to 7% between the Equator and 4° N. where the S.E. trade ends, but from 4° to 10° N. it increases to 44%, being 15% between 4° and 5° N., and increasing 13% between 6° and 7° N. These facts seem to connect it with the

Harmattan winds which the Admiralty Pilot Charts show to prevail in January on the west coast of Africa.

Vertical Strips.—*Lightning* is $20^{\circ}/_{\circ}$ between 23° and 24° W., and remains about $15^{\circ}/_{\circ}$ for three strips on each side of this, but from 26° W. it gradually decreases to the westward.

“*Squalls* are most abundant between 25° and 29° W. *Heavy squalls* are most prevalent between 22° and 24° W. The three *very heavy squalls* lie between 23° and 29° W.

“*Rain* is most abundant between 21° and 22° W., whilst the least rain is between 20° and 21° W. From 25° to 30° W. it decreases in amount as you go to the westward.

“*Mist* prevails in 20° to 21° W. and 23° to 24° W.; there is $12^{\circ}/_{\circ}$ more in the eastern than in the western half of the square. *Heavy mist* prevails in 24° to 25° W.

“ REMARKS.

“ We shall now refer to the remarks for January, which have been considered worthy of extraction, and will take them in their order, commencing with the currents.

“*Currents.*—They bear out the conclusions derived from Tables 3 and 4, viz., that an easterly current prevails in 5° and 6° N., and strong westerly ones to the southward of this latitude.

“ Remarks on current rips are pretty general over the whole square, but they seem to be more decided where the easterly current prevails, which frequently runs counter to a slight easterly wind.

“*Clouds.*—The upper clouds seem to be more generally from the south-westward after passing 7° N. To the southward of this latitude the clouds seem to be very frequently from S.E. when the wind is N.E., or from N.E. when the wind is S.E., as if at first the one Trade rose above the other, carrying its clouds with it at a comparatively low altitude. When near a Trade it is not uncommon to see its clouds flying at a moderate height overhead, with a calm below. The remarks on clouds seem to indicate a more settled state of weather to the westward.

“*Sea.*—The northerly swell extends to the Equator in January, and probably further south it predominates from 5° to 10° N.; occasionally southerly swells are mentioned even between 9° and 10° N., but they seem to be comparatively rare from 6° to 10° N. It is very clear that much of the difficulty which ships experience in the doldrums is the effect of the very confused swells which check their progress in light winds.

“ The following tables, giving the sea disturbance in percentages, and dividing the square into eastern and western halves, would perhaps be considered sufficient for navigators, instead of giving a table for each strip.

JANUARY.

PER-CENTAGES OF OBSERVATIONS OF SWELL OR SEA FOR EVERY FOURTH POINT.

TABLE 1.—Containing the per-centages for each 5° strip, and for the whole of the eastern half of Square 3.

Sub-squares.	N ^{ly} .		N.E ^{ly} .		E ^{ly} .		S.E ^{ly} .		S ^{ly} .		S.W ^{ly} .		W ^{ly} .		N.W ^{ly} .		Confused.		Smooth.
	N.N.W. to N. by E.	N.E. by E.	N.N.E. to N.E. by E.	E.N.E. to E. by S.	E.N.E. to E. by S.	E.S.E. to S.E. by S.	S.S.E. to S. by W.	S.S.W. to S.W. by W.	W.S.W. to W. by N.	W.N.W. to N.W. by N.	N.E ^{ly} . and S.E ^{ly} .	Generally.							
00-04	18	-	9	-	-	9	9	2	-	-	Heavy.	Heavy.	-	-	Heavy.	11	-	10	Very.
10-14	30	16	2	-	-	4	11	-	-	1	-	4	-	-	Heavy.	7	-	7	-
20-24	23	2	19	-	-	3	6	-	-	-	-	12	-	2	Heavy.	12	2	12	-
30-34	30	6	4	-	-	2	3	-	-	2	-	19	-	-	Heavy.	13	1	13	-
40-44	26	9	9	-	-	-	9	2	-	-	-	14	-	-	Heavy.	10	-	10	-
50-54	18	9	12	5	-	3	14	-	-	-	-	6	-	-	Heavy.	19	-	18	-
60-64	33	-	32	-	-	5	7	-	-	-	-	2	-	-	Heavy.	16	-	16	-
70-74	17	13	31	-	-	-	5	-	-	-	-	7	-	-	Heavy.	26	-	26	-
80-84	13	8	44	-	-	-	-	-	-	-	-	-	-	-	Heavy.	49	-	49	-
90-94	11	-	24	-	-	11	-	-	-	-	-	-	-	-	Heavy.	-	-	-	-
Per-centages in the eastern half of Sq. 3	22	6	18	3	1	4	6	1	0	-	-	9	0	8	18	1			

TABLE 2.—Containing the per-centages for each 5° strip, and for the whole of the western half of Square 3.

Sub-squares.	N ^{ly} .		N.E ^{ly} .		E ^{ly} .		S.E ^{ly} .		S ^{ly} .		S.W ^{ly} .		W ^{ly} .		N.W ^{ly} .		Confused.		Smooth.
	N.N.W. to N. by E.	Heavy	N.N.E. to N.E. by E.	Heavy	E.N.E. to E. by S.	Heavy	E.S.E. to S.E. by S.	Heavy	S.S.E. to S. by W.	s.s.s.w. to s.w. by w.	Heavy	w.s.w. to w. by n.	Heavy	w.n.w. to n.w. by n.	N.E ^{ly} . S.E ^{ly} .	Generally.			
05-09 -	10	13	5	4	-	Heavy	10	Heavy	-	-	Heavy	-	Heavy	-	7	13	13	32	-
15-19 -	14	8	3	3	1	-	10	-	1	-	-	-	-	-	13	9	2	25	1
25-29 -	15	20	11	5	9	-	2	-	5	-	-	-	-	-	5	3	3	17	6
35-39 -	13	3	12	14	4	-	4	-	5	-	-	-	-	-	3	7	2	16	15
45-49 -	18	2	18	16	5	-	6	-	-	-	-	-	-	-	11	1	2	11	10
55-59 -	9	16	9	7	3	-	3	-	3	-	-	-	-	-	3	15	12	10	9
65-69 -	28	5	35	14	2	-	-	-	5	-	-	-	-	-	-	-	5	6	-
75-79 -	16	20	10	10	3	-	-	-	5	-	-	-	-	-	5	-	2	21	-
85-89 -	39	9	13	8	7	-	-	-	3	-	-	-	-	-	-	3	2	13	-
95-99 -	37	3	3	19	7	-	-	-	3	-	-	-	-	-	-	-	6	12	3
Per-cent-ages in the western half of Sq. 3 -	20	10	12	10	4	-	3	-	3	0	-	-	-	-	5	5	4	16	4

“The above tables show, first, that northerly and north-easterly swells (especially those which are heavy) prevail in the western half of the square.

“2ndly, that southerly and south-easterly swells (especially those which are heavy) prevail in the eastern half of the square ;

“3rdly, that confused swells are pretty equally divided, but that the heaviest are in the western half.

“Lastly, that smooth seas are pretty equally divided, but that there are more “very smooth” in the western than in the eastern half of the square.

“*Wind*.—The wind remarks fully bear out the facts in Table 2, namely, that there is more wind on the western than on the eastern side of the square.

“*Weather*.—The weather remarks show that it is generally unsettled. In 5° N. and 20° W. mention is made of its being misty on the horizon. From 6° to 10° N. the remarks on mist and haze increase. In sub-square 94 there was an awful thunder-storm, with a southerly wind whilst it lasted.

“In the strip between 3° and 4° N. lightning is generally seen to the northward, whilst in that between 5° and 6° N. and further north it is more frequently seen to the southward, indicating that the most disturbed weather is between 4° and 5° N. where the S.E. wind has just lost, and the N.E. just gained, ascendancy, and that the probable cause of the lightning, &c., is their collision. In each of the four months from January to April the largest per-centage of thunder and lightning is at the southern part of the N.E. trade, and not where the two trades have a more equal per-centage. The weather seems to be more settled on the western than on the eastern side of the square.

“*General*.—A severe earthquake was experienced in sub-square 09 in 1859, at 1 p.m. 25th. The red dust, so often seen on ships' sails, seems to have abounded from 6° to 10° N. ; between 7° and 8° N. it is remarked that the wind blew hot, and the weather is often spoken of as “misty,” “very hazy on the horizon,” and “close.” It is worthy of notice that January is one of the months in which the Harmattan winds blow on the coast of Africa, and that the square of hottest air is to the eastward in 7° N. (see the isotherms).

“Swallows and a snipe were found in 5° to 7° N. A land bird like a lark was caught in sub-square 01, and a moth was seen in 35. The land birds and insects, like the water, seem to be drifted into and to accumulate in the doldrums, as they appear to fly with the prevailing wind.

“Several falling stars have been noticed : when possible, the hour and date of their fall have been given.

“*Conclusion*.—It is hardly necessary to say that the sum-mings up in the marginal strips are not intended to show that the data are uniformly spread throughout the strip ; still they are useful guides to the navigator, as is proved by the differences in

the direction and force of wind lying in the strips between 21° and 22° W. and 28° and 29° W. When the navigator has found in any strip a prevalence of the wind or weather which he prefers he may then go along the sub-squares of that strip and see if what he is looking for, or wishes to avoid, prevails more in one sub-square than another; for instance, in the month of January between 3° and 4° N. there is a larger per-centage and a stronger south-easterly wind in the western than in the eastern half of the strip.

“ It will be seen that although a strip may have a good mean force of wind, this may arise from the force being much above the average in certain sub-squares of the strip, leaving others with much calm. Hence, by giving the winds, weather, sea, &c., for each sub-square, the seaman has all the information for his exact position which the logs in this office can afford.

No. 3.—DESCRIPTION of the DAILY WEATHER CHARTS issued by the METEOROLOGICAL OFFICE.

These Charts were first issued on the 11th of March, and were supplied gratis to a number of public offices, institutions, and private persons up to the end of the month, at which time the regular issue to subscribers commenced. The demand for them up to the 31st of March had reached the amount of 200 copies daily.

The rates of subscription, as already explained, at present are—

Five shillings per quarter for a copy forwarded by book-post.

Ten shillings per quarter for a copy delivered by hand in London within a reasonable distance from Lincoln's Inn Fields, where the lithographic establishment is situated.

As regards the process of drawing the Charts, the reduced observations are entered on a chart of larger scale, and from that chart the results relating to the separate elements are copied on to the four small charts in lithographic ink. This portion of the work is usually completed by about 11.30 a.m. The Charts are then sent to the lithographic establishment, and printed by the anastatic process. Copies are ready for despatch to the City soon after 1 o'clock p.m.

A slight explanation of the separate charts for the day in question may not be undesirable, and they will be taken seriatim

1. *Pressure.* The barometrical readings from some of the most important stations are given; isobars are drawn at intervals of about 2-10ths of an inch, and the principal “gradients” (*i.e.* the amounts of difference in barometrical readings per 50 miles between the stations) are given.

It will be seen from the Chart and Report that a considerable fall of the barometer, amounting to nearly an inch in the north of Scotland, had occurred since 8 a.m. on the 3rd. The isobar of

29·0 in. embraces the Western Highlands, the lowest readings reported being 28·98 in. at Nairn, and 29·00 in. at Ardrossan.

The highest reading is 30·13 in. at Biarritz, but the steepest gradient over a considerable distance is that from Rochefort to Ardrossan, which is $\frac{1·07}{12} = ·089$ of an inch per 50 geographical miles. (See Quarterly Weather Report for 1869, p. 43.) Between Pembroke and Ardrossan the gradient is still more serious, being as much as ·105 of an inch per 50 miles.

2. *Temperature.* A few readings are given, and the isotherms are drawn at intervals of 5°. There was no great difference of temperature, so that the atmosphere was not in a very disturbed condition.

3. *Wind and Sea disturbance.* The wind was generally fresh to strong, a slight southerly gale (force 8) being reported at Aberdeen and Holyhead.

The only very light winds on our coasts were at Nairn and Thurso. At Christiansund, in Norway, a calm was reported, and it will be noticed how divergent the isobars became across the northern part of the North Sea, so that the gradients in that region were extremely slight.

The long arrows are intended to show the general drift of the air currents, or the direction in which a balloon might be expected to travel if it were drifting free before the wind.

The sea disturbance is given in words.

4. *Cloud and Rain.* This Chart explains itself sufficiently.

The fall of the barometer had been so general that there did not appear to be any fear of a serious gale, so that no warnings were issued till the afternoon.

It may be interesting to state that at 2 p.m. it was found that the barometer had risen 0·20 in. at the north of Ireland, and that a N.W. gale had begun at Valencia. Warnings were issued to the west and north-east coasts of England, being those most likely to feel such a gale seriously, but the disturbance passed off without the force of 9 being reached at any other station, and the drums were lowered next morning.

STATIONS.	BAROMETER.		THERMOMETERS. (In shade).				WIND.				Amount of Cloud 0 to 10.	Weather. By Beaufort Scale.	Rainfall. — In past 24 Hours.	Sea Disturb- ance. — 0 to 9.	
	At 8 a.m. Reduced to 32° F. at the Mean Sea Level.	Change since yesterday.	At 8 a.m.		In past 24 hours.		At 8 a.m.	Extreme.							
			Dry bulb.	Wet bulb.	Max.	Min.		Dirac.	Force. — (0 to 12).	Force. — (0 to 12).					Dirac.
*Christiansund...	29.41	-.36	45	40	+2	—	—	2	0	4	WSW	—	C	—	2
*Skudesnaes ...	29.34	-.64	45	44	-1	—	—	SE	6	4	S	—	OL	—	4
*Oslo (Christiania) ...	29.47	-.48	45	45	0	—	—	SE	4	2	SW	—	OL	—	3
*Faro ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cuxhaven ...	29.69	-.41	53	52	0	61	—	SW	5	3	N	9	0	—	—
Sumburgh Head	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Thurso...	29.03	-.84	49	44	+3	56	39	SSE	2	5	SSW	4	C	0.14	5
Wick ...	29.03	-.74	49	46	+2	52	44	SSE	4	4	SSE	9	0	0.03	4
Nairn ...	28.98	-.81	46	43	-3	58	42	SW	2	6	SW	6	bc	—	2
Aberdeen ...	29.06	-.89	44	42	-3	52	43	S	8	8	S	9	CL	0.12	3
Leith ...	29.01	-.88	45	43	-7	59	41	SW	6	5	SW	8	CO	0.11	—
Shields...	29.25	-.74	48	45	-5	53	45	SSW	5	5	SW	8	cu	0.13	3
Scarborough ...	29.34	-.71	53	45	-4	58	44	SW	6	4	SW	10	0	0.07	4
Yarmouth ...	29.50	-.56	53	48	-1	63	49	WSW	4	4	SSE	4	bc	0.03	3
Ardrossan ...	29.00	-.89	48	46	0	55	45	SW	8	8	SW	8	p	0.56	7
Greencastle ...	29.01	-.74	49	46	0	55	42	W	7	7	WSW	9	gp	0.25	—
Holyhead ...	29.33	-.72	48	46	-3	54	46	SSE	8	8	SSW	10	po	0.17	7
Liverpool (Bishop's Cleeve) ...	29.37	-.48	44	45	-5	59	44	SW	5	6	SW	—	0	0.04	4
Valencia ...	29.56	-.37	51	49	-3	57	45	W	7	8	W	8	hp	0.13	7
Roches Point ...	29.40	-.50	51	50	-6	59	44	W	5	6	W	8	po	0.15	4
Pembroke ...	29.54	-.60	50	46	-1	54	46	WSW	7	9	SW	7	mc	0.12	7
Scilly ...	29.77	-.46	52	49	-1	56	49	W	7	7	W	5	C	0.01	6
Plymouth ...	29.74	-.49	52	49	-1	59	47	WSW	5	7	WSW	9	om	0.04	2
Portsmouth ...	29.72	-.50	54	49	0	62	50	SW	7	7	SW	5	C	0.03	5
Dover ...	29.73	-.45	52	50	-6	59	51	WSW	4	5	WSW	6	mc	0.01	3
London ...	29.67	-.51	53	48	-5	66	48	WSW	6	7	SW	6	bc	0.03	—
Helder ...	29.66	-.51	51	—	-2	—	—	SW	6	—	—	—	—	—	2
Cape Gris Nez...	29.75	-.43	50	48	-1	58	41	WSW	8	5	WSW	9	cm	0.04	6
Brest ...	—	—	52	48	+1	59	48	WSW	4	5	WSW	—	0	—	4
L'Orient ...	29.97	-.37	53	51	+4	62	48	W	5	5	WSW	9	0	0.04	5
Rochefort ...	30.07	-.22	53	51	+1	63	50	SW	5	5	SW	6	bc	—	3
Biarritz ...	30.13	-.21	54	52	+1	68	48	S	3	5	W	8	of	—	5
Cornwall ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brussels ...	29.81	-.38	54	—	+4	—	—	SW	3	—	—	—	—	—	—
Charleville ...	29.89	-.33	52	—	-1	—	—	SW	6	—	—	—	—	—	—
Paris ...	29.93	-.31	52	—	+3	—	—	SW	2	—	—	—	0	—	—
Lyons ...	30.03	-.13	62	—	+15	—	—	SW	3	—	—	—	—	—	—
Toulon...	30.07	-.05	56	54	-6	71	54	E	4	1	SSW	8	f	—	3

YESTERDAY'S 2 p.m. REPORTS AND REMARKS.

Skudesnaes ...	29.86	-.12	48	47	+2	— —	WSW	2	—	—	—	C	—	1
Thurso...	29.44	-.36	52	50	+6	— —	SSE	5	4	SSE	6	C	—	3
Scarborough ...	29.86	-.19	53	51	+1	— —	SW	3	2	SW	10	—	—	2
Greencastle ...	29.56	-.19	53	50	+4	— —	WSW	7	7	WSW	9	0	—	—
Holyhead ...	29.80	-.25	52	51	+1	— —	S	7	7	S	10	m	—	5
Valencia ...	29.88	-.05	56	53	+2	— —	WSW	5	6	SSW	5	C	—	4
Scilly ...	30.08	-.15	53	54	+2	— —	SW	6	6	SW	10	d	—	6
London ...	30.05	-.13	63	57	+5	— —	WSW	4	2	WSW	10	0	—	—
Rochefort ...	30.30	-.00	58	56	+4	— —	W	5	—	—	0	l	—	3

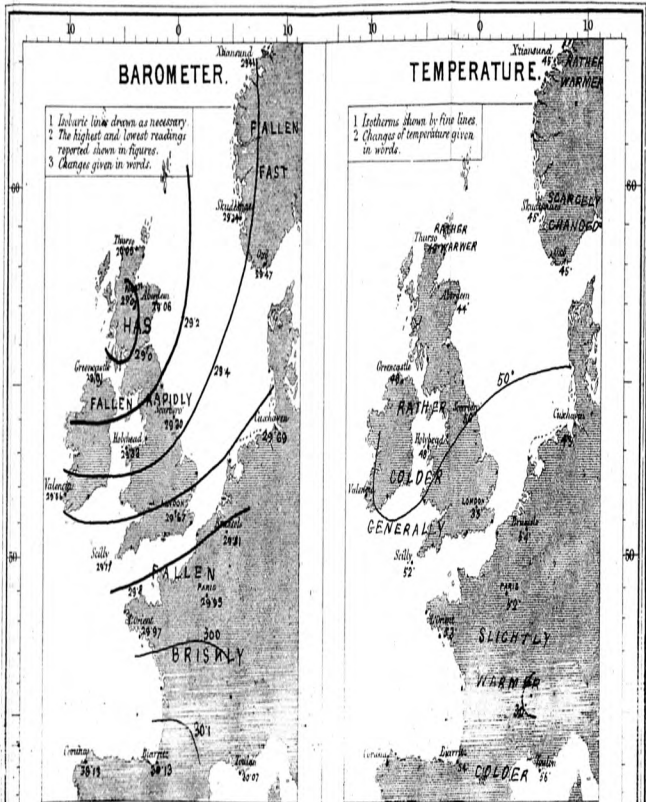
The decrease of pressure has continued generally. It has now become rapid at Thurso, but has slackened materially in Ireland. The wind has become strong from the SW on our Northwest coasts.

EXPLANATION OF COLUMNS.

BAROMETER.—The letters r, (rising), f, (falling), and s, (steady), indicate the motion of the mercury in last 24 hours. **EXTREME WIND** is the strongest wind experienced in past 24 hours. **WEATHER:** Beaufort Scale is, b, blue sky; c, detached clouds; d, drizzling rain; f, fog; g, dark, gloomy; h, hail; l, lightning; m, misty (hazy); o, overcast; p, passing showers; q, squally; r, rain; s, snow; t, thunder; u, ugly, threatening; v, visibility, unusual transparency; w, wet, dew.

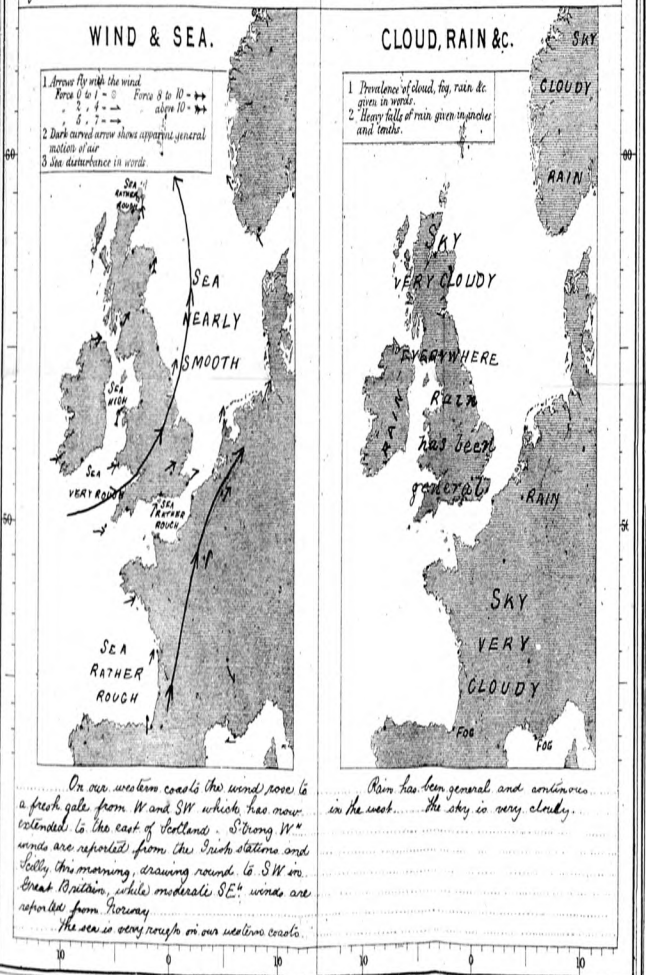
The "change" of barometer and temperature and the "extreme" wind given in the 2 p.m. report are those since the previous 8 a.m. N.B.—The wind is said to "veer" when its direction changes with the sun, and to "back" when it shifts in the opposite direction.

*The Norwegian Stations and Faro do not report rainfall, and their "extreme" wind is an observation taken at 8 p.m.



During the past night the barometer has fallen rapidly at all our northern stations and to a less extent in all other parts of north-west Europe. It will mark a depression, never less over Scotland. The reading at Rochefort is 1.10 in higher than that at Paris, giving a gradient of nearly 0.08 in per 50 miles, the steepest position of which lies over the Irish Sea.

Temperature has fallen throughout our islands, but more slightly over France.



On our western coasts the wind rose to a fresh gale from W and SW which has now extended to the east of Scotland. Strong W. winds are reported from the Irish stations and Scilly this morning, drawing round to SW on Great Britain, while moderate SE. winds are reported from Norway. The sea is very rough on our western coasts.

Rain has been general and continuous in the west. The sky is very cloudy.

Subscriptions for these Charts payable in advance to cover delivery.
Delivery by hand, 10/- per quarter.
— by post, 3/- per quarter.

Meteorological Office
116, Victoria Street, Westminster, S.W.
ROBERT H. SCOTT, Director.

Winds: Beaufort, Day & Night

Satur- day 8 a.m.

WEATHER REPORT. *May 4th* 1872.

*Christiansund...	29.41	-36	45	40	+2	—	—	Z	0	4	WSW	—	C	—	2
*Skudesnaes ...	29.34	-64	45	44	-1	—	—	SE	6	4	S	—	OR	—	4
*Oxö (X'tiansand)	29.47	-48	45	45	0	—	—	SE	4	2	SW	—	OR	—	3
*Fanö ...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—
Cuxhaven ...	29.69f	-41	53	52	0	61	—	SW	5	3	N	9	0	—	—
Sumburgh Head	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thurso...	29.05f	-84	49	44	+3	56	39	SSE	2	5	SSW	4	C	0.14	5
Wick ...	29.05f	-74	49	46	+2	52	44	SSE	4	4	SSE	9	0	0.03	4
Nairn ...	28.78f	-81	46	43	-3	58	42	SW	2	6	SW	6	bc	—	2
Aberdeen ...	29.06f	-89	44	42	-3	52	43	S	8	8	S	9	CR	0.12	3
Leith ...	29.01f	-88	45	43	-7	59	41	SW	6	5	SW	8	CO	0.11	—
Shields...	29.25f	-74	48	45	-5	53	45	SSW	5	5	SW	8	cwg	0.13	3
Scarborough ...	29.34f	-71	53	45	-4	58	44	SW	6	4	SW	10	0	0.07	4
Yarmouth ...	29.59f	-56	53	48	-1	63	49	WSW	4	4	SSE	4	bc	0.03	3
Ardrossan ...	29.00f	-89	48	46	0	55	45	SW	8	8	SW	8	p	0.56	7
Greencastle ...	29.01f	-74	49	46	0	55	42	W	7	7	WSW	9	g p	0.25	—
Holyhead ...	29.33f	-72	48	46	-3	54	46	SSE	8	8	SSW	10	po	0.17	7—
Liverpool ^(Bidston Obs.)	29.37f	—	48	44	-5	59	44	SW	5	6	SW	—	0	0.04	4
Valencia ...	29.56f	-37	51	49	-3	57	45	W	7	8	W	8	hp	0.13	7
Roche's Point ...	29.49f	-50	51	50	-6	59	44	W	5	6	W	8	po	0.15	4
Pembroke ...	29.54f	-60	50	46	-1	54	46	WSW	7	9	SW	7	mc	0.12	7
Scilly ...	29.77f	-46	52	49	-1	56	49	W	7	7	W	5	C	0.01	6
Plymouth ...	29.74f	-49	52	49	-1	59	47	WSW	5	7	WSW	9	om	0.04	2
Portsmouth ...	29.72f	-50	54	49	0	62	50	SW	7	7	SW	5	C	0.03	5
Dover ...	29.73f	-45	52	50	-6	59	51	WSW	4	5	WSW	6	mc	0.01	3
London ...	29.67f	-51	53	48	-5	66	48	WSW	6	7	SW	6	bq c	0.03	—
Helder ...	29.64f	-51	51	—	-2	—	—	SW	6	—	—	—	—	—	2
Cape Gris Nez...	29.75f	-43	50	48	-1	58	41	WSW	8	5	WSW	9	cm	0.04	6
Brest ...	—	—	52	48	+1	59	48	NNW	4	5	WSW	—	0	—	4
L'Orient ...	29.97f	-37	53	57	+4	62	48	W	5	5	WSW	9	0	0.04	5
Rochefort ...	30.07f	-22	53	57	+1	63	50	SW	5	5	NR	6	bc	—	3
Biarritz ...	30.13f	-21	54	52	+1	58	48	S	3	5	W	8	of	—	5
Corunna ...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—
Brussels ...	29.81	-38	54	—	+4	—	—	SW	3	—	—	—	r	—	—
Charleville ...	29.89	-33	52	—	-1	—	—	SW	6	—	—	—	—	—	—
Paris ...	29.93	-31	52	—	+3	—	—	SW	2	—	—	—	0	—	—
Lyons ...	30.03	-13	62	—	+15	—	—	NR	3	—	—	—	b	—	—
Toulon...	30.07f	-05	56	54	-6	71	54	E	4	1	SSW	8	f	—	3

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Skudesnaes ...	29. 86	- 12	48	47	+ 2	—	—	WSW	2	—	—	—	c	—	1
Thurso...	29. 44	- 35	52	50	+ 6	—	—	SSE	5	4	SSE	6	c	—	3
Scarborough ...	29. 86	- 19	53	51	+ 1	—	—	SW	3	2	SW	10	r	—	2
Greencastle ...	29. 56	- 19	53	50	+ 4	—	—	WSW	7	7	WSW	9	o	—	—
Holyhead ...	29. 80	- 25	52	51	+ 1	—	—	S	7	7	S	10	m	—	5
Valencia ...	29. 88	- 05	56	53	+ 2	—	—	WSW	5	6	SSW	5	c	—	4
Scilly ...	30. 08	- 15	53	54	+ 2	—	—	SW	6	6	SW	10	d	—	6
London ...	30. 05	- 13	63	57	+ 5	—	—	WSW	4	2	WSW	10	o	—	—
Rochefort ...	30. 30	00	58	56	+ 4	—	—	NW	5	—	—	0	b	—	3

The decrease of pressure has continued generally. It has now become rapid at Thurso, but has slackened materially in Ireland. The wind has become strong from the SW^{wd} on our northwest coasts.

EXPLANATION OF COLUMNS.

EXPLANATION OF COLUMNS.

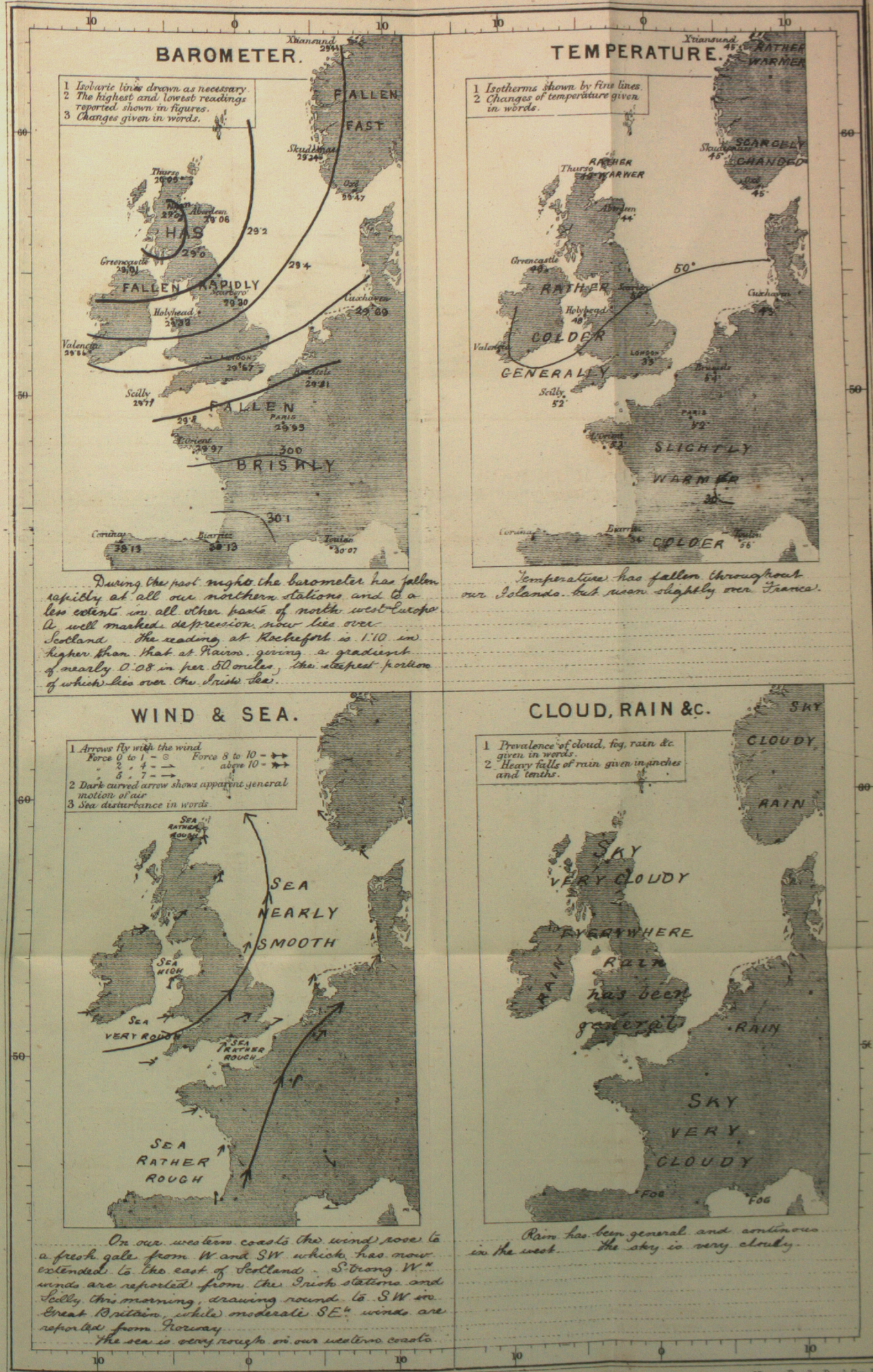
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WEATHER CHARTS

AND REMARKS FOR
SATURDAY 4th MAY 1872 AT 8 A.M.



Subscription for these Charts payable in advance
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Delivery by hand 10/- per quarter
" " " book post 5/- per quarter

Meteorological Office
116, Victoria Str^t, Westminster, S.W.
ROBERT H. SCOTT, Director.

APPENDIX.

APPENDIX I.

METEOROLOGICAL OFFICE REVENUE and EXPENDITURE ACCOUNT for the year ended the 31st March 1872.

Dr.	REVENUE.	EXPENDITURE.	Cr.
To Parliamentary Vote	- £10,000 0 0	OFFICE :	
„ Balance from year 1870-71 -	1,826 17 3	By Salary of Director -	£800 0 0
„ Dr. C. Jelinek -	£26 13 6	„ Two Clerks -	261 15 2
„ Colonel Walker	3 0 0	„ Office-keeper and Mes-	
„ W. W. Rundell -	2 3 1	senger -	161 0 0
„ J. R. Stebbing -	6 10 0		£1,222 15 2
„ G. Dornbusch -	10 0 0	„ Rent of Office -	520 3 9
„ H. Lee & Sons -	2 10 0	„ Fuel and Gas -	29 9 5
„ M. v. Wojeikoff	6 0 0	„ Furniture and Fittings -	79 16 9
„ Professor H. Mohn	34 1 0		629 9 11
„ Herr v. Freeden	44 5 0	„ Postage -	97 5 7
„ Dr. J. W. Moore	3 3 0	„ Printing, &c. -	22 2 6
„ J. Hartnup -	2 5 0	„ Attendance, and other	
„ F. Dun -	9 11 0	Contingencies -	117 13 3
„ G. T. Kingston -	9 19 8		237 1 4
„ Dr. E. Henderson	4 13 9		
„ Sale of old In-		LAND METEOROLOGY :	
struments, &c.	5 5 0	By Expenses at Observa-	
	170 0 0	tories -	2,588 11 1
„ Interest on deposit account -	59 16 9	„ New Instruments for do.	225 6 4
		„ Computations -	807 8 2
			3,621 5 7
		„ Telegraphy -	2,393 12 6
		„ Inspections and other	
		Expenses -	171 18 3
		„ Computations -	457 4 5
			3,022 15 2
		OCEAN METEOROLOGY :	
		By Marine Superintendent	400 0 0
		„ Supply and Return of	
		Instruments :	
		Admiralty -	90 9 2
		Mercantile Marine -	433 4 6
		„ Computations and Care	
		of Instruments -	903 9 8
			1,827 3 4
			10,560 10 6
		„ Cash in hand -	72 4 1
		„ Advance to Valencia	
		Observatory -	50 0 0
		„ Bank of England	
		account -	639 16 5
		„ London and Westmin-	
		ster Bank -	734 3 0
			1,496 3 6
			£12,056 14 0
	£12,056 14 0		

Examined and compared with the vouchers and found correct.

(Signed) WARREN DE LA RUE, } Auditors.
W. J. SMYTHE,

6 May 1872.

APPENDIX II.

LIST of CAPTAINS (and Officers) who have received from the Committee a Copy of the Admiralty Pilot Charts, to 31st March 1872 (*see* Report, p. 7). The figures opposite to each show the number of Special Letters of Thanks written to each Observer in acknowledgment of "Excellent" Registers *subsequently* returned to the Office.

Captain's Name.	Letters of Thanks.	Ship.
Almond, Thomas Michael -	--	"Decapolis."
Angel, John Fry -	—	"Twilight."
Banner, Frederick William -	1	"Lady of the Lake."
Barwood, William Richford -	—	"Fugitive."
Blake, Edwin John -	1	"Gilbert Thompson."
Bouchette, Francis Baines -	1	S.S. "European."
Brooks, Samuel -	2	S.S. "City of Brooklyn."
Brown, Robert -	1	S.S. "Moravian."
Bruce, John -	1	"City of Adelaide."
*Bythesea, John (V. C.) -	2	H.M.S. "Phœbe."
Campbell, Archibald -	1	S.S. "Britannia" and S.S. "Europa."
Capper, Edward Hall -	1	"Palm Tree."
Carruthers, Forrest Priest -	1	"Minero."
<i>Davidson Charles</i> -	—	"Perseverance."
Donkin, Thomas, R.N.R. -	1	"Inverness."
Ellery, William -	—	"Bowfell."
Finlay, James -	1	"Duncairn."
Fry, Alfred -	2	"Foam."
Grange, James -	—	S.S. "Acantha."
Gray, David -	—	S.S. "Eclipse."
Gray, John -	—	S.S. "Mazinthien."
Gray, John McDonald -	1	"Speranza."
†Greenwood, William -	1	S.S. "Scotia" and "Assaye."
Harris, David -	—	S.S. "Medway."
*Hayward, George Olive -	—	S.S. "Durley."
Hassell, Thomas Edward -	1	"Mervyn."
Hayes, James -	3	S.S. "Ptolemy."
Heggum, Edward Carl V. -	3	"Czar."
Henderson, Henry -	4	"Hope."
†Hodding, Samuel White -	2	"Indus."
*Hopkins, John O., R.N. -	1	H.M.S. "Liverpool."
Hunter, David -	2	S.S. "Alpha" and S.S. "Delta."
Jones, Arthur Arundel -	1	"Victoria Nyanza."
Jones, George Henry -	—	S.S. "Nile."
†Kennedy, Charles William -	—	S.S. "Scotia."
Kennedy, James Branch, R.N.R. -	—	S.S. "Blue Cross."
Kerr, Thomas Coulter, R.N.R. -	—	"Durham."
Lecky, Squire Thornton Stratford, R.N.R. -	3	S.S. "Uruguay" and S.S. "Halley."
Leportier, Theodore -	1	"Kate."
Lunham, Robert Dowe -	1	S.S. "Berar" and S.S. "Durley."

* Pilot charts not presented.

† Chief Officer.

‡ Second Officer.
Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
* <i>MacDonald, John</i> - -	--	S.S. "Europa."
Mackellar, D. E. - -	—	Observations at Rapa Island.
Maddison, John, R.N.R. - -	—	"Anglesey."
Manning, Henry - -	—	S.S. "Kangaroo."
Martyn, John Artis - -	6	S.S. "Siberia" and S.S. "Samaria."
*Mayne, Richard C., R.N., C.B. -	1	H.M.S. "Nassau."
†Menzies, Charles James - -	1	S.S. "Austrian" and S.S. "Sarmatian."
Moore, Thomas - -	—	"W. E. Gladstone."
Morton, John D'Arcy - -	—	"Henry Bath."
Mossop, Clement - -	2	"Candahar."
Murphy, Michael - -	—	S.S. "Tarifa."
†Paterson, James Forrest - -	2	S.S. "Moravian."
*Perry, John L., R.N. - -	—	H.M.S. "Orontes."
†*Petch, John A. R., R.N. - -	2	H.M.S. "Phœbe."
Petrie, Peter Conrad - -	1	S.S. "Patagonia."
Potts, Thomas Crosbie - -	2	"Tenasserim."
Rawle, Charles, R.N.R. - -	—	"Star of the North."
Raymond, Charles Tenzer - -	2	"British India" and "British Consul."
Reid, Carson William - -	—	"Lord Strathnairn."
Renaut, Charles Henry - -	—	"Celaeno."
†Scott, Fergus - -	—	S.S. "Hotspur."
†Scott, George Alexander Brown -	—	S.S. "Nestorian."
*Sharp, William H., Staff Com., R.N.	—	H.M.S. "Liverpool."
*Shortland, P. F., R.N. - -	1	H.M.S. "Hydra."
Simpson, Alexander - -	1	"Traveller."
<i>Smith, David, F.R.A.S.</i> - -	—	"Wiltshire."
Smith, William Henry, R.N.R. -	2	S.S. "Hibernian" and S.S. "Peruvian."
Stanhope, John - -	—	"Decision."
Steele, John - -	1	S.S. "Erl King."
Stuart, George Rennie - -	—	"Otago."
Stuart, William Henry - -	—	"Richmond."
Symington, William - -	1	"Northfleet" and "Flying Venus."
Stephen, John George - -	—	S.S. "Moravian" and S.S. "St. Patrick."
*Tandy, Dashwood G., R.N. -	1	H.M.S. "Nassau."
Tilmouth, Robert J. C. - -	—	"Peeress."
Townsend, William Henry - -	—	"Valentine and Helene."
Trench, Chas. E. Le Poer - -	—	"Newcastle."
Tucker, John Worth - -	—	"John Temperley."
*†Vine, William W., R.N. - -	—	H.M.S. "Orontes."
Walker, John Burnett - -	—	S.S. "Erik."
Watkins, Thomas - -	—	"Emulation."
Watson, William - -	2	S.S. "Palmyra."
Wherland, Frederick, R.N.R. -	2	"Galatea."
Wight, Henry Potts - -	3	"Gosforth."
Wilcox, Henry George, R.N.R. -	—	"St. Lawrence."
Williams, James Agnew - -	—	S.S. "Wisconsin."
Wylie, James - -	1	S.S. "Austrian" and S.S. "Sarmatian."

In addition the Committee have presented barometers to two gentlemen who have formerly kept registers for the office, but have now retired from the sea, viz., to Capt. A. D. Wood in 1867, and to Capt. Isaac Gales in 1870. A set of instruments was also presented to Capt. Alfred Fry in 1868.

* Pilot Charts not presented.

† Chief Officer.

‡ Navigating Lieutenant.

Names of Officers, deceased, *in italics*.

APPENDIX III.—A LIST of DOCUMENTS received from SHIPS and LAND STATIONS during the year 1871.

The number of ships supplied during the year 1871 was 100, of which number 15 were steamers belonging to the various companies and others now collecting observations for this office.

The above statement does not refer to ships in the Royal Navy, all of which are supplied with meteorological instruments from the office.

In addition to the registers returned from the ships referred to, documents amounting altogether to 86 in number have been registered during the year 1871, containing observations made at the following places:—

Place.	Observer.	Nature of Observations.
Angra do Heroismo (Azores)	-	One observation daily.
Bangkok (Siam)	Dr. Campbell	"Weather Book" Register, from January to December 1868.
Belize, Br. Honduras	S. Cockburn, F.M.S.	Daily observations and monthly means for October 1870.
Bermuda	Dockyard Authorities	Anemometrical Records.
Ceylon (Point de Galle)	D. Blyth, Master Attendant	Two observations daily and monthly means.
Cratow Imperial Observatory	Dr. F. Karlinski	One observation daily and monthly means for January 1871.
Falkland Islands (Cape Pembroke)	Lightkeeper	"Lighthouse" Register, from January 1870 to December 1871.
Funchal (Madeira)	-	One observation daily.
Gibraltar	Staff-Sergeant P. Sheehan, and Serjeant H. J. Hassell.	Two observations daily and monthly means.
Hamburg	Herr W. v. Freeden	Three observations daily for October and November 1869.
Hirtshals (Denmark)	M. Björneborg	Six observations of wind and weather daily, at the Lighthouse, from January to March 1871.
Lisbon	Sr. F. Da Silveira	One observation daily.
Lyttleton (N.Z.)	F. D. Gibson, Hr. Master	"Weather Book" Register, from April to October 1870.
Sombreno	Lightkeepers	"Lighthouse" Register, from May 1870 to October 1871.

List of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Adams, Joseph	Soukar	1,304	J. Fleming, London	To Melbourne, Calcutta, and home	8
Almond, T. M.	Decapolis	632	T. B. Walker, London	To and from Brisbane	6
Angel, J. F.	Twilight	631	Edward Bates, Liverpool	To and from Singapore	7
Archer, Frederick	S.S. Ottawa	1,860	J. & A. Allan, Glasgow	Two voyages to and from Quebec	2
Bain, John	County of Nairn	999	R. & J. Craig, Glasgow	To Bombay, Java, and home	7
Balderston, R. J.	Rajmahal	1,302	T. Brocklebank, Liverpool	To and from Calcutta	8
Banner, F. W.	Lady of the Lake	307	Edwards & Co., Bristol	To and from Valparaiso	7
Barwood, W. R.	Fugitive	471	T. B. Walker, London	To and from Tasmania	7
¹ Bax, W. H.	S.S. Hector	1,979	E. T. Gourley, Sunderland	To and from Valparaiso	4
² Bedingfeld, N. B.	Gladiator	1,210	H.M.S. -	To Madeira, Rio Janeiro, Monte Video, Cape of Good Hope, Rio Janeiro, and on south-east coast of South America.	14
Blake, E. J.	Gilbert Thompson	1,061	E. Bates, Liverpool	To and from Calcutta	8
Bolt, E. J.	Pride of Wales	886	C. Hill, Cardiff	To Buenos Ayres, Rangoon, and home	10
Bouchette, F. B.	S.S. European	2,647	Bryce Allan, Liverpool	One voyage to and from Baltimore, three to and from Quebec.	4
Brooks, Samuel	S.S. City of Brooklyn	2,911	W. Inman, Liverpool	Six voyages to and four from New York	4
³ Brown, Robert	S.S. City of London	2,765	Ditto	From New York	10 days
⁴ Brown, —	S.S. Moravian	2,481	Allan Bros., Glasgow	Five voyages to and from Quebec, three to and from Portland.	6
Bruce, John	Zoroaster	1,264	C. J. Fox, London	To and from Calcutta	9
Bulkeley, E. G.	City of Adelaide	791	J. Moore, London	To and from Adelaide	6
Campbell, Archd.	Cornwallis	648	James Southern, London	To and from Ceylon	8
⁵ Capper, E. H.	S.S. Britannia	1,392	Handyside & Henderson, Glasgow	Two voyages to and one from New York	2
	S.S. Europa	1,840	Ditto	Four voyages from and two to New York	3
	Palm Tree	1,458	R. Gibbs, London	To Bombay, Newcastle (New South Wales), Bombay, Cochin, Bimlipatam, and home.	12

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Carruthers, F. P.	Minero	478	C. L. Claude, Valparaiso	Hamburg to Valparaiso, Baltimore, and home.	7
Clarke, James	Western Empire	1,245	John Cuthbert, Sydney, N.S.W.	To and from Melbourne	7
Cohu, John	Silvercraig	491	-	To and from Valparaiso	6
Comley, W. G.	S.S. Blue Cross	1,075	G. Luckley, Newcastle	To and from Calcutta, viâ Suez	3
⁵ Conlan, G. N.	S.S. Cordillera	2,860	Pacific S. N. Co., Liverpool	Two voyages to and from Valparaiso	7
Cooper, Austin	Carlisle Castle	1,458	H. & F. Green, London	To and from Sydney	4
⁶ Craig, James	S.S. Anglia	2,253	T. & J. Henderson, Glasgow	Four voyages to and from New York	3
Donkin, Thomas	Inverness	725	J. & R. Grant, London	To and from Madras	7
Elery, William	Bowfell	1,002	T. & R. Brocklebank, Liverpool	To and from Calcutta	6
Erskine, William	Doune Castle	887	T. Skinner, Glasgow	To Sydney, San Francisco, and home	8
Fernie, A. D.	Sir John Lawrence	879	Donaldson, Rose, & Co., Aberdeen	To and from Sydney	7
Finlay, James	Dun Cairn	1,303	W. P. Sinclair, Liverpool	To and from Calcutta	8
Fletcher, H. B.	Arachne	618	T. & R. Brocklebank, Liverpool	To and from Calcutta	7
Fredrickson, A.	S.S. Odessa	1,079	John Francis Norwood, Hull	To and from Calcutta, viâ Suez	4
⁷ Fry, Alfred	Avonside	254	R. J. P. King, Bristol	To and from Cape Palmas	3
Gedye, Frank	Belvidera	685	J. H. Allan, London	To Madras and from Colombo	8
Goddard, W.	La Hogue	1,331	J. Moore, London	To Sydney	3
⁸ Graham, John	S.S. Moravian	2,481	J. & A. Allan, Glasgow	Three voyages to and from Quebec	2
Grahame, George	City of Florence	1,200	Geo. Smith & Sons, Glasgow	To and from Calcutta	7
Grange, James	S.S. Acantha	1,042	J. Gray Laurie, Glasgow	To Galle and various places in China and Japan, viâ Suez.	6
Gray, David	S.S. Eclipse	435	James Arbuthnot, Peterhead	To and from Greenland	5
Gray, John	S.S. Mazinthien	397	R. Kidd, Peterhead	To and from Greenland	4
Gray, J. Mc D.	Speranza	455	Wm. Nicholson, Sunderland	To Negapatam, Bimlipatan; Marseilles, Kertch, and home.	12
⁹ Green, W. C.	S.S. Nevada	3,125	L. & Gt. Wn. S. Co., Liverpool	Seven voyages to and from New York	6
Grigs, George	S.S. Helvetia	3,975	National S.S. Co., Liverpool	Two voyages to and from New York	2
Hall, William	Glenisla	373	J. Brodie, London	To Monte Video, Callao, Peru, Mauritius and home.	13

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
¹⁰ Hammill, M. D.	S.S. Magellan	2,856	Pacific S. N. Co., Liverpool	Two voyages to and from Valparaiso	6
Harrington, G. H.	England	850	G. H. Harrington, Portsmouth	To lat. 40° S., long. 12° W.	2
¹¹ Harris, David	S.S. Medway	1,846	J. Temperley, London	Three voyages to and from Quebec, one to and from Halifax.	4
Hayes, James	S.S. Ptolemy	1,115	Brazil and River Plate S. N. Co.	To and from Monte Video	2
Heggum, E. C. V.	Czar	1,147	R. Cuthbert, Greenock	To and from Pensacola	3
"	"	"	"	Two voyages to and from Quebec	3
Henderson, Henry	Hope	454	John Robinson, South Shields	Newcastle (N.S.W.) to Shanghai and other places in China Seas.	4
"	"	"	"	Trading between various places in the Eastern Seas.	4
¹² Hollway, S. S.	S.S. Araucania	2,877	Pacific S. N. Co., Liverpool	To and from Callao, &c.	3
¹³ Hopkins, J. O.	Liverpool	2,656	H.M.S.	To Bahia, Rio Janeiro, Monte Video, Valparaiso, Cape of Good Hope, Melbourne, Sydney, Hobart Town, Lytleton, Wellington, Auckland, Yokohama, Vancouver Island, Honolulu, Valparaiso, Bahia, and home.	14
Houston, Thomas	Florence	841	R. Gibbs, London	To Bombay Calcutta, Mauritius, Point de Galle, Calcutta, New York, and home.	12
Hunter, David	S.S. Alpha	653	W. Cunard, Halifax, N.S.	Seven voyages from Halifax to St. Thomas, via Bermuda, and back.	4
"	S.S. Delta	644	"	Five voyages from Halifax to St. Thomas, via Bermuda, and back.	3
Jack, William	City of Madrid	1,191	G. Smith & Sons, Glasgow	To Bombay, Calcutta, and home	10
Jarvis, W. E.	Ocean Belle	550	G. Balkwill, South Huish, Devon	To Singapore	3
Jones, A. A.	Victoria Nyanza	1,022	Joshua Prouse & Co., Liverpool	To Bombay, Moulmein, and home	8
¹⁴ Jones, Edward	Superb	1,451	Henry Green, London	To, at, and from Melbourne	5

LIST of DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Jones, G. H.	S.S. Nile	1,354	C. M. Norwood, London	To Galle, various places in India and home, via Suez.	6
¹⁵ Judkins, C. H. E.	S.S. Scotia	4,050	Burns & MacIver, Liverpool	Six voyages to and from New York	4
Kennedy, J. B.	S.S. Yorkshire	2,273	W. H. Tindall, London	To and from Calcutta via Suez	3
Kerr, T. C.	Durham	1,286	G. Marshall, London	To and from Calcutta	7
Lecky, S. T. S.	S.S. Halley	1,347	Brazil and River Plate S. N. Co.	Lisbon to Bahia, Rio Janeiro, back to Bahia and thence to New York.	2
Leportier, Theodore	S.S. Diana	104	J. Lamont, Knockdow, Ayrshire	To and from Arctic Ocean	4
Lewis, J. T.	S.S. Cashmere	1,083	British India S. N. Co., Lim. London	From Calcutta, to and from Bombay	2
"	S.S. Scotia	1,168	" "	In Bay of Bengal	8
Lunham, R. D.	S.S. Berar	1,011	G. Palmer, Greenwood, Hants	To and from Bombay, via Suez	3
McDonald, J.	S.S. Europa	1,840	T. & J. Henderson, Glasgow	Seven voyages to and five from New York.	6
McKechnie, D. F.	Cottica	319	Adam Pearson, Glasgow	To and from Jamaica	3
¹⁶ McRitchie, D.	Assaye	1,281	James Stewart, Greenock	To and from Rangoon	8
Maddison, John	Anglesey	1,012	H. Green, London	Two voyages to and from Melbourne	10
Mann, C.	S.S. Abbotsford	—	"	Suez, to and from Point de Galle	2
¹⁷ Manning, Henry	S.S. Kangaroo	1,773	Edward Bates, Liverpool	To Madras, Singapore, Penang, and home, via Suez.	5
Manson, J. S.	Canaan	840	R. McLachlan, London	To Hong-Kong, and from Java to New York and home.	8
Martyn, J. A.	S.S. Java	2,696	J. Burns, Glasgow	Two voyages to and from New York	2
"	S.S. Samaria	2,605	"	Six voyages to Boston and six from New York.	5
Miller, G. M.	Suffolk	975	Money Wigram, & Sons, London	Equator to Melbourne and home	4
¹⁸ Mitchell, James	S.S. Singapore	2,223	E. H. Watts, London	To and from Bombay, via Suez	2
"	"	"	"	To Aden, and home from Calcutta, via Suez.	3
Moore, Thomas	W. E. Gladstone	534	R. R. Glover, London	To Singapore, and from Akyab	8

LIST of DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Morice, O. T.	Southern Belle	540	R. Hill, Plymouth	To and from Colombo -	7
Morton, J. D'Arcy	Henry Bath	490	H. Bath & Son, Swansea	To and from Valparaiso -	7
Mossop, Clement	Candahar	1,418	T. & R. Brocklebank, Liverpool	To and from Calcutta -	6
Murray, Alexander	Sir Colin Campbell	365	J. Rae, Aberdeen	To Ivigtut, Philadelphia, back to Ivigtut.	4
Peacock, Emlyn	Lothair	—	-	To Yokohama and towards New York -	7
Petrie, P. C.	S.S. Patagonia	2,867	Pacific S. N. Co., Liverpool	Two voyages to and from Valparaiso -	5
¹⁹ Phelps, H.	Orontes	2,812	H.M.S. -	Halifax to Queenstown -	13 days.
Potts, T. C.	Tenasserim	1,418	T. & R. Brocklebank, Liverpool	Two and from Calcutta -	7
Poulson, Andrew	Lady Harewood	382	A. Gaviller, London	Two voyages to and from Barbados -	4
Price, James	S.S. Idaho	3,132	Liverpool & Great Western Steam Co., Liverpool.	Eight voyages to and nine from New York.	7
Raymond, C. T.	British Consul	1,267	British Shipowners' Co., Liverpool	To and from Bombay -	7
Renaut, C. H.	Celaeno	702	T. Rhoades, London	To and from Wellington, N.Z. -	6
Rowe, T. F.	Dunbar Castle	925	Devitt and Moore, London	To Sydney -	3
²⁰ St. John, H. C.	Sylvia	695	H.M.S. -	Inland sea of Japan -	8
Shand, J. D.	City of Benares	1,187	G. Smith and Sons, Glasgow	To and from Calcutta -	6
Shaw, Gilbert	S.S. Alpha	653	W. Cunard, Halifax, N.S.	Three voyages from Halifax to St. Thomas, via Bermuda and back.	2
"	S.S. Delta	644	"	Three voyages from Halifax to St. Thomas, via Bermuda and back.	2
²¹ Shinner, Henry	Lincolnshire	1,025	Money Wigram, & Sons, London	To and from Melbourne -	5
Simpson, Alexander	Traveller	196	John Ewen, Peterhead	To Ivigtut, thence to and from Copenhagen, Philadelphia, and home.	7
Sims, Nugent	S.S. Araucania	2,877	Pacific S. N. Co., Liverpool	To, at, and from Valparaiso -	3
Small, J. J.	S.S. Columbia	1,698	T. & J. Henderson, Glasgow	Four voyages to and three from New York.	4
Smith, David	Wiltshire	1,461	G. Marshall, London	To Calcutta, Trinidad, and home -	7
Smith, W. H.	S.S. Peruvian	2,320	J. & A. Allan, Glasgow	Three voyages to and from Quebec; two to and from Portland.	4
Steele, John	S.S. Erl King	1,671	W. Wallace, London	To Singapore, China, and home, via Suez.	5

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Steele, John	S.S. Erl King	1,671	W. Wallace, London	To, at, and from Bombay, viâ Suez	4
Stuart, G. R.	Otago	993	J. Galbraith, Glasgow	To and from Otago, N.Z.	4
Stuart, W. H.	Richmond	183	Board of Trade	At Bahamas	9
Symington, Wm.	Flying Venus	1,778	Edward Bates, Liverpool	To Bombay, Calcutta, and home	9
"	S.S. Hong Kong	1,881	E. H. Watts, London	To and from various places in China, viâ Suez.	5
"	Melbourne	1,636	Edward Bates, Liverpool	To and from Bombay	10
"	Northfleet	876	James Inrray, London	To Sydney, Hong Kong, thence to and from Calcutta and home.	12
"	"	"	"	To Hong Kong, Foochow, and home	9
"	"	"	"	To Hong Kong, Saigon, and home	9
Tait, James	City of Foochow	1,034	G. Smith & Sons, Glasgow	To Bombay, Calcutta, and home	9
Thomas, John	Santona	855	W. F. Donaldson, Glasgow	Lat. 42° N., Long. 24° W. to Lat. 15° N., Long. 28° W.	14 days.
²² Thomas, W. H.	S.S. Cordillera	2,860	Pacific S. N. Co., Liverpool	To and from Valparaiso	3
Thompson, J. M.	British American	1,207	C. Hill, Bristol	To and from Callao	7
Thompson, Peter	Belted Will	812	Bushby and Edwards, Liverpool	Towards Hong Kong	3
Tilmouth, R. J. C.	Peeress	780	Merchant Shipping Co., London	To and from Madras	7
Townsend, W. H.	Valentine and Helene	637	H. Bath & Sons, Swansea	To and from Pisagua	5
Trench, C. E. Le P.	Newcastle	1,137	Henry Green, London	To and from Port Philip	6
Tully, Thomas	Baroda	1,364	T. Brocklebank, Liverpool	Two voyages to and from Calcutta	13
²³ Unknown	Ellen Rogers	—	-	Abstract of voyage from Foochow towards London.	1
²³ "	Falcon	—	-	Abstract of voyage on China coast, Japan Formosa Channel, Java Sea, Adelaide, round Cape Horn, to Lat. 20° S., Long. 22° W.	7
²⁴ "	S.S. N. American	1,673	J. & A. Allan, Glasgow	To and from Portland, U.S.	1
²⁵ Vaile, T. G.	S.S. Crosby	1,498	G. Luckley, Newcastle-on-Tyne	To and from Calcutta, viâ Suez.	4
²⁶ Various	Three German ships	—	-	In North Atlantic, February 1870	1
²⁷ Verney, E. H.	Growler	464	H.M.S.	On West Coast of Africa	2

LIST OF DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Walker, J. B.	S.S. Erik	533	G. L. M. Gibbs, London	Two voyages to and from Cumberland Sound.	6
Watson, William	S.S. Palmyra	2,044	J. Burns, Glasgow	One voyage to Boston, one to New York, two from New York.	2
"	S.S. Parthia	3,500	"	One voyage to New York, five to Boston, six from New York.	5
Watt, H. F.	Eliada	246	H. F. Watt, Liverpool	Two voyages to and from West Indies	5
²⁸ Weaver, Isaiah	S.S. Arancania	2,877	Pacific S. N. Co., Liverpool	To and from Callao	4
Wherland, Frederick	Galatea	1,477	S. R. Graves, Liverpool	To Calcutta, Bombay, Marseilles, and home.	11
"	"	—	"	To and from Calcutta	7
Wight, H. P.	Gosforth	810	G. Luckley, Newcastle	To and from Madras	6
Wilcox, H. G.	St. Lawrence	1,094	J. Southern, London	To and from Calcutta	8
Wilding, James	Lizzie Iredale	693	P. Iredale, Cockermouth	To Shanghai, thence to New York	8
Williams, J. A.	S.S. Wisconsin	3,700	L. & Gt. Wn. S. Co., Liverpool	Four voyages to and from New York	3
²⁹ Wylie, James	S.S. Austrian	2,458	J. & A. Allan, Glasgow	Four voyages to and from Quebec, two to and from Portland.	4

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by officers as follows:—

- | | |
|---|---|
| ¹ E. Jackson, Chief Officer.
² Chas. E. Pritchard, Navigating Lieutenant.
³ s James F. Paterson, Chief Officer.
⁴ William S. Thomson, Chief Officer.
⁵ 22 Officers
⁶ T. G. Knox.
⁷ Assisted by J. F. Hunt.
⁹ Assisted by H. Gadd.
¹⁰ Messrs. B. B. Turner and A. W. Rae.
¹¹ F. A. Harvey.
¹² E. Jackson, 3rd Officer.
¹³ W. H. Sharp, Staff Com.
¹⁴ Mr. Hill.
¹⁵ C. W. Kennedy, Chief Officer. | ¹⁶ W. Greenwood.
¹⁷ W. Goodsell, 3rd Officer.
¹⁸ W. J. Sullivan, 3rd Officer.
¹⁹ W. W. Vine, Navigating Lieutenant.
²⁰ F. S. Wheeler, Navigating Midshipman.
²¹ Part of Homeward Voyage by G. Clarke, 2nd Mate,
²³ J. Catnach, Chief Officer.
²⁴ Benjamin Thomson, 3rd Officer.
²⁵ Robert McAvon, 2nd Officer.
²⁶ Abstracts received from Herr von Freeden, Hamburg.
²⁷ H. B. C. Winyard, Sub-Lieutenant.
²⁸ J. C. Marshall, 3rd Officer.
²⁹ C. J. Menzies |
|---|---|

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1871, afloat - -	175	366	827	12	23	131
Issued in 1871 - - -	52	82	244	29	29	33
Returned in 1871 - - -	227	448	1,071	41	52	164
	58	79	233	29	25	36
January 1st, 1872, afloat - -	169	369	838	12	27	128

INSTRUMENTS supplied, &c. for use at Naval Stations.

January 1st, 1871, in use - -	52	57	79	10	14	27
Issued in 1871 - - -	5	16	11	2	2	5
Returned in 1871 - - -	57	73	90	12	16	32
	9	7	25	4	6	26
January 1st, 1872, in use - -	48	66	65	8	10	6

DISPOSITION of ADMIRALTY INSTRUMENTS on January 1st, 1872.

Afloat in Royal Navy - - -	169	369	776	12	27	128
„ merchant ships - - -	—	—	—	—	—	11
In use at stations - - -	48	66	65	8	10	6
In store, at M.O. - - -	155	108	68	30	26	139
„ Chatham - - -	2	4	18	2	2	17
„ Sheerness - - -	5	7	31	1	1	15
„ Portsmouth - - -	8	9	18	7	8	34
„ Devonport - - -	8	12	30	2	2	24
„ Queenstown* - - -	1	4	6	2	2	8
„ Gibraltar - - -	2	—	—	—	—	4
„ Malta - - -	2	6	25	1	1	24
„ Halifax - - -	3	3	1	1	2	—
„ Bermuda - - -	5	4	22	1	—	16
„ Jamaica - - -	5	6	24	5	4	8
„ Cape of Good Hope - -	5	8	24	—	—	27
„ Hong Kong† - - -	15	34	65	1	1	28
„ Vaiparaiso‡ - - -	4	1	23	2	2	16
Under repair - - -	—	—	8	—	—	—
On way to Bermuda - - -	—	6	18	3	3	—
Total, January 1st 1872 - -	437	647	1,222	78	91	505
Destroyed and lost during 1871 -	3	3	141	14	9	15

* No return has been made since 1870, January 1st.

† No return has been made since 1871, July 1st.

‡ No return has been made since 1869, January 1st.

APPENDIX V.

INSTRUMENTS, &c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1871, afloat -	123	6	732	—	—	464
Issued in 1871 - -	105	2	555	1	1	298
Returned in 1871 -	228	8	1,287	1	1	762
	123	3	649	—	—	369
January 1st, 1872, afloat -	105	5	638	1	1	393

INSTRUMENTS in use at Stations, viz., Telegraph Offices, Lighthouses, Observatories, Navigation Schools, &c.

January 1st, 1871, in use	91	3	191	37	38	43
Issued in 1871 - -	15	2	56	16	13	19
Returned in 1871 -	106	5	247	53	51	62
	15	2	61	13	9	9
January 1st, 1872, in use	91	3	186	40	42	53

DISPOSITION of Board of Trade Instruments.

In merchant ships -	105	5	638	1	1	382
In naval ships - -	—	—	62	—	—	—
In use at stations -	91	3	186	40	42	53
In store at M.O. - -	61	42	126	10	10	130
At Liverpool agency -	6	8	51	1	1	27
„ Aberdeen „ -	7	—	45	—	—	27
„ Glasgow „ -	3	—	18	—	—	13
„ Dundee „ -	1	—	5	—	—	1
Under repair - -	1	—	14	—	—	—
Jan. 1st 1872, total -	275	58	1,145	52	54	633
Lost, &c. during 1871	13	2	237	14	8	92

APPENDIX VI.

LIST of STATIONS reporting Meteorological Observations by Telegraph
to the Office, with the Observers.

Sumburgh Head	-	W. Lawrence	-	-	-	-	—
Thurso	-	J. Trotter	-	-	-	-	—
Wick	-	J. Sandison	-	-	-	-	Postmaster.
Nairn	-	W. D. Penny	-	-	-	-	Schoolmaster.
Aberdeen	-	J. McCormack	-	-	-	-	Telegraph Clerk.
Leith	-	T. Bolton	-	-	-	-	Do.
Shields	-	J. Irvine	-	-	-	-	Do.
Scarborough	-	F. Shaw	-	-	-	-	Do.
Yarmouth	-	T. Robinson	-	-	-	-	—
Ardrossan	-	W. McNeil	-	-	-	-	Telegraph Clerk.
Moville	-	J. McGladery	-	-	-	-	Do.
Holyhead*	-	T. Slater	-	-	-	-	Do.
Liverpool	-	J. Hartrup, junr.	-	-	-	-	Liverpool Observatory.
Valencia	-	E. O'Sullivan	-	-	-	-	Telegraph Clerk.
Roche's Point	-	W. Kennedy	-	-	-	-	Do.
Pembroke	-	J. C. Walker	-	-	-	-	Do.
Scilly	-	W. Thomas	-	-	-	-	—
Plymouth	-	J. Merrifield, F.R.A.S.	-	-	-	-	Teacher of Navigation.
Portsmouth	-	J. Hoar	-	-	-	-	—
Dover	-	J. Costello	-	-	-	-	Telegraph Clerk.
London†	-	Clerks in Meteorological Office	-	-	-	-	—

* By Mr. Williams, Harbour Office, after 1st April 1872.

† Reports not sent by telegraph.

APPENDIX VII.

LIST of Persons, Places, &c. to which the Daily Weather Report has
been supplied to 31st December.*Newspapers :*

Daily News.
 Echo.
 Express.
 Globe.
 Lloyd's Shipping List.
 Mark Lane Express.
 Mechanics' Magazine.
 Observer.
 Pall Mall Gazette.
 Shipping and Mercantile Gazette.
 Standard (Morning and Evening).
 Times (1st and 2nd editions).

For Exhibition at following Seaports :

Banff.	Hull.
Belfast.	Newquay.
Blackpool.	Plymouth.
Boscastle.	Port Dinorwic.
Buckie.	Porthcawl.
Carnarvon.	St. Ann's Head.
Cromer.	Scarboro'.
Cullen.	Silloth.
Exeter (2 copies).	Teignmouth.
Falmouth.	Ventnor.
Great Grimsby.	Yarmouth.
Hayle.	

Societies, &c. :

Association of Underwriters, Liverpool.
 Do. Lloyd's.
 British Museum.
 Calcutta, Meteorological Committee.
 Patent Office, London.
 Press Association.
 Reuter's Telegram Company.
 Royal Society.
 Scottish Meteorological Society.
 Southport, Fernley Observatory.

Individual Observers, in co-operation, &c. :

Barnes, R. H., Kensington.
 Dymond, W. P., Falmouth.
 Griffith, Rev. C., Strathfield Turgiss.
 Hoskins, Dr. S. E., Guernsey.
 Malleson, Rev. F., Broughton-in-Furness.
 Mansell, J. C., Longthorns, Blandford.
 Moore, Dr. J. W., Dublin.
 Richards, W. H., Penzance.
 Smith, Rev. F., Merville.
 Sutherland, A., Carrickfergus.
 Tennent, R., Edinburgh.
 Whitehouse, W., Hampstead.

Foreign Places :

Christiania, Meteorological Institute.
 Constantinople, Imperial Meteorological Observatory.
 Emden, Dr. Prestel.
 Florence, Ministry of Agriculture.
 Hamburg, North German Ocean Observatory.
 Lisbon, Observatory.
 Paris, Meteorological Observatory, Montsouris.
 „ Meteorological Society.
 „ Ministry of Marine.
 „ National Observatory.
 St. Petersburg, Central Physical Observatory.
 Upsala, University Observatory.
 Utrecht, Royal Meteorological Institute.
 Vienna, Imperial Meteorological Institute.
 Washington, Smithsonian Institution.
 „ United States Naval Observatory.
 „ War Office.
 „ Chief Signal Office.

APPENDIX VIII.

TELEGRAPHIC WEATHER INTELLIGENCE.

The following stations, having been approved by the Board of Trade, are supplied with telegraphic information of storms free of expense, and "drum" signals have been furnished to most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated, 77 in England and

Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND. EAST COAST. Kirkwall. Inverness. Nairn. Burghead. Lossiemouth. Buckie. Portsoy. Banff. Fraserburgh. Peterhead. Aberdeen. Stonehaven. Montrose. Broughty Ferry. St. Andrews. Dundee. Anstruther. St. Monance. Burntisland. Alloa. Grangemouth. Bo'ness. Granton. Leith. Fisherrow. Dunbar. Eyemouth.	ENGLAND, N.W. Silloth Maryport. Workington. Whitehaven. Ramsey. Douglas. Castletown. Barrow. Morecambe. Fleetwood. Blackpool. Lytham. Runcorn. Southport. Liverpool. Queensferry. Hawarden. Mostyn. ENGLAND, W. Port Penrhyn. Holyhead. Carnarvon. Port Dinorwic. Aberystwith. Milford. Pembrey. Llanelly. Swansea. Briton Ferry. Porthcawl. Penarth. Cardiff. Newport. Weston-super-Mare. Burnham. IRELAND, E. Belfast Howth. Kingstown. IRELAND, S. and W. New Ross. Dunmore, East. Dungarvan. Youghal. Queenstown. Passage. Cork. Tralee. Limerick. Galway.	ENGLAND, S.W. Ilfracombe. Barnstaple. Port Isaac. Boscastle. Newquay. Hayle. Pendennis. Scilly. Penzance. Falmouth. Plymouth. Teignmouth. Exeter. Exmouth. ENGLAND, S. Guernsey. St. Helier } Jersey. Gorey Poole. Cowes. Ventnor. Portsmouth. Littlehampton. Brighton. Newhaven. Hastings. Rye. Dover.	ENGLAND, E. Tynemouth. S. Shields. Sunderland. Middlesborough. Redcar. Whitby. Filey. Withernsea. Hull. Goole. Grimsby. Boston. Sutton Bridge. Lynn. Cromer. ENGLAND, S.E. Yarmouth. Southwold. Ipswich. Harwich. Chatham. Sheerness. Faversham.
FIRTH OF CLYDE. Glasgow. Greenock. Rothesay. Campbeltown. Girvan.			

APPENDIX IX.

LIST of PLACES supplied with FISHERY BAROMETERS.

Those supplied during the years 1867–71 are distinguished by an asterisk.

Shetland Isles.—Sandsair, Lerwick.

Orkney Isles.—Burray. Kirkwall.*

Scotland, east coast.—Stroma, Staxigoe, Sarclet, Lybster, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy,* Whitehills, Gardenstown, Roseheart, Pitullie, Findon, Portlethen, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance,* Burntisland, Newhaven.

England, east coast.—Berwick, Beadnell, North Shields, South Shields, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn, Wells, Gorleston, Harwich,* Brightlingsea,* Wivenhoe,* Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor,* Portsea, St. Helens and Ventnor* (Isle of Wight), Gorey (Jersey), Poole, Weymouth, Portland, Budleigh-Salterton, Cawsand, Mevagissey, Gorranhaven, Devoran, Penryn, Falmouth (2), Newlyn, Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle,* Fremington, Burnham, Highbridge.

Wales.—Swansea, Milford.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Port St. Mary,* Peel.

Scotland, south-west coast.—Port Patrick,* Stranraer.

Ireland, east coast.—Belfast, Bangor, Strangford, Ardglass, Carlingford,* Dundalk, Malahide,* Howth, Kingstown, (2).

Ireland, south coast.—Dungarvan, Kinsale,* Crookhaven.*

Ireland, west coast.—Valencia, Dingle, Tralee, Ballina,* Killybegs.*

Ireland, north coast.—Bunbeg, Burton Port, Dunfanaghy, Rathmullen.

Scotland, west coast.—Campbeltown,* Portree (Isle of Skye) Plockton.

Hebrides, Stornoway, Cromore, Babyle, Obb, Ness.

APPENDIX X.

DONATIONS RECEIVED DURING THE YEAR 1871.

Presented by Societies, Institutions, &c.

Adelaide	-	Observatory	-	-	-	Meteorological Observations at Adelaide, and Rainfall at various places, 1869. By C. Todd, Government Observer.
Batavia	-	„	-	-	-	On the Lunar Atmospheric Tide at Batavia. By Dr. P. A. Bergsma, Director.
Berlin	-	K. Statistische Bureau	-	-	-	Preussische Statistik, Nos. 23, 24. (Monthly means of Pressure, Temperature, &c., for 1869 and 1870.) <i>See also</i> Dove.
Bombay	-	Colaba Observatory	-	-	-	Reports for September 1865 to December 1870, and for year ending 30th June 1871. Magnetical and Meteorological Observations, 1845-1864. By C. Chambers, Supt.
Brisbane, &c.	-	„	-	-	-	Summary of Rainfall, July to September 1870.
		„	-	-	-	Summary of Meteorological Observations in Queensland 1869, and at Brisbane, July to September 1870.
		„	-	-	-	Summary of Observations at Toowoomba, Warwick, and Cape Moreton, July to September 1870.
		„	-	-	-	Ditto at Sweer's Island, April to June 1870. By E. MacDonnell, Government Meteorological Reporter.
Brussels	-	Observatoire Royal	-	-	-	Annales, Vol. XX. Détermination de la Déclinaison et de l'Inclinaison magnétique à Bruxelles en 1870. Orages en Belgique en 1870. Observations des Phénomènes Périodiques, 1869. By M. A. Quetelet, Director.
Calcutta	-	Meteorological Office	-	-	-	Meteorology in India (Review). By H. F. Blanford, Government Meteorological Reporter.
		St. Xavier's College	-	-	-	Meteorological Register, January to June 1871. By the Rev. E. Lafont, S.J.
		Surveyor General's Office	-	-	-	Abstracts of the Results of Hourly Meteorological Observations, September 1870 to August 1871. By Col. Thuillier, F.R.S.
Cape of Good Hope.	-	Royal Observatory	-	-	-	Results of Meteorological Observations. By E. J. Stone, F.R.S., Astron. Royal.
Ceylon	-	Surveyor General's Office	-	-	-	Monthly results of Meteorological Observations made at 28 stations, May 1869 to September 1871. Rainfall returns, 1869-70. By Captain A. B. Fyers, R.E.
Christiania	-	Norske Meteorologiske Institut.	-	-	-	Meteorologisk Aarbog for 1870. Meteorologiske Jagttagelser i Norge November 1870 to November 1871.

Christiania	-	Norske Meteorologiske Institut.	-	Om Tordenvejr i Norge, 1870.
		"	- - -	Nogle Bemærkninger om Tordenveirenes Dannelse. Aarsberetning, 1870. Torghatten. Norges Wind- og Stormstatistik. Havets Temperatur mellem Island, Skotland, og Norge. Om Fordelingen af den Lys- og Varmemængde som Jorden modtager fra Solen, af C. Fearnley. Le Névé de Justedal et ses Glaciers, par C. de Seue. By Professor H. Mohn, Director, and by the University.
Constantinople	-	Observatoire Impérial Météorologique.		Résumé des Observations Météorologiques, August 1870 to May 1871. By A. Coumbary, Director.
Copenhagen	-	K. Danske Videnskabernes Selskab.		Forhandlinger, Nos. 2-3 for 1870, and Nos. 1-3 for 1871. By J. Steenstrup, Secretary.
		K. Landhus-holdnings-selskab		Aarsberetning, 1861-9 ; Fem-aarsberetning, 1861-5 ; Vejrforholdene, September, October, 1871.
Cracow	-	K. K. Sternwarte	- -	By H. J. Fjord and J. C. La Cour. Meteorologische Beobachtungen, December 1865 to November 1866, January to October 1871. Materyaly do Klimatografii Galicyi, 1867-70. Stündliche Barometer-Beobachtungen zu Krakau, 1848-56. Mittlere Temperatur zu Krakau nach 40-jährigen Beobachtungen, 1826-65. Allgemeine Übersicht meteorologischer Beobachtungen, 1826-52. By Dr. F. Karlinski, Director.
Dorpat	-	Kaiserliche Universität	-	Meteorologische Beobachtungen, 1869. By Dr. A. v. Oettingen.
Edinburgh	-	Royal Society	- -	Proceedings for Session, 1869-70.
		Scottish Meteorological Society.		Journal, New Series, Vol. III., Nos. 28-32.
Falmouth	-	R. Cornwall Polytechnic Society.		Results of Hourly Meteorological Observations, 1870. Diagram showing the Mean Velocity and Direction of the Wind, &c. for every day in the year 1870. Meteorology of West Cornwall, 1870. By W. P. Dymond, Hon. Sec.
Fiume	-	I. R. Academia di Marina		Meteorological Observations, January to October 1871.
Florence	-	Ministero d'Agricoltura Industria e Commercio.		Meteorologia Italiana, October 1870 to July 1871.
		"	-	Climatologia Italica, November 1870 to August 1871. By Dr. P. Maestri.
Greenwich	-	Royal Observatory	-	Report of the Astronomer Royal to the Board of Visitors, 1871.
		"	-	Magnetical and Meteorological Observations, 1869. By Sir G. B. Airy, K.C.B., Astronomer Royal.
Hamburgh	-	Norddeutsche Seewarte	-	Jahres-Bericht, 1870.
		"	-	"Hansa" 1871. Wetterberichte, for year 1871.
		"	-	Entwurf eines Organisationsplanes für die Deutsche Seewarte. By W. H. v. Freeden, Director.

Havana	-	Observatoire	-	-	<p>La Rotation azimutale des Nuages. La Polarisation atmosphérique observée sous le Ciel tropical de la Havane. L'existence des arcs surnuméraires à la Havane, et sur les arcs-en-ciel observés en 1862. Catalogue comprenant 1,008 ouvrages, &c., sur les ouragans et les tempêtes cycloniques. Instructions et considérations synthétiques sur la nature, &c. des nuages. Les colorations ozonoscopiques obtenues à l'aide du réactif de Jame, et sur l'échelle ozonométrique de M. Berigny. Description d'un ozonographe et d'un actinographe destinés à enregistrer de demi-heure en demi-heure l'ozone atmosphérique, &c. Expériences sur l'ozone ou l'oxygène naissant exhalés par les plantes. Étoiles filantes observées à la Havane du 24 Juillet au 12 Août, et remarques sur le retour périodique du mois d'Août. Relacion del gran terremoto acaecido el 13 y 16 de Agosto de 1868 en las Repùblicas del Perú, de Chile y del Ecuador. Anuario del Observatorio de la Habana. Año primero 1862; Barometria.</p> <p>By A. Poey, Director.</p>
		R. Colegio de Belen	-		<p>Observaciones Magneticas y Meteorologicas, Nov. 1869 to Nov. 1870.</p> <p>By Sr. J. M. Velez.</p>
Hong Kong	-	Government Civil Hospital			<p>Meteorological Observations taken at Victoria, Sept. 1870 to Sept. 1871.</p> <p>By R. Young, M.D.</p>
		Harbour Office	-	-	<p>Meteorological Observations taken at Praya West and Victoria Peak, Sept. 1870 to Sept. 1871.</p> <p>By Captain H. Thomsett, R.N., Harbour Master.</p>
Leipzig	-	Sternwarte	-	-	<p>Übersicht der Resultate aus den Meteor. Beobachtungen angestellt auf den K. Sächsischen Stationen, May 1870 to June 1871. Results of ditto for year 1868. Meteorologische Beobachtungen angestellt auf der Leipziger Universitäts-Sternwarte, 1869.</p> <p>By Dr. C. Bruhns, Director.</p>
Lemberg	-	K. K. Universität	-	-	<p>Meteorologische Beobachtungen, Nov. 1870 to Sept. 1871.</p> <p>By Dr. A. Handl, Director.</p>
Lisbon	-	Observatorio do Infante D. Luiz.			<p>Annaes, Vol. VIII., 1870, and Dec. 1870 to Feb. 1871.</p>
		"		-	<p>Boletim Meteorologico for the year 1871.</p> <p>By Sr. F. Da Silveira, Director, and Sr. C. de B. Capello.</p>
Liverpool	-	Observatory	-	-	<p>Reports of the Astronomer to the Marine Committee, &c., 1868 and 1870.</p> <p>By J. Hartnup, F.R.A.S.</p>
London	-	Admiralty	-	-	<p>Tide Tables for 1872. Nautical Almanac for 1871. List of Lights in the British Islands. Manual of Scientific Enquiry, 4th edition. Sun's True Bearing, or Azimuth Tables.</p>

London -	-	Admiralty - - -	Sailing Directions for— West Coast of England. Bristol Channel. West Coast of Scotland. Coast of Ireland. Channel Islands Pilot. North Sea Pilot. Directions for passage from the Downs to the White Sea. By Admiral Richards, C.B., F.R.S., Hydrographer.
		Board of Trade - -	Report of Wrecks, Casualties, &c. for 1870. By Thos. Gray, Assistant Secretary.
		British Association -	Report for 1870.
		British Horological Insti- tute.	Journal, Vol. XIII., Nos. 149–156. Vol. XIV., Nos. 157–160.
		Colonial Office - -	Returns from various colonies and settlements. See Hong Kong, Ceylon, and Wel- lington.
		India Office - . -	Returns from various Observers in India. See Bombay and Calcutta.
		„ -	A Memoir of the Indian Surveys, by C. R. Markham.
		„ -	Abstract of ditto for 1869–70.
		„ -	Great Trigonometrical Survey of India, Vol. I., by Col. Walker.
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		Royal Astronomical Society	Monthly Notices, Vol. XXXI., Nos. 2–12. No. 1. of Vol. XXXII.
		„ -	Memoirs, Vol. XXXIX., Part I.
		„ -	General Index to the first 29 Vols. of Memoirs.
		Royal Geographical Society	Proceedings, Vols. I. (except No. 3), II., III., IV. (except No. 1), V., VI., VII. (except No. 1), VIII. to XIII., XIV., Nos. 1–5, XV., No. 1.
		„ -	Journal, Vol. XL. (see also Toynbee).
		Royal Institution of Great Britain.	Proceedings, Vol. VI., Nos. 54 and 55.
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Manchester -	-	Literary and Philosophical Society.	Proceedings, Vol. XI., Nos. 1–11.
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		"	-	Osservazioni barografiche e termografiche, March to August 1871.
		"	-	Osservazioni barometriche, December 1869 to February 1871.
		"	-	Osservazioni termometriche, February 1870 to February 1871.
		"	-	Magnetic Observations, 29 and 30 August, and 21-23 December 1870. By Sr. Brioschi, Director.
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		Association Scientifique de France.	-	Bulletin Hebdomadaire, Nos. 189-237.
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		"	-	Phares des Côtes, Nos. 216-218, 220, 225. By Captain A. Le Gras.
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		Société Météorologique de France.	-	Nouvelles Météorologiques, Vol. III., Nos. 9-12.
		"	-	Annuaire de la Société Météorologique, Vol. XVII. Feuilles 1-12.
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	„	- Jahres-Bericht for 1870.
	„	- Über die Bewölkung Russlands. By Dr. H. Wild, Director.
	Société Impériale Géo- graphique	Travaux Météorologiques. No. 1. March 1871. By Dr. A. v. Wojeikoff.
San Fernando -	Observatorio de Marina	- Annales. August to December 1870. By Sr. C. Pujazon, Director.
Singapore -	Convict Jail Hospital	- Meteorological Observations, November 1870 to August 1871.
	„	- Abstracts, 1869-70, and 1870. By H. L. Randell, M.D.
Southport -	Fernley Observatory	- Weekly Abstracts of Observations and Results, from September 1871. By J. Baxendell, Esq., F.R.A.S.
Stonyhurst -	Observatory - -	- Results of Magnetical and Meteorolo- gical Observations, 1870. Results of Seven Years' Observations of Dip and Horizontal Force. April 1863 to March 1870. By the Rev. S. J. Perry, S.J.
Stuttgart -	Polytechnische Schule	- Die Meteorologischen Verhältnisse Württembergs nach den Resultaten der Württembergischen Stationen. By Dr. H. Schoder.
Sydney, &c. -	Observatory - -	- Abstract of Meteorological Observa- tions made in New South Wales, to the end of 1869, with Remarks on the climate.
	„	- Results of ditto, 1870.
	„	- Meteorological Observations made at Sydney, and Abstract from the country stations. January to July 1871. By H. C. Russell, B.A.
Tiflis - -	Imperial Observatory	- Die Sonnenfinsterniss vom 6 März 1867. Bemerkungen über die Meeres- höhe von Tiflis. Erdbeben in Kau- kasien im Jahre 1868, von H. Kiefer. Zwei Bemerkungen zu Regnault's Tafel der Spann-kraft des Wasserdamp- fes. Über die Anwendung des Pistor'- schen Reflections- Kreises zum Mes- sen von angular- Distanzen zwischen terrestrischen Objecten. Der Bewe- gungs- Mechanismus am Drehthurme des Observatoriums zu Tiflis. Collec- tion de Tables à l'usage des stations météorologiques du Caucase. Con- version des pouces Anglais et des demi-lignes Russes en millimètres. Exercices Hypsométriques. Samm- lung von Hülftafeln zur Berechnung barometrischer Hohenbestimmungen. By Dr. A. Moritz, Director.
Toronto - -	Education Office - -	- Journal of Education, Vol. XXIV. Annual Report for 1869. By the Rev. E. Ryerson, D.D.
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Trieste - -	R. Academia di Commercio Nautico.	Osservazioni Meteorologiche, October 1870 to 1871. Results of Observations for 1870.
Turin - -	R. Osservatorio - -	Bollettino Meteorologico, 1866.
	" - -	Do., et Astronomico, 1867-70.
	" - -	Catalogo delle 634 Stelle principali visibili alla latitudini media di 45°, &c. (With an Atlas).
		By Sr. Dorna, Director.
Upsala - -	Observatoire - -	Bulletin Météorologique Mensuel, Vol. I., Nos. 6-10; Vol. II., Nos. 10-12; Vol. III., Nos. 1-10.
		Om Vindarnes Lagar och de Nyaste Försöken till Väderleks- Förutsägelser, by C. F. E. Björling.
		By MM. Svanberg and Rubenson.
	" - -	Om Stormar och Askväder.
		By Dr. H. Hildebrandsson.
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Vienna - -	Adria Commission - -	1 and 2 Berichte an die K. Akademie der Wissenschaften.
		By Dr. J. R. Lorenz.
	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, November 1870 to October 1871.
	" - -	Telegraphische Witterungsberichte, December 1870 to November 1871.
		By Dr. C. Jelinek, Director.
	K. K. Sternwarte - -	Wiener Meteorologische Beobachtungen, 1823-1866.
		By Dr. C. v. Littrow, Director.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift, Bd. VI.
		By Dr. C. Jelinek.
Washington -	Department of Agriculture	Report for 1869. Monthly Reports for 1870.
	Smithsonian Institution -	Report for 1869. The Annular Eclipse of May 26th, 1854. The Aurora Borealis, its Phenomena and Laws, by Prof. Loomis. Map of the Solar Eclipse of March 15th, 1858, by the Rev. T. Hill. Report upon Physics and Hydraulics of the River Mississippi.
		By Professor J. Henry, Secretary.
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		By Admiral Sands, Superintendent.
	War Office - -	Daily Weather Reports and Maps, from 7th June 1871.
		By Brigadier-General Myer, U.S.A.
Wellington, N.Z.	Observatory - -	Meteorological Observations at various Stations, May 1870 to April 1871. Abstracts for year 1869, and December 1870 to April 1871. Report for 1870.
		By J. Hector, M.D., F.R.S., Government Meteorological Reporter.
Zurich - -	Meteor. Centralanstalt der Schweizerischen Naturforschenden Gesellschaft.	Meteorologische Beobachtungen, December 1869 to December 1870.
		By Dr. Wolf.

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Brioschi, Sr. -	-	„ Naples.
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Merrifield, J., L.L.D.	-	-	The Meteorology and Climate of Plymouth. Meteorological Summary for 1870.
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Mohn, Professor H.	-	-	See Christiania.
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Symons, G. J. - -	Monthly Meteorological Magazine; Vol. VI.
Thomsett, Captain - -	See Hong Kong.
Thuillier, Col., F.R.S. - -	„ Calcutta.
Toynbee, Capt. H., F.R.G.S.	Journals of the Royal Geographical Society, Vols. XXX. ; XXXIV.-V. ; XXXVII.-VIII.
Velez, Sr. - -	See Havana.
Walker, Col., R.E. - -	„ India Office.
Wheeler, Rev. F. - -	Meteorological Reports of the Tyneside Naturalists' Field Club, 1868-70.
Wild, Prof. H. - -	See St. Petersburg.
Wojeikoff, Dr. A. von - -	„ do.
Wolf, Dr. R. - -	„ Zurich.
Young, R., M.D. - -	„ Hong Kong.

APPENDIX XI.

LIST of PERSONS in the EMPLOYMENT of the METEOROLOGICAL COMMITTEE on December 31st, 1871, with their Occupations and Amount of Salary.

Name.	Duties.	Salary.						
		Yearly.			Weekly.			
Office.		£	s.	d.	£	s.	d.	
Robert H. Scott	- Director of the office - - -	800	0	0	—			
J. S. Harding, jun.	- Correspondence, Accounts, Library -	190	0	0	—			
J. S. Harding, sen.	} Copying, accounts of stores, registry of documents, &c. {	—			1	18	6	
T. D. Bell		- -	—			1	0	0
Land Meteorology (Observatories).								
R. H. Curtis	} Reproduction of observatory curves by pantagraphs, and preparation for publication. {	110	0	0	—			
F. C. Steventon		- -	100	0	0	—		
C. Stodart		- -	—			2	0	0
*H. W. Woodward		- -	—			1	0	0
E. Allen	} Discussion of returns and compu- tations. {	—			1	10	0	
E. Magrath		- -	—			1	10	0
J. P. Cutts		- -	—			0	17	6
Land Meteorology (Telegraphy).								
F. Gaster	} Preparation of weather reports, and computations. {	150	0	0	—			
F. Brodie		- -	—			1	1	0
G. G. Francis		- -	—			1	0	0
R. Sargeant		- -	—			0	14	0
Ocean Meteorology.								
Capt. H. Toynbee	- Marine Superintendent - - -	400	0	0	—			
W. Salmon	- Examination of logs under discussion	240	0	0	—			
R. Strachan	- Care of instruments and reduction of meteorological returns.	220	0	0	—			
C. Harding	- Examination of logs under discussion	130	0	0	—			
J. A. Curtis	} Computations - - - - {	—			1	10	0	
W. G. James		- -	—			1	10	0
J. W. McVeagh		- -	—			0	14	0
Commissionaire	- Messenger - - - - -	—			1	1	0	
Rev. Thos. Kerr	- Director of Valencia Observatory -	250	0	0	—			

* Engaged since 31st December.

LIST OF PUBLICATIONS, &c.

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OFFICIAL.

- No. 1. Report for 1867. Presented to Parliament. 1s.
 2. Instructions for Meteorological Telegraphy. 6d.
 3. Fishery Barometer Manual. 6d.
 4. Charts of Surface Temperature, South Atlantic Ocean. 2s. 6d.
 5. Report for 1868. Presented to Parliament. 5d.
 6. Report for 1869. Presented to Parliament. 10d.
 7. Quarterly Weather Report for 1869. Parts I. to IV. Price 5s. each. [Stanford.]
 8. Barometer Manual. 1s.
 9. Quarterly Weather Report for 1870. Parts I. to IV. Price 5s. [Published by Stanford, Charing Cross.]
 10. Report for 1870. Presented to Parliament. Price 10d.
 11. Contributions to our knowledge of the Meteorology of Cape Horn and the West Coast of South America. Price 2s. 6d. [Stanford.]
 12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. Price 2s. 6d. [Stanford.]
 13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N. for the Eleven days ending 8th February 1870. Price 2s. 6d. [Stanford.]
 14. Quarterly Weather Report for 1871.—Part I. January–March. Price 5s. [Stanford.]
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- No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6d.
 2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1s.
 3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1s.
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